GENDER AFFIRMING VAGINOPLASTY

Edited by

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ACADEMIC PRESS
An imprint of Elsevier

Preface

Year 2023: Many individuals are seeking help by healthcare professionals to reducing personal discomfort with one's own appearance, wishing for aligning the body to one's own idea of self, or one's self ideal; this might result in improving social well-being and quality of life.

Examples of such procedures are various: some are defined as cosmetic, some as reconstructive. Medical procedures as fillers to counteract the ageing process, or surgical procedures as those using implants to enlarge one's own breast, belong to the "cosmetic" category; the associated costs of these procedures are usually not covered by government-based, or insurance-based, healthcare systems. Conversely, procedures involving reconstruction to correct physical alterations through accidents or medical reasons (such as following a cancer) frequently are covered by these systems.

Year 2023: Individuals are defining, and affirming, one's own gender, regardless the gender they had been assigned at birth; thus, regardless the genital characteristics they presented at birth.

Among those individuals, those comfortable with their birth-assigned gender are referred to as cis, whereas those departing from such assignment are referred to as trans; those who are going beyond the dichotomy of male and female, and affirm one's gender within a gender spectrum, might prefer to identify as nonbinary. Broadly speaking, sex and gender are now defined according to a spectrum of attributes rather than a binary choice [1,2] with approximately ~0.5% of adults in the United States identifying as "transgender" [3].

For trans or gender-diverse individuals, election to undergo medical and surgical procedures is motivated by a desire to improve their quality of life. In this case, the two categories cosmetic and reconstructive blend together, and clear distinction cannot be made. In fact, modifying bodily characteristics to match their chosen gender and obtain the associated functions constitutes an essential step in a life-affirming process. Naturally, the decision to move forward with such changes requires considerable support from both mental health and healthcare professionals [4].

A key difference between the cis population and that constituting trans- and gender-diverse individuals is the level of discomfort with how they present themselves to the world. According to a transgender survey conducted in the United States in 2015, 40% of the 28,000 trans individuals interviewed reported having attempted suicide during their lifetime versus 4.9% of cis population, with 7% having attempted suicide within the previous year (compared with 0.6% of the cis population) [5].

In the 11th edition of the International Statistical Classification of Diseases and Related Health Problems (ICD-11), the World Health Organization (WHO) defined the condition of people presenting an incongruence between the gender assigned at birth and that in which they prefer to identify. The ICD-11 codes reflecting a modern understanding of sexual health and gender identity represent a significant step forward by the WHO. Specifically, diagnostic categories from the ICD-10, including "transsexualism" and "gender identity disorder," were replaced by "gender incongruence." Additionally, the latter category moved from the chapter describing mental and behavioral disorders to one describing conditions related to sexual health. According to the WHO, these changes signal recognition that trans-related and gender-diverse identities are not mental illnesses [6]. Furthermore, the ICD-11 promotes access to gender-affirming healthcare systems and services for these populations.

Diagnostic and treatment guidelines for trans and gender-diverse individuals are described in the eighth version of the World Professional Association for Transgender Health Standards of Care (WPATH SOC-8) [7]. Treatments include aspects of social, psychological, behavioral, and medical (hormonal and surgical) interventions and should focus on supporting affirmation of individual gender identity [6,7]. Among medical interventions, gender-affirming surgery includes procedures, such as facial feminization and masculinization, chest-wall contouring, voice surgery, genital feminization (orchiectomy and creation of a vulva and vagina), genital masculinization (penile reconstruction, urethroplasty, and vaginectomy), etc. [8,9].

Many societies are increasingly accepting of people presenting gender incongruence through both acknowledgement of the condition and a willingness to recognize its impact. Such recognition extends to healthcare systems, which are expanding the availability of reimbursement for surgical procedures targeting this patient population. This is largely a consequence of scientific evidence demonstrating the success of such procedures and the associated increases in patient quality of life. As a result, increasing numbers of patients are now seeking gender-affirming surgical procedures [10], with 66% of transfeminine people reporting a willingness to undergo gender-affirming vaginoplasty (GAV) [5]. In fact, the goal of GAV is to enhance the benefits already achieved by psychotherapy, social transition, and hormone therapy to further alleviate the experience of gender dysphoria by ultimately aligning genital physical characteristics with the person's gender identity [11−13].

Vaginoplasty should create a natural-appearing vulva with a correctly positioned urethral meatus and urinary stream directed downward while in a seating position. The procedure should also result in a sensate clitoris enabling orgasm (possibly together with the prostate) and a vaginal canal for penetrative intercourse [11,12]. Ideally, a functional neovagina should be moist, elastic, and hairless with a minimal depth of 10 cm and a minimum diameter of 3 cm [12].

This represents the first book specifically addressing all aspects of clinical approaches to GAV to persons assigned male at birth, and presenting gender dysphoria. Given the increasing demand for this procedure, our goal is to provide healthcare professionals clarification on details related to state-of-the-art surgical techniques and the procedures necessary to prepare patients for their life-changing results, as well as details on the recovery period and the outcomes following GAV.

This book is divided into the following chapters:

Chapter 1 presents a history of GAV along with future concepts related to gender-affirming surgery based on current research.

Chapter 2 describes the impact of WPATH SOC-8 on GAV and highlights its impact on health care systems.

Chapter 3 presents cultural aspects related to GAV and how *trans* and *gender-diverse* persons have historically been perceived in society.

Chapter 4 focuses on patient motivations for choosing orchiectomy as an option over GAV and details concerning the surgical procedure.

Chapter 5 describes psychological support before, during, and after GAV and following definitive diagnosis of gender dysphoria.

Chapter 6 describes the multidisciplinary approaches involved in preparing patients for GAV, including consultations with the surgical team, preparation of the local tissues, and instrumental examinations.

Chapter 7 describes the relevant anatomy of penile inversion vaginoplasty.

Chapter 8 describes the personal technique from Dr. Bowers.

Chapters 9 through Chapter 12 provide clinical descriptions of different approaches to cavity dissection involved with GAV. Authors of these chapters represent surgeons with extensive experience with these surgical methods.

Chapter 13 presents a detailed comparison of each respective technique described in Chapters 9 through Chapter 12.

Chapter 14 describes use of the scrotal flap and skin grafts in GAV.

Chapter 15 describes the surgical details involved with vulvoplasty performed without a full vaginal cavity.

Chapter 16 focuses on the surgical refinements available for improving aesthetic outcomes related to GAV.

Chapter 17 describes the surgical details involved with the use of bowel tracts to line the vaginal cavity.

Chapter 18 describes technical details related to the use of peritoneum to line the vaginal cavity during GAV, including the associated advantages and risks.

Chapter 19 constitutes a literature review of complications following GAV.

Chapter 20 addresses the causes and frequency of recto-vaginal fistula as a particularly devastating complication of GAV and the approaches employed to its resolution.

Chapter 21 constitutes a literature review of sexual wellbeing and health as reported by patients following GAV.

Chapter 22 describes the aspects of pelvic floor physical support for transfeminine persons undergoing GAV.

Chapter 23 describes surgery for trans and gender-diverse individuals assigned male at birth and not requesting a full vaginoplasty procedure. These cases include requests for nullification surgery or penile-/testicle-preserving genital surgery.

Chapter 24 describes *reversal surgery* following genital gender-affirming procedures, including phalloplasty following vaginoplasty and vaginoplasty following phalloplasty.

Chapter 25 [1] presents our conclusions and thoughts on the future development of gender-affirming surgical procedures.

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Foreword

Gender-affirming care has evolved into a critical area of healthcare, not only due to its technical demands but because of its profound impact on the lives of individuals experiencing gender incongruence. In recent years, there has been a growing global recognition of the need for comprehensive, respectful, and effective healthcare tailored to transgender and gender-diverse individuals. This recognition is now reflected across a multitude of healthcare systems, as they seek to provide gender-affirming treatments (including surgical procedures) that validate an individual's gender identity. Of all such procedures, vaginoplasty remains the most frequently performed and one of the most impactful. This book, *Gender Affirming Vaginoplasty*, stands as a landmark contribution, offering an unprecedented exploration into the medical, cultural, and surgical aspects of this highly specialized surgery.

The editors of this book, Prof. Dr. Gennaro Selvaggi from the Department of Plastic Surgery at Sahlgrenska University Hospital, Gothenburg University in Sweden, and Prof. Dr. Miroslav L. Djordjevic from the Department of Urology at the University of Belgrade, Serbia, and the Icahn School of Medicine at Mount Sinai in New York, are internationally recognized authorities in this field. Their work has contributed significantly to the advancement of gender-affirming vaginoplasty, improving not only the technical aspects of the surgery but also the holistic care surrounding it, including preoperative planning, psychological preparation, and postoperative follow-up. Their leadership in editing this text ensures that the book embodies a level of expertise that is unmatched in the global gender-affirming surgical community.

Historically, vaginoplasty has been the cornerstone of genital gender-affirming surgeries. Its ability to transform not just the physical body but the psychosocial well-being of individuals undergoing this procedure is well documented in scientific literature. Numerous studies demonstrate how successful vaginoplasty enhances quality of life, providing functional and aesthetic outcomes that contribute to patients' sense of self-affirmation, belonging, and mental as well as sexual health. For many, this procedure is not merely cosmetic or functional; it is a vital step toward living an authentic life aligned with their gender identity.

What makes this book, *Gender Affirming Vaginoplasty*, especially notable is that it is the first book to comprehensively address all the facets of this specialized surgery. It delves into the technical details of state-of-the-art surgical methods while also contextualizing them within broader medical, social, and cultural frameworks. The editors, alongside their contributing experts, provide a thorough examination of the evolving standards of care, most notably the latest World Professional Association of Transgender Health (WPATH) Standards of Care, version 8 (SOC8), which guide healthcare professionals in offering transgender and gender-diverse individuals the most current, respectful, and effective care.

This book tackles a wide spectrum of essential topics, from the historical evolution of vaginoplasty to its current and future trajectories. It highlights the significant research that supports the ongoing refinement of these surgical techniques and explores the challenges and innovations in this field. By addressing the cultural considerations surrounding gender-affirming surgeries, it acknowledges that these procedures occur within the context of larger societal shifts toward greater acceptance and understanding of gender diversity.

For me as a surgeon with a lifelong passion for gender affirmation operations, one of the most impressive aspects of this volume is its detailed surgical descriptions. The editors and contributors, all world authorities in this field, explain into detail the nuances of creating the vaginal cavity, the intricate use of penile skin flaps and skin grafts, bowel vaginoplasties and the aesthetic refinements that are critical for optimal patient satisfaction. This book also explores innovative, nonstandard techniques, such as the use of peritoneal tissue performed with the help of robotic surgery. These sections underscore the versatility and adaptability of modern surgical approaches to meet the diverse needs of patients. Equally important, this book addresses specialized procedures that are performed less frequently such as limited-depth vaginoplasty, nullification and other nonbinary surgeries, and even reversal surgery after prior gender-affirming operations, reflecting the diverse journeys and decisions individuals may navigate during their lives.

The inclusion of postoperative care and complication management demonstrates the editors' commitment to providing a holistic and comprehensive view of vaginoplasty. Surgical success is not solely measured by the completion of the procedure but by the long-term health, functionality, and happiness of the patient. Equally critical are the nonsurgical aspects that accompany this journey: psychological support, sexual health counseling, pelvic floor therapy, and a recognition of the emotional and physical complexities transgender individuals often face both before and after surgery.

In addition to its clinical focus, this book looks ahead, addressing future developments and ongoing research in the field. This is especially important as the landscape of gender-affirming care continues to evolve rapidly. Whether through technological advancements, improved surgical techniques, or broader access to care, the authors encourage readers to think critically and progressively about the future of gender-affirming vaginoplasty and the continuous improvement of patient care.

Ultimately, *Gender Affirming Vaginoplasty* is not just a clinical guide; it is a testament to the progress and promise of gender-affirming care. It reflects a deeper understanding of the importance of compassionate, personalized healthcare for transgender and gender-diverse individuals. As healthcare professionals and society at large should continue to recognize the validity and necessity of such care, this book will serve as a foundational resource for surgeons, multidisciplinary teams, and all whoare committed to providing comprehensive and empathetic care.

I would like to sincerely congratulate both editors and all the expert contributors of this book that stands as a reflection of where we are today and where we are headed in gender-affirming surgery. I consider it as essential reading, important for the education of all those dedicated to advancing this field and, more importantly, to improving the lives of the patients who rely on this transformative operation.

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Academic Press is an imprint of Elsevier
125 London Wall, London EC2Y 5AS, United Kingdom
525 B Street, Suite 1650, San Diego, CA 92101, United States
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States

ISBN: 978-0-443-21776-0

For information on all Academic Press publications visit our website at https://www.elsevier.com/books-and-journals

Publisher: Stacy Masucci
Acquisitions Editor: Patricia M. Osborn
Editorial Project Manager: Barbara L. Makinster
Production Project Manager: Vishnu T. Jiji
Cover Designer: Mark Rogers

Typeset by TNQ Technologies

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In 2010, he obtained a PhD in Gender-Affirming Surgery from the University of Ghent, Belgium. He further expanded his expertise with an MSc in Leading and Managing in Healthcare Organizations from Plymouth University in 2013, which he utilized to establish the Gender-Affirming Surgery Unit at Sahlgrenska University Hospital. In 2018, he earned an MA in Global Public Health with a major in Bioethics from New York University, allowing him to explore ethical issues in plastic surgery, gender-affirming surgery, and innovative surgical techniques.

Since 2011, Dr. Selvaggi has been leading the Gender-Affirming Surgery Program at Sahlgrenska University Hospital, where he currently serves as both Associate Professor and Senior Consultant. He oversees all gender-affirming surgical procedures at the hospital, including chest contouring surgeries, facial feminization surgeries, and genital surgeries.

A frequent presenter at international scientific conferences, Dr. Selvaggi is also a prolific author, contributing peer-reviewed articles and book chapters primarily focused on gender-affirming surgery. He serves on the editorial boards of several peer-reviewed journals and holds various roles in medical associations such as WPATH (World Professional Association for Transgender Health) and EURAPS (European Association of Plastic Surgeons). Additionally, he advises the Swedish Ministry of Health on the development of national guidelines and the organization of healthcare for transgender individuals in Sweden.

Beyond his clinical, research, and organizational work, Dr. Selvaggi is dedicated to education. He teaches gender-affirming surgery, plastic surgery, and public health related to the LGBTQ population to medical students, surgeons, and other healthcare professionals at Sahlgrenska University Hospital, the University of Gothenburg, and various other institutions worldwide by invitation.

Miroslav L. Djordjevic, MD, PhD

Dr. Miroslav L. Djordjevic is a Professor of Urology and Surgery at the School of Medicine, University of Belgrade, Serbia, and Icahn School of Medicine at Mount Sinai, New York. The main field of his multidisciplinary work is urogenital reconstructive surgery, encompassing treatment of all anomalies of the genital system, regardless of gender or age. Professor

Djordjevic has been multiply awarded for his comprehensive scientific work. He is the Editor of many leading journals and books and a member of all the relevant international associations in the field of urology and genital reconstructive surgery. Professor Djordjevic has been an Invited Lecturer and Visiting Professor at many universities all around the world. As a member of humanitarian societies, he actively participated in humanitarian missions all over the world. Finally, he is the Founder and Leader of the Belgrade Center for Genital Reconstructive Surgery, which is chosen as a fellowship program center by 20−30 foreign colleagues every year. He is the former President of GURS (Genitourinary Reconstructive Surgeons Society). From 2019, Professor Djordjevic joined the Urology Department at Icahn School of Medicine at Mount Sinai in New York, United States. From 2022, he has been a gender-affirming Consultant Surgeon at Chelsea and Westminster Hospital, London, United Kingdom.

CHAPTER

1

A history of gender-affirming surgery

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History of gender-affirming surgery (GAS) spans centuries, not decades, and was likely present or imagined since the earliest days of civilization. So-called "change of sex" was represented in ancient Greek mythology—for romantic advantage, as a deceptive ploy, as punishment, and even to attain greatness and omnipotence, the pinnacle in a pious state of balance between male and female. History of GAS should also include discussions of eunuchs: castrated males whose testicle removal rendered the person testosterone-free. In the absence of male hormone, the body softens, as does the behavior, many believing that eunuchs possess a clarity of judgment.

Modern surgical history is limited to the past 100 years and is dotted by unlikely origins in sometimes remote locations, punctuated by heroes, by serendipity and by a few notable villains as it progressed through history in fits and starts over decades. This slow advance of the field occurred first as scientific pursuit in explanation of human tendency, later as deeply hushed and muted experimentation and, finally, as a consumer-driven commodity with a limited supply chain.

For surgeons, GAS was initially approached with trepidation, fearful of patients expressing regret or colleagues' accusations of "creating mayhem." It was also curiously explored as a scientific breakthrough, something of a medical miracle, a technical advance. In time, some surgeons came to appreciate the passion and the unwavering conviction present within trans persons' decisions to undergo painful and sometimes dangerous surgical procedures. Surgeons also risked their own professional standing among their peers. Over decades, transgender surgery has become far more accepted, finally drawing interest from hospitals, academic centers, and young surgeons, no longer afraid, uninterested, or ashamed to work in the field. Aside from the hazards of unchecked opportunism, new surgeons brought new perspective and innovation.

For transgender persons, surgery was a way to leave the physical shackles of birth assignment behind, an almost unattainable endpoint throughout the 1900s. Just gaining access to surgery required persistence, enormous courage, and expectations of surgical results that were not always functional let alone aesthetic. Possessing the required money was only a

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00001-7

small part of the equation. In addition, the desire to change one's sex was first considered delusional, if not, psychopathological. Ever so slowly, acceptance that "changing the body rather than the mind" became an accepted approach to gender dysphoria. Safety, functionality, and cosmetic appeal were gradually incorporated as expectations for a successful surgical outcome. Through demand of patients themselves, coverage within national health plans around the globe and among insurers further enabled access.

Among *the general public*, GAS was something that happened only rarely, poorly understood, possibly abhorrent, and occurring largely under the radar. Clearly, there were visionary proponents but also those who saw gender diversity as an unraveling of society and something that ran afoul of God's natural order, oblivious to the uncomfortably common but obscured presence of intersex conditions—which coincidentally required similar surgical procedures. The 1933 destruction of Magnus Hirschfeld's Institute for Sexual Science was the first in a series of backlashes that have attacked the field. A second backlash that effectively shuttered trans care within academic settings across the United States and much of the world came largely as a result of Johns Hopkins' Dr. Paul McHugh in 1979 [1]. That there is a third major backlash against gender-affirming care (GAC) currently is not entirely surprising. This chapter reviews transgender surgical history from its often random and secretive early beginnings to its still evolving future.

Just in 2020, gender diversity has been accepted as a medical diagnosis [2]. Further, the old term 'transsexualism' has been removed, and the condition, currently named 'gender incongruence' is no longer categorized as a psychiatric illness [3]. Many university departments, community hospitals, and national health plans have added or are attempting to add gender-affirmingn services, providing encouragement for patients who have endured years of denials, long wait times for surgery, and uncovered claims for surgeries and clinical care. Many today still travel long distances to access gender-related healthcare. Follow-up medical care for recovering patients returning home remains difficult to find for many and often substandard in quality, provided by clinicians who have limited exposure, credentials, or experience. In response to growing demand, WPATH initiated its Global Education Initiative in 2016. Conferences focusing on GAC are well attended by patients and by providers and cis-allies and families. Hospitals, university programs, national health plans, and community health clinics are increasingly providing GAC. Specifially, GAC is meant not to push patients toward treatment but rather, to treat patients wherever they are, individually, and over time.

Transgender as a term is recent but encompasses feelings that have existed throughout human existence. DNA has not changed significantly over time. Medical conditions have always existed although not always defined by medical science. Certainly, this includes intersex conditions—whose presence in human beings has been evident throughout the ages—just as they are within the plant and animal kingdoms. Genitalia arise from the same embryonic structures with potential to become male, female or something in between, *just as they have always*—naturally. What has and continues to change is our response to the public manifestations of these medical conditions and our personal acceptance or suppression of gendered feelings within ourselves. Society has always reacted with passion to those who are ambiguous, androgynous, or intersex—and similarly, to those who willfully seek or, in some way, cross the boundaries between genders. As **Milton Diamond** has said frequently, "…

nature loves diversity" [4]. If women were perfectly female, they would possess no testosterone and men, no estrogen.

GAS is complex, crossing surgical disciplines in its delicate alterations of human tissues associated with sex and reproduction. Contributions from plastic surgery, general surgery, urology, gynecology—even otolaryngology—were common. Due to repressed candor regarding nudity and sexuality in the 20th century, it is little wonder these procedures were also tagged with taboo and controversy. Perhaps by their surgical complexity, the characters and the innovations induced became that much more groundbreaking. Further, the innovations themselves were not so much driven by surgeons thinking deep into the night as by the transgender community asking and insisting upon procedures that better matched who they felt themselves to be. In early trans history, the notion that a transfeminine person (today called 'Assigned Male at Birth' (AMAB)) might seek to become physically female but remain sexually attracted to women ran counter to the gender binary. The early WPATH SOC swore patients to avowed heterosexuality. Similarly, it seemed antithetical to some surgeons that a transmasculine gentleman would not want an enormous phallus to affirm his own masculinity or, even less likely, that he would want to retain his uterus for child-bearing or his vagina for sex. Attitudes regarding same sex relationships and sexuality as a whole changed gradually during the late 20th century and early 21st century. Surgeries that were reflective of those societal changes and that made better sense to the individual trans person have gradually followed—as did language that described those feelings and those individuals. And today, nonbinary and gender nonconforming persons are further challenging our standards for body parts and language and how language, medication, and surgery can better respect gender identity in a way that fits personally, however diverse.

Eunuchs

Surgical "changes of sex" (-as it was called at that time-) would not be realized until the 20th century. However, for centuries, the role of castration in feminizing the male body was well known. Although sometimes instituted as punishment, a eunuchoid existence was also chosen by some for the changes offered by gonadal removal alone: relief from sexual urges, reduced aggressiveness and, for some, judgment that was unclouded by inclinations for conquest and domination. Besides physical artifacts suggesting the presence of eunuchoid persons for centuries BC, in Egypt, priests from the second dynasty (c 2890–2686, BC) willingly underwent self-castration in search of purity (Encyclopedia Britannica 2024). So too, during the Byzantine period (330–1430 AD), nine of the **Patriarchs of Constantinople** and all of the treasurers of the monasteries and convents were eunuchs [5]. "Such was the recognition of the purity, ascetism, and trustworthiness of men who had been castrated." Thousands of *eunuchs* were cast throughout history into roles of power, not for the suppressive control that power can bring but for the balanced judgment perceived to be worthy of leadership.

Although there are also examples of eunuchoid warriors, for the majority, castration resulted in a less aggressive persona owing to the lack of testosterone (later elucidated in the 20th century) following testicle removal. Castration also imbued eunuchs with libido-free servitude, inducing a demand for eunuchs, sought after to serve as chamber maids, attendants, and caretakers.

Nowhere were eunuchs more institutionalized than in Chinese tradition. Use of eunuchs was elevated to its highest form, existing as it did from the Hsia Dynasty (2205−1766 BCE) to November 5, 1924 when the last of 470 eunuchs were ousted from the Tzu Chin Palace by the republican army. **Sun Yaoting**, the last surviving imperial eunuch of Chinese history died in 1996 [6].

Physiologically, we understood much later that removal of gonads resulted in lowered blood testosterone. Besides its effect on behavior and aggressiveness, absent testosterone resulted in bodily feminization. Fat shifted, facial features softened and, in general, *eunuchs* could be said to have had feminine physical characteristics, even breasts. Eunuchs are mentioned 63 times in the Bible [7]. Representations of eunuchs vary throughout history but were often adorned with clothing and accessories that suggested femininity: long skirts, flowing hair, jewelry. Eunuchs did and were allowed to marry but accommodations for their reduced, if not, absent libido were made. Wives of eunuchs were specifically excluded from the scorn of adultery for extramarital affairs. In the Biblical passage, Matthew 19:12, Jesus states, "For some are eunuchs because they were born that way [bilateral cryptorchidism], others were made that way by man [forcible orchiectomy as punishment], others have made themselves because of the kingdom of heaven [transgender?]."

In all likelihood, such individuals of the past, subjecting themselves to castration and willing feminization, for whatever the motivation, might today be considered transgender, or gender diverse persons. As we look back in history, it is hard not to trace the roots of more modern medicine to some of these early eunuchs and what was gleaned from the past.

Early surgical changes of sex: Berlin and Beyond

Concluding the pioneering hormonal/gender work of **Magnus Hirschfeld** and **Eugene Steinach** amid an increasingly tolerant Weimar Republic, pre-WWII Germany became fertile ground for the first surgical change of sex. Although history recognizes **Lili Elbe**, popularized in the 2015 film, "The Danish Girl" as the first, it is in all likelihood that **Dora "Dorchen" Richter** (1891−1933) (see Fig. 1.1) was the *first transgender person* to undergo a surgical so-called "sex change" [8]. While under hormonal care in Berlin at Dr. Hirschfeld's Institute, Dora initially underwent orchiectomy in 1921 and later, in 1931, removal of the penis (**Dr. Ludwig Levy-Lenz**) and subsequent "vaginoplasty" (**Dr. Erwing Gohrbandt)** [9]. **Dr. Felix Abraham**, a psychiatrist who worked at the Institute, described her orchiectomy as a case study: "The castration had the effect—albeit not extensive—of making her body fuller, restricting her beard growth, making visible the first signs of breast growth and giving the fat pad a more feminine shape" (From documentation by Magnus Hirschfeld [10,11]).

These early efforts by surgeons willing to perform surgery on transgender individuals initially chose anatomical subtraction to achieve gender alignment. Thus, *hysterectomy*, in the case of trans men, and *gonadectomy*, in the case of trans women, was the extent for most early gender-affirming surgeries. Lilli Elbe pushed the limits of surgery far ahead of

FIGURE 1.1 **Dora Richter.** Dora Richter working within the *Institut*: From the Magnus Hirschfeld Foundation.

FIGURE 1.2 **Hitlerite "students" burning books.** Hitlerite "students" burning books, among them those of Hirschfeld's Sexual Institute.

its time, succumbing to complications as a result of ill-advised ovarian transplantation in 1933, among the final of many surgeries she agreed to.

Upon Hitler's election as chancellor in 1933, nonbinary gender expression and homosexuality came promptly under attack. Emerging LGBT visibility in Berlin was considered particularly irksome to the era's newly elected "law and order candidate" and his followers. Just

FIGURE 1.3 **Pink Triangle used to designate LGBT persons within Nazi concentration camps.** The Pink Triangle, used to designate LGBT persons within Nazi concentration camps, later became symbol of pride.

FIGURE 1.4 **LGBT concentration camp prisoners.** LGBT concentration camp prisoners were emblazoned with pink triangles.

3 months after Hitler's election, a mob of "students" and Nazi Hitlerites looted and burned Hirschfeld's Sexual Institute and its records (see Figs. 1.2–1.4). Dora Richter, defending the Institute, was found among the ashes, incinerated in perhaps a prelude to later manifestations of the Holocaust. Hitler called Hirschfeld's work a "conjunction of sexual perversion and permissiveness" and what Hitler thought to be "Jewish science." Magnus Hirschfeld was, fortunately, on a speaking tour during the attack but never returned to German soil, exiling eventually in France.

Hippolyte Morestin (1869–1919) was a French general surgeon and early cosmetic surgery innovator. As a pioneer in the fledgling subspecialty of plastic surgery, his work had significant influence for gender surgery. Although he died of influenza during the 1918–19 global pandemic, Morestin's contributions in the form of skin grafting would pave the way for others.

Among Morestin's proteges was **Sir Harold Gillies** (1882–1960), whom Morestin acquainted while on leave in Paris during WWI [12]. Gillies, later dubbed the "father of modern plastic surgery," was born in New Zealand though received surgical specialization in otolaryngology and practiced primarily in London. During this time, thanks largely to Gillies, the United Kingdom witnessed significant breakthroughs and milestones within the field of transgender surgery. Among Gillies' patients was **Michael Dillon,** credited with being the first trans man to undergo genital surgery [12] in 1949. Dillon's final procedure, having received 13 prior pre-phalloplasty procedures, became an immediate testament to the complexity of the surgical process for trans men. Michael also argued that he had an endocrine disorder rather than a psychological one—the "psyche of one sex and the body of the other," a reasonable rationale for surgery.

The first phalloplasty is said to have occurred in the Netherlands in Arnheim in 1959–60. The lead surgeon**, Dr. S. Woudstra**, did so in spite of letters of protest written to the Dutch Journal of Medicine, which had published staff meeting minutes discussing the upcoming surgical procedure. Traumatized over the attention, the plastic surgeon vowed never to perform such a procedure again [12a].

Dr. Gillies also performed one of the earliest gender-affirming operations when he performed vaginoplasty upon **Roberta Cowell** in 1951 [2,9]. Technical aspects of the surgeries were adapted from Gillies' experience operating upon injured soldiers in both world wars. Specifically, Gillies utilized the foreskin and penile skin inversion method to create a rudimentary vagina.

Gillies' early anterior pedicle flap prototype would later be called the *Penile Inversion Vaginoplasty* (PIV) after modifications by **Dr. Georges Burou** (1910–1987). Burou, a gynecologist by training, achieved transgender legacy while practicing "sex change surgery" in Casablanca, Morocco. Burou's *Clinique du Parc* [13] thrived from the late 1950s until the mid-1970s. Denmark retreated from the notoriety at having performed "sexual reassignment surgery" for **Christine Jorgensen**, eventually banning all foreigners from such intervention. Conversely, Dr. Burou profited from increased demand for his surgical services when word got out. By 1974, he had done 800 vaginoplasties in AMAB patients with gender dysphoria, said to take 1 hour to perform. Although the cost was $500.00 (equivalent purchasing power to $2700.00 in 2024), Dr. Burou would only work on women who were "convincing in their femininity" [13,14]. "Going to Casablanca" became a popular colloquialism in reference to those who traveled to Morocco for their gender-affirming surgery. **April Ashley**, the second British woman to undergo GAS, and **Coccinelle** were notable early clients of both **Dr Harry Benjamin** (1885–1986) and Burou ("The Life and Legacy of Coccinelle") [15].

If there was a singular transgender surgical icon, it would be Christine Jorgensen (1926–1989). Arriving home to the United States after her "sex change surgery" in 1952 to NY Daily News headlines proclaiming "Ex-GI Becomes Blonde Bombshell," Ms. Jorgensen's journey is well chronicled. Possessing a sharp wit, fashion sense, and innate femininity, Ms. Jorgensen was extraordinarily well received by the press and, later, Hollywood. Although she received a series of operations in Europe including orchiectomy (Gentofte Hospital) and penectomy (Copenhagen University Hospital) in Copenhagen [16], she did not receive her vagina until years later while living in the United States (**Paul Fogh-Andersen**). The latter operation was performed with full thickness skin grafting. Although endocrinologist/sexologist Dr Harry Benjamin became her treating physician throughout her post-op years, she was cared for initially by Benjamin's colleague, **Christian Hamburger** (1904–1992), best known for documenting that castrated males contained elevated levels of follicle-stimulating hormone/FSH [2,12].

Midcentury gender surgery: The slow emergence

Although there was continued technical progress in surgery, the general mid-20th century attitude held by psychologists and physicians was that "transsexuals" were "mentally ill and willfully annoying." Psychiatrist **Karl M. Bowman** and researcher **Bernice Engle** encapsulated the dominant view at the time stating that they defined "transsexualism" as "the person who hates his own sex organs and craves sexual metamorphosis" [17]. They denied evidence of biology as an explanation for transgender patients' dysphoria, and rejected surgery because it "plays into the patient's delusions and does not solve the problem," recommending instead "extensive psychotherapy." Though they represented the minority view at the time, some stood in contrast to this sentiment and lauded efforts made by surgeons at the time. **Eugene de Savitsch** wrote *Homosexuality, Transvestitism and Change of Sex* where he applauded surgeons who risked their professional reputations in performing surgery on trans individuals—against the wishes of most in American psychiatry. "The tragedy of the present day attitude," he wrote, "is that very few people are willing to tackle this problem" [18].

With the advent of plastic surgery as a surgical specialty in the early 20th century, Dr Gillies and others began to utilize updated plastic surgical techniques involving flaps and grafts to go further. The 1940s saw some initial progress in creating better *phalloplasties*—at least it was a viable tube of skin. *Vaginoplasty* was improved upon with Dr Burou's anterior pedicalized penile inversion technique, but little attention was paid to vulvar anatomy or clitoral sensation. Perhaps reflective of contemporary society's dismissive view of female sexuality, the bar for either surgery remained low in terms of sensory and sexual function—basically, a tube of skin and functional conduit of urine for males versus a passive hole for females in which to accept penetration. For trans men, implantable prosthetics for achieving a sexually erect phallus came later [2].

Early surgical pioneers in the United States included UCLA urologist, **Dr Elmer Belt** (1893–1980) (see Fig. 1.5). Dr. Belt is credited with performing among the earliest vaginoplasties in the United States [19]. An avid collector of Leonardo di Vinci memoribilia, Dr Belt performed so-called 'sex-change surgeries' from as early as 1948 but quit in 1962 after receiving pressure from his wife and son to stop—and upon realization that others including Dr. Burou offered a better outcome. Details of his earliest work remain unknown due to fire which destroyed his office. He is known to have created labia in addition to vaginoplasty.

The 1950s and 1960s witnessed increasing academic fascination regarding gender and gender identity although few institutions were willing to promote surgery. This "golden age of psychiatry" limited its reach in attempting to understand the psychological underpinnings of "transsexualism" rather than to acquiesce further toward this alleged mental condition. Finally, in 1966 under the guidance of psychiatrist, **John Money** (1921–2006) [20], Johns Hopkins opened its Sex and Gender Identity Clinic. Dr Money had risen to fame 1 year earlier as a nurture-versus-nature proponent after a young boy [21] suffered irreparable penile injury during a botched circumcision. Dr Money hypothesized that gender identity was mutable and completely plastic. Therefore, the mutilated boy, despite his male assignment at birth, could be simply raised as a girl by affirming gender cues and reinforcement. The boy was castrated, given female hormones, surgery to create a vagina, and raised as a girl. Although

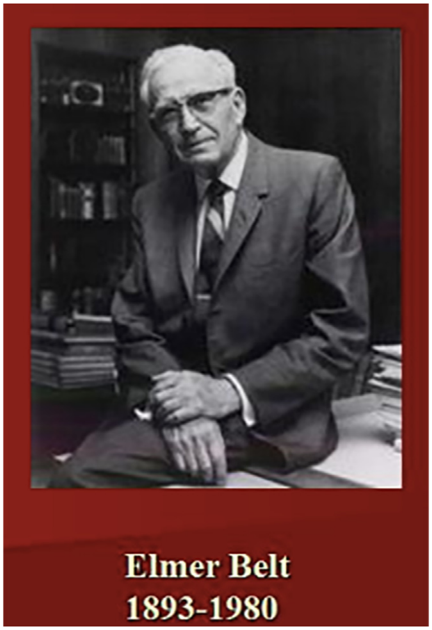


FIGURE 1.5 **Elmer Belt, MD.** Pictured: Elmer Belt seated on his desk in one of the last decades of his practice. He is credited with performing among the earliest vaginoplasties in the United States.

the Reimer case was championed as a success by Money in his book, *As Nature made Him*: *The Boy Raised as a Girl*, psychologist, anatomist, and advocate for Intersex persons, **Milton Diamond** (1934–2024) took issue with Money's rosy conclusions. Dr Diamond exposed that David Reimer was, in fact, miserable while living as a female. Reimer eventually reassumed a male identity (nature) at age 15 and, following the death of his twin brother (whom David was never told of), committed suicide in 2004 [22].

Although the nurture-trumps-nature experiment ended in tragic failure, Dr Money was sympathetic to the trans community and came to recognize the importance that gender identity plays in happiness overall. Joined by endocrinologist, **Claude Mignon** (1924–2018), and plastic surgeon, **Milton Edgerton** (1922–2018), the Hopkins program became the first comprehensive program to offer treatment for gender dysphoria and, rarely, surgery [23]. **John E. Hoopes**, plastic surgeon and Johns Hopkins committee chairman at the time said, "If the mind cannot be changed to fit the body," he said "… then perhaps we should consider changing the body to fit the mind."

Over the ensuing 13 years, the Hopkins Clinic evaluated thousands of patients, only 29 of whom actually underwent surgery. It seemed to many that Hopkins was less interested in affirming a person's gender identity through hormones and surgery than in psychologically understanding why a person would proceed on a path of self-destruction. It appeared as though only the most recalcitrant, entrenched patients with unwavering delusions that they were indeed women, would be allowed to progress towards surgery. **Dana Beyer**, a retired ophthalmologist and one of Hopkins' earliest patients, assessed her clinical experience there, “It was so highly sexualized, which was not at all my experience, certainly not the reason I was going to Hopkins to consider transition, that I just got up and left. I didn’t want anything to do with it,” she said. “No one said this explicitly, but they certainly implied it, that the whole purpose of this was to get a vagina so you could be penetrated by a penis.”

In 1971, **Paul McHugh** (1931–present), head of psychiatry, asked John Money for a study of the efficacy for Hopkins’ vaginoplasty patients. Fellow psychiatrist and gender skeptic, **Jon Meyer,** conducted the study of 29 patients who had the surgery and 21 who did not. His conclusion was that patients were no happier following hormones and surgery than without. Meyer told the New York Times in 1979: “My personal feeling is that surgery is not proper treatment for a psychiatric disorder ….these patients have psychological problems that don’t go away following surgery” [24]. Meyer’s study came shortly after a contrasting study by Money showing that all but 1 of 24 patients were sure they had made the right decision. But McHugh, focused on the “science” he liked (Meyer’s) rather than that he didn’t (Money’s), shut the gender program down. Many were skeptical of Meyer’s conclusions and methodology, “an early example of junk science.” By 1979, there were more than a dozen university transgender surgery programs within the US stretching from Norfolk, Virginia to UCLA. Nevertheless, the Hopkins program was hugely influential, and its decision to close was a domino that shuttered most every US academic institution performing gender surgeries.

Dr Beyer continues, “McHugh actually did the trans community a very big favor … Privatization helps far more people than the alternative of keeping it locked in an academic institution which forced trans women to jump through many hoops” [1]. Surgeries continued but

FIGURE 1.6 **John Ronald Brown, MD.** John Ronald Brown, MD, labeled the “world’s worst sex change surgeon.”

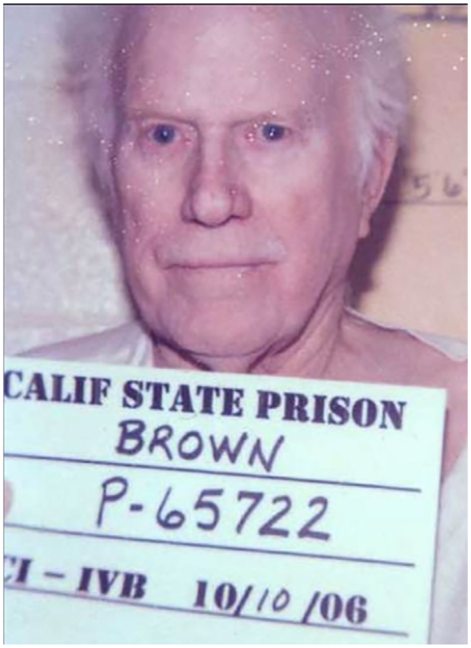


FIGURE 1.7 **John Ronald Brown, MD.** Dr. John Ronald Brown, pictured, after his arrest in 1999.

outside the restrictive confines of university sanctioned programs. Beyer would eventually undergo vaginoplasty with Dr Marci Bowers in 2003. What the loss of academic institutions *did* do was to close the door on American research participation, delaying a good deal of scientific legitimacy within the field of transgender surgery and medicine for decades.

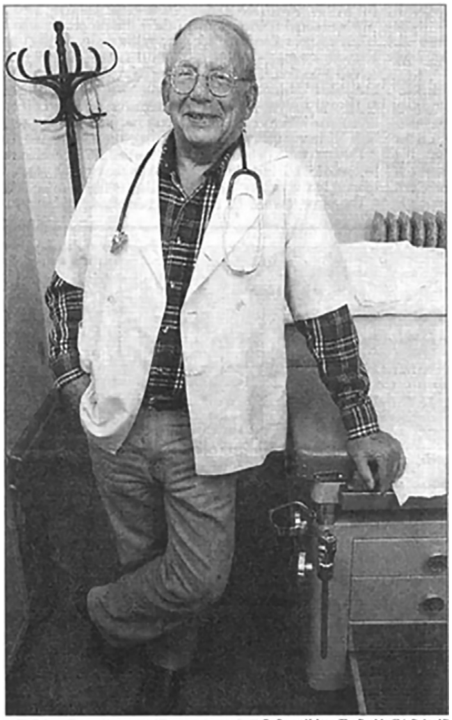
The rise of **John Ronald Brown** [25] (aka "Butcher Brown" or "Table-top Brown") (1922–2010) (see Figs. 1.6 and 1.7) among transgender surgeons is a conundrum and may well be long debated. Although unqualified as a surgeon, Dr Brown responded to the transgender community's need for surgery. One certainty about the mid-1970s in the United states was that it was a very difficult time to be a transgender person. There was little support, no advocacy groups, surgery was a cash transaction, coming out was never an option, all marriages ended in divorce, the standards of care required absolute femininity (or masculinity), and surgeons willing to operate were scarce. There were then only two significant gender programs in the United States—Stanford and Johns Hopkins. Hopkins strictly limited its new clientele to just two per month. If you were trans and rejected by either of the programs, there remained few surgical options within the United States.

Dr Brown, well-intentioned but also clearly motivated by the financial compensation associated with surgery, was a University of Utah Medical School graduate in general studies, not surgery. He originally established a clinic in San Francisco but, due to his lack of credentials or training, was forced to set up surgical suites in unlikely and often, unsafe locations including garages or storage facilities. Dr Brown admitted that he would "work on anyone," often the only recourse for poor women or women who were denied care elsewhere. Brown was dogged by a legacy of poor outcomes and substandard results. In 1977, after a patient death and subsequent lawsuit, his California medical license was revoked for "gross negligence, incompetence, and practicing unprofessional medicine in a manner which involved moral turpitude." Patients were also allowed to work as unqualified medical assistants to pay for their own surgical services. Although some patients were grateful, he earned the nickname "Butcher Brown' and a poor reputation within the trans community. Yet he was convincing enough and patients desperate enough that Dr Brown performed more than 600 vaginoplasties and once delivered an invited lecture at Stanford University. In 1990, he spent 19 months in prison for operating without a license. After leaving prison, he drove a taxi until resuming practice once again, working in Tijuana, Mexico. He was also willing to remove healthy extremities for those with body dysmorphic disorder. Finally, in 1999, a patient named Bundy died from Gas gangrene (clostridium perfringens) in National City, California, after a leg amputation performed by Dr Brown. Brown was extradited to the United States, convicted of second-degree murder and sentenced to 15 years in prison, where he remained until his death [26,27].

The "sexual revolution": Implications for gender-affirming surgery

The sexual revolution of the 1960s and 1970s broke through barriers that seemed confining to sex and sexuality. Arbitrary rules of morality began to change. Homosexuality was at least something that could be discussed publicly but gay individuals, fearing discrimination, remained remarkably closeted. Even further suppressed, discussions of gender identity and gender diversity were barely heard of. And yet, the emergence of general surgeon, **Stanley Biber** (1923–2006) (see Fig. 1.8) in the United States during this time period became an epic link to the modern era of transgender surgery. Born in Des Moines, Iowa to Jewish parents, they had hoped that young Stanley would become a rabbi or a concert pianist. Instead, Biber followed his own dream, graduating from the University of Iowa Medical School in 1948, then becoming chief surgeon in a Mobile Army Surgical Hospital (M*A*S*H) in the Korean war. In 1956, Biber received an opportunity that would allow him to secure land for cattle ranching while working as a small-town general surgeon. Thus, he accepted a staff physician job at the United Mine Workers Clinic in tiny Trinidad, Colorado, population 9000 [2,9,18]. There, Biber gained the trust of the citizenry as he set bones, replaced hips, removed gallbladders and delivered babies.

In 1969, Doctor Biber was approached by a local social worker who asked him to perform her bottom surgery (gender-affirming vaginoplasty). Surprised but unfazed, armed with a self-confidence that he could learn anything, Stanley agreed to operate. "Doc Biber" consulted with Harry Benjamin and subsequently sent for Dr. Georges Burou's original drawings, then at Johns Hopkins (published in Howard. W. Jones' *Transsexualism and Sex Reassignment)*. The surgery was crude but a success. With the closure of Hopkins' and other university programs in 1979 plus the retirement of Dr Burou, rural Trinidad became *the location worldwide* for GAS. Dr Biber went on to perform more than 5000 gender surgeries (including 2350 vaginoplasties and more than 1000 phalloplasties) and is cited in the Guinness Book of World Records. Hushed at first, tiny Trinidad reacted with mixed feelings as



By Bryan Kelsen, The Pueblo Chieftain, AP

Thriving practice: Stanley Biber of Trinidad, Colo., is one of the country's leading practitioners of sex-change operations.

FIGURE 1.8 **Dr. Stanley Biber.** Dr. Stanley Biber, Trinidad, Colorado; Dr. Biber has performed more than 5000 gender surgeries (including 2350 vaginoplasties and more than 1000 phalloplasties) and is cited in the Guinness Book of World Records.

the scope and scale of the surgeries became apparent. Reluctantly, Trinidad came to be known in time as the "Sex Change Capital of the World." For the most part, the rural Colorado community welcomed the influx of visitors and cash. Although Dr Biber first performed these dramatic surgeries in a Catholic hospital (Mt San Rafael Hospital) within sight of the Sangre de Cristo mountains, the local townspeople were calmed by a special dispensation received from Pope Paul VI in 1969 and by Dr Biber, who explained the "transsexual phenomenon" as a medical condition that deserved compassion.

Technically, Biber's surgeries were lacking by today's standards: they were performed in two stages, one to create the vagina and the other to create "labia." The procedure was a simple penile inversion. He used the glans to create a realistic appearing neocervix internally but did not utilize the dorsal penile nerves to create any sort of sensory clitoral likeness. Patients were able to orgasm due to the erectile tissue from the old male urethra, which he used instead of the glans, to create the clitoris. If patients lacked penile skin for the inversion, an unsightly split thickness skin graft was taken from the patient's thigh or buttocks. The scrotal skin was discarded as was the majority of the perineal fat. If less functional, Biber's surgeries were creative, reasonably aesthetic, reliable and suitably affirmed gender for the many who flocked there. It was also well known that Dr Biber too performed a multistaged phalloplasty including urethral extension. Learning of Dr Biber largely by word of mouth, patients traveled to Trinidad in significant numbers throughout the 1970s and 1980s. Many surgeons came to Trinidad to learn from Dr Biber, some of whom hoped to become the heir to his legacy. The list included **Eugene Schrang** (1931–2019), Toby Meltzer, and Marci Bowers, Biber's eventual hand-picked replacement [18,28].

Concurrently, **Donald Laub** (1935–2024) (see Fig. 1.9), another US surgical pioneer, cofounded Stanford's early Gender Dysphoria program with psychiatrist, **Norman Fisk** in 1968 and was one of the founding members of WPATH (at that time named Harry Benjamin International Dysphoria Association). Laub, a Marquette University Medical School graduate, specialized in plastic surgery and recognized the specific needs of gender diverse patients. Dr Laub in particular pressed the sexual aspects of transgender surgery in developing several important additions to the surgical menu. The first, *metoidioplasty* [9], modified the testosterone-enlarged clitoris in trans men to create a small but sensory phallus [18,29].

The second, the awkwardly named "Rolls Royce Vagina," (*rectosigmoid vaginoplasty*) utilized a 15–20 cm colon interposition flap to form a coloneovagina in AMAB patients with GD. The technique was adopted from **Colin Markland**, Chief surgeon at the University of Minnesota in 1974. Use of the colon allowed for a well-lubricated neovagina with significantly increased girth as compared with the Burou-era penile inversion technique, which

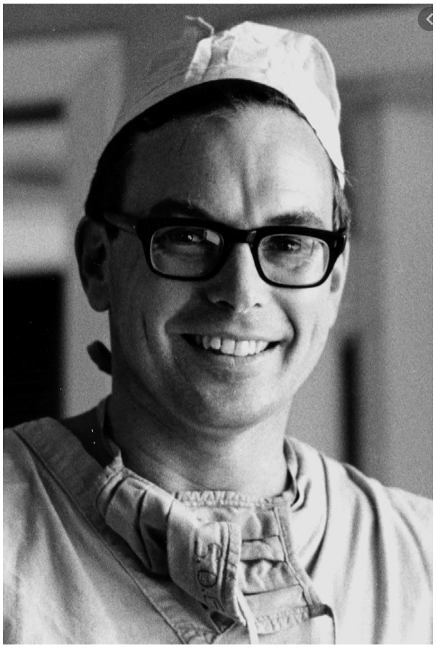


FIGURE 1.9 **Donald R. Laub, MD (Wordpress.com).** Dr. Laub was another US surgical pioneer, cofounded Stanford's early Gender Dysphoria program with psychiatrist, Norman Fisk in 1968, and was one of the founding members of WPATH (at that time named Harry Benjamin International Dysphoria Association).

Laub himself dismissed as a “VW [Volkswagon] vagina” [29a]. Despite Laub’s marketing prowess, later updated versions of the penile inversion technique eclipsed rectosigmoid vaginas in preference for patients and surgeons, relegating the “Rolls Royce Vagina” to the garage of gender affirming surgeries. Specifically, rectosigmoid vaginoplasty is now preferred as a secondary or salvage procedure owing to its greater invasiveness, higher complication rates, requirement for postoperative colon screening, excessive mucus production, and less convincing visual appearance [30]. In general, penile inversion with its squamous epithelial lining most closely approximates the vaginal composition of a cisgender woman.

Finally, Laub popularized the “postmodern phalloplasty,” a rolled abdominal skin flap used to create a phallus. A removable silicone device was added to allow urination while standing in the absence of a truly functional urethra. Despite being relegated to a basement office at Stanford University, Laub very much advocated for his transgender clientele, was occasionally at odds with his peers, and with Norman Fisk is credited with coining the term, “gender dysphoria” [30a]. In all, Dr Laub performed nearly 1500 transgender surgical procedures including 600 primary vaginoplasties. As Dr Laub writes in his memoir, “*Second Lives*, *Second Chances*,” “I knew from the beginning that Gender Confirmation Surgery … was absolutely right. I knew that the work we were doing was vital and valuable and far more effective than behavioral modification in easing the discomfort of patients with gender dysphoria.”

In the latter years of the 20th century, transgender patients gradually found gender transition slightly easier. The notion was rare but slightly less far-fetched. The WPATH Standards of Care (SOC), newly established in 1979, allowed for a pathway to transition, albeit through a confining series of hoops that were regularly updated but slow to respond to gradually warming social acceptance. Trans community-generated websites emerged (TSRoadmap, Susan’s Place, Transgender Map, and many others) that offered online resources that allowed patients to nonintrusively compare surgeons’ surgical outcomes for the first time. Providers and therapists, necessary to meet the requirements of the SOC, stepped forward to care for patients. Surgeons, for many reasons, remained a scarce commodity. Despite the ongoing difficulties, many trans persons managed to retain employment, relationships, and a growing sense of normalcy following transition. With the relaxation of the WPATH standards that heretofore had enforced “passing privilege” and avowed heterosexuality, patients increasingly sought surgery to live more comfortably in their desired gender, regardless of how they fit within society’s definition of male and female appearance and manner.

Douglas Ousterhout, MD, DDS(1935-retired) in San Francisco, California, was the first to assess maleness and femaleness in terms of craniofacial features. He recognized the importance of the face in one’s gender presentation and applied techniques he had gained through his training with noted French surgeon, Paul Tessier, regarded as the “father of craniofacial surgery.” Dr. O, as he was called with affection, opened the Center for Craniofacial Anomalies at the University of California-San Francisco [31]. He helped to coin the term, FFS (facial feminization surgery), and studied the skull for precise measures of maleness and femaleness to be used in reconstructing the face for, predominantly, transgender women. His surgeries and the many surgeons who have since adopted his teachings have been instrumental in advancing the ability of transgender women to live and work as women if they did not wish involuntarily disclosure of their transgender status.

Michel Seghers (1932–2014), performing primarily genital surgery for AMAB persons, throughout the late 1970s–2001, in Brussels, Belgium, applied techniques learned through the repair of war injuries while working in the Congo, after expressing dissatisfaction at outcomes from other surgeons [27]. A vaginoplasty patient of the time (1980s) would be expected to pay approximately $4200 USD for a 1-week stay [31a].

To the east, another entirely new phenomenon emerged in the trans surgical arena from Thailand. **Preecha Tiewtranon** (1942–retired) would begin work with **Dr. Prakob Thongpeaw** to perform the first vaginoplasty for GD in Thailand's Chulalongkorn University Hospital, 1975. Dr Preecha was a prolific teacher, spawning the majority of Thailand's growing list of transgender surgeons and performed the first known "live vaginoplasty" before an audience of his peers in 2004. Dr Tiewtranon is credited with more than 3500 gender surgeries overall. Today, Thailand remains one of the foremost international destinations for gender-affirming vaginoplasty and other gender-affirming surgeries [32] with more than a dozen surgeons currently active. Confronted in the early 1980s with the specter of HIV infection among their clientele, "Dr Preecha" added a 30% surcharge to each patient's surgical fees.

Contemporary pioneers

As the 20th century concluded, the transgender community moved slowly from a spirit of survival to one of invested activism, much as cisgender women had done previously in regard to personal gynecologic care. Patients began to interact with providers and surgeons, not as passive recipients but as informed consumers. One of the first and most influential of providers to reference her transgender status in bettering the lives of other trans persons via education was **Sheila Kirk** (1930–2019) [29,33]. Dr Kirk, a Boston University School of Medicine graduate, specialized in Ob/Gyn. In 1994–95, she published the landmark health resource books, "Feminizing Hormonal Therapy for the Transgendered" and "Masculinizing Hormonal Therapy for the Transgendered." She became the first trans person to serve on the WPATH Board, was cofounder of IFGE (International Foundation for Gender Education), and in 1998, at age 68, opened the Transgender Surgical and Medical Center (TSMC) in Pittsburgh, PA. Although short-lived, the center was a first-of-its-kind to have been opened by a transgender woman. In coordination with plastic surgeon**, J. William Futrell** (1941–retired), the center offered transgender counseling, gynecologic care, and vaginoplasty with Dr. Furtrell.

With little fanfare at the time, the late 1980s saw two significant contributions to the field of GAS from a region of the world (China) where, to this date, such surgeries are less commonly performed. **Rong-Hwang Fang (plastic surgery**) first introduced the radial forearm free flap for coverage of burns or other injuries when local skin sources were unavailable [2]. This was later refined and translated for use in phalloplasty procedures and is today considered the preferred method owing to the flap's preferred skin quality.

Secondly, Rong-Hwang Fang, citing earlier suggestion by S.O. Rubin, introduced the concept of *dorsal nerve preservation* for vaginoplasty in transfeminine patients. This technical change allowed for true anatomic equivalency with cisgender women in terms of clitoral sensation and was widely adopted by surgeons, **Toby Meltzer, Yvon Menard,** and many of the foremost Thai surgeons.

Toby Meltzer (1957−present) was one of the most prolific and earliest proponents of Fang's dorsal nerve clitoral construction in anterior-pedicle flap vaginoplasty. Performed in two stages, Dr Meltzer continues to practice in Scottsdale, Arizona, and has now performed approximately 2300 vaginoplasties in AMAB patients, in addition to his many surgical offerings for trans and gender diverse clients [31,34].

Pierre Brassard (1962−present) teamed with Dr Menard in 1996 (Montreal) and advanced a significant challenge to the traditional dogma of the two-stage surgery requirement for vaginoplasty in AMAB patients with GD. By utilizing an island flap within the splayed male urethral mucosa, Dr Brassard proved able to line both labia with pink that afforded simultaneous labia minora formation. Support for this as a rationale for vulvoplasty is best arrived at through study of male hypospadias, a natural—but clearly intersex—condition in young birth-assigned males where the urinary opening lies lower down the penile shaft [9]. Dr Brassard has now performed more than 3000 primary vaginoplasties for gender dysphoria, likely the most of any surgeon to date.

Perhaps the most glass ceiling-shattering event in the early 21st century was the assumption of Dr Stanley Biber's transgender surgical duties by **Marci Bowers (1958−present) in 2003.** In the United States' State of Colorado, Trinidad had worn its "Sex Change Capital of the World" title with reluctant acceptance. Recognizing the regional economic such surgeries brought to the isolated community, Dr Biber had for years hoped to find a successor. At age 80, prospects for finding such a person faded. As Dr Biber had said, "Many have come to Trinidad to learn the surgery. Some didn't have the hands, some didn't have the courage, and some didn't have the heart. Marci is the first to have all 3." What Dr Bowers also had was a transgender past—something that was a global first but not explained to the local townspeople prior to her arrival.

Before the July 2003 surgical handoff from Dr Biber could happen, Dr Bowers prepared for the surgery as best she knew how—reading, questions, literature. But there was no way a surgery of this complexity could happen without allies. Despite working alongside Dr Biber for some 6 months, there was simply not enough time to know all of what being the lead surgeon might entail. It was a daunting task to prepare. In March 2003 in Philadelphia, Marci attended her first IFGE conference. There, she was introduced to **Christine McGinn** (1969−present). McGinn too was young, spunky, and battle-tested from a recent tell-all *MSNBC Investigates* program devoted to her and her gender transition. At the time, young Dr. McGinn was just a medical student, albeit a former Navy Flight surgeon, which is to say she was not a surgeon or a doctor at all. And yet, she had a confidence. "We quickly developed a symbiosis and a sense of purpose," says Bowers. We looked at each other and knew that we were going to rewrite history". Never had a woman—let alone a transgender woman—previously perform vaginoplasty. "I scheduled my first three patients there at that conference with scanty proof but a ton of surgical experience and resolve." 3 months later, at Bowers' coaxing (it didn't take much), following a night on call, McGinn drove her 1983 Jeep Wrangler 1770 miles with no rest to Trinidad to assist Dr Bowers on her inaugural case. With the Biber technique as a prototype, the surgery took 6 hours and was successful. Dr Biber, having lost his insurance due to age (80), was not around for Bowers' first vaginoplasty "lest there be problems he might be liable for." He called in from the local barber shop that July 9, 2003, but never saw Bowers operate that day or any day in the future. Upon her return home, McGinn's jeep, overworked but safely back in Pennsylvania, erupted in flames and black smoke as she approached the Schuylkill River. The rest, as is commonly said, is history.

Bowers, an Ob/Gyn by training, has performed more than 2500+ vaginoplasties, having passed Dr Biber's Guinness-Book-of-World-Records legacy in 2023. She is also the first woman with transgender history elected WPATH President. She performed the first Ring Metoidioplasty in North America and described the first Simple Metoidioplasty. She also performed New York Mt. Sinai's first vaginoplasty and helped found the Transgender Surgical Fellowship at Mt. Sinai-Icahn School of Medicine, among other programs around the world.

Christine McGinn, an osteopathic physician by training, along with Marci Bowers, represent the first two transgender women in the world to perform gender-affirming genital surgery. Dr McGinn has practiced in New Hope, PA, since 2007, having performed thousands of gender-affirming surgical procedures including more than 1200 gender-affirming vaginoplasties.

A significant aesthetic advance was introduced by Preecha disciple, **Suporn Watanyusakul (1955-retired).** Although tending toward hype, his "Chanburi technique" differed from prior techniques in utilizing scrotal skin alone for the vaginal graft while retaining outside structures including the penile skin to create the labia and clitoral hood. Dr Suporn also moved his incisions laterally to obscure scars within the groin creases [35].

Lee Zhou (1979-present), modifying techniques established by Russian gynecologist, SN Davydov [36], for the treatment of cisgender women with vaginal agenesis, added robotics to perform *Peritoneal Flap Vaginoplasty (PFV)*. Teamed with colleague **Rachel Bluebond-Langner** (1977−present) working on the external genitalia/vulva, the procedure utilizes portions of the *Penile Inversion Vaginoplasty (PIV)*, which inverts the penile skin to join with a vascularized peritoneal flap from the posterior bladder and anterior rectum in deepening the neovagina [37]. The procedure has found increasing utility for transfeminine persons with penoscrotal hypoplasia (especially early puberty blockade) and those who require vaginal deepening revisions. PFV has also been increasingly adopted by institutions globally.

Differences in functional approaches to transfeminine *vaginoplasty* by surgeons have slowly diminished over the years of the early 21st century, highlighting many of the aesthetic differences as often as not. Patients are expected to be orgasmic, to avoid urinary complications for the most part, to attain depths of at least 14 cm, and to be functional within a narrow range of generally minor complications.

For transmasculine persons, *phalloplasty* differences tend to be patient driven, as often as not. Outcomes still vary widely, and donor site scars remain as undesirable stigmata for their recipients. A better mousetrap is likely discoverable. *Metoidioplasty* remains a chosen outcome by many trans men who wish to avoid the multiple stages and high residual complication profiles associated with phalloplasty.

Pressing forward: The future

Challenges going forward will remain from those who see surgery as unnecessary or a violation of religious dogma or personal ideology. Those who work in the field of transgender surgery must be prepared with objectivity and data. Research answers questions and doubt. Surgeons will additionally be challenged by puberty-suppressed trans youth on GnRH blockers presenting surgeons with infantile genitalia, wishfully intended to create functional adult sexual organs. Peritoneal grafting, pull-throughs, and advanced techniques are increasingly on the table. Tilapia skin vaginas, vaginas made from thigh skin or allografting, all possible. Tissue labs, in vitro vaginas, transplanted penises, all a matter of time.

The past decade has seen incredible growth in the numbers of providers, programs, and surgeons. As of 2024, worldwide, 47 countries are represented in WPATH membership. Yet quality standards, especially in surgery, remain widely variable. There is, it seems, less agreement on aesthetics than ever. Patients have also newly challenged traditional male/female thinking to expand and consider body parts as a la carte items on a menu that supports their personal gender identity between the extremes of the gender binary. Some patients now request *Zero Depth Vaginas* (*ZDV*) or vaginas that retain testicles or even penises *penile-preserving vaginoplasty (PPV)* or nothing at all ("Ken doll"). It probably isn't for any of us to set rules or try to bring order to any of this. Rather, we need to remain true to our patients and always do our best to remain humble, connected and open to change, whatever that may be, and to be vigilant, valiant, and logical against those that seek to hurt us, to hide us, or to get rid of us. Research needs to find and document those of us who are trans persons of color, aging trans persons, disabled trans persons, even conservative trans persons. We are all here in plain sight.

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CHAPTER

2

The impact of the eighth version of WPATH standards of care on gender-affirming vaginoplasty

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Introduction

The World Professional Association of Transgender Health (WPATH) is an international, multidisciplinary organization dedicated to providing evidence-based guidelines for healthcare for transgender and gender-diverse (TGD) people. One of WPATH's primary functions is to develop and publish the Standards of Care (SOC). The SOC are guidelines for the care of TGD people based on the best available evidence and the consensus of international experts. The Standards of Care Version 8 (SOC-8), the most recent version, was published in September 2022 [1]. The SOC-8 builds upon the previous version, SOC-7, which was published in 2012 [2]. With respect to gender-affirming vaginoplasty, the SOC-8 recognizes the diversity and heterogeneity of gender identities (i.e., nonbinary identity), emphasizes the importance of multidisciplinary care, and highlights the improved quality and quantity of contemporary evidence. The purpose of this chapter is to describe the impact of the SOC-8 on gender-affirming vaginoplasty as well as its broader effects on TGD care in today's healthcare system.

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00002-9

Terminology

The SOC-8 values informed and individualized decision-making processes, recognizing the various expressions of gender. This includes updates in language and vocabulary to better reflect inclusivity. For example, “transgender and gender diverse” has replaced the sole term “transgender,” and specific procedures and surgeries are described instead of grouping them into “top” and “bottom” surgeries. While the SOC-7 commonly used the terms male-to-female (MtF) or female-to-male (FtM), the SOC-8 does not use these terms, as they are binary and exclusive to many TGD patients. Healthcare teams should use language, which recognizes local terminology and promotes safety, dignity, and respect. Providers should inquire as to appropriate pronouns and not assume gendered honorifics (Mr, Mrs, Ms, etc.).

Surgery and postoperative care

Chapter 13 of the SOC-8 combines surgery and postoperative care, which were previously independent chapters. The chapter focuses on recommendations for gender-affirming surgery, including preoperative assessment, surgical planning, and postoperative care, and includes 11 Statements of Recommendation. This chapter highlights the most salient updates of the SOC-8.

Tracking surgical outcomes

The SOC-8 lists credentials for gender affirming surgeons and recommends surgical outcome tracking. These criteria are more explicit than the SOC-7 and are independent of the surgical specialty (i.e., plastic surgeon, gynecologist, urologist, general surgeon, otolaryngology, etc.). These criteria include the following:

Statement 13.1: We recommend surgeons who perform gender-affirming surgical procedures have the following credentials:

1. *Training and documented supervision in gender-affirming procedures*
2. *Maintenance of an active practice in gender-affirming surgical procedures*
3. *Knowledge about gender-diverse identities and expressions*
4. *Continuing education in the field of gender-affirmation surgery*
5. *Tracking of surgical outcomes*

Criteria 1 through 4 are similar to the recommendations in SOC-7. Item 5, however, is a new recommendation. SOC-8 states surgical outcomes should be tracked and the outcomes shared with people considering surgery. This recommendation is derived from *Gender Confirmation Surgery: Guiding Principles* by Schechter et al., in which the authors delineate a set of guidelines for the education, training, and measurement of quality parameters for gender-affirming surgeons [3]. Tracking surgical outcomes enhances the informed consent process and allows surgeons to evaluate their outcomes.

Preoperative assessment for adults

Regarding genital gender-affirming surgery, the SOC-8 makes the following recommendations:

Statement 13.6: We suggest healthcare professionals consider gender-affirming genital procedures in eligible transgender and gender-diverse adults seeking these interventions when there is evidence the individual has been stable on their current treatment regime (which may include at least 6 months of hormone treatment or a longer period if required to achieve the desired surgical result unless hormone therapy is either not desired or is medically contraindicated).

This updated statement emphasizes the importance of tailoring gender-affirming care to each person's goals. While gender-affirming hormone therapy (GAHT) leads to anatomic, physical, and psychological effects, some people may have contraindications to GAHT, and other people may not desire these changes. Rather than requiring a specific duration of GAHT prior to gender-affirming vaginoplasty, the SOC-8 instead recommends that patients should be stable on their current treatment regimen. This update allows for a more personalized patient experience in gender-affirming care and improves access to gender-affirming vaginoplasty for patients who do not receive GAHT.

The SOC-7 lists a set of six explicit criteria patients should meet prior to undergoing gender-affirming genital surgery, including vaginoplasty:

Criteria for metoidioplasty or phalloplasty in FtM ("female-to-male") patients and for vaginoplasty in MtF ("male-to-female") patients:

1. *Persistent, well-documented gender dysphoria*
2. *Capacity to make a fully informed decision and to consent for treatment*
3. *Age of majority in a given country*
4. *If significant medical or mental health concerns are present, they must be well controlled*
5. *12 continuous months of hormone therapy as appropriate to the patient's gender goals (unless the patient has a medical contraindication or is otherwise unable or unwilling to take hormones)*
6. *12 continuous months of living in a gender role that is congruent with their gender identity*

The SOC-8 moves away from requiring a specific duration of time for GAHT. The SOC-8 also removes the criterion of living in a given "gender role" prior to undergoing surgery. This update removes a barrier for those whose gender identity and gender expression may not be binary and further recognizes the diversity within the TGD community.

The SOC-7 also required patients undergoing genital gender-affirming procedures to receive two letters of referral from independent mental health professionals. The SOC-8 recommends one referral prior to gender-affirming surgery; additional assessments may be requested based upon the clinical scenario. Chapter 5 of the SOC-8, titled Assessment of Adults, includes a series of new recommendations, including the following:

Statement 5.5

We recommend transgender and gender-diverse adults who fulfill the criteria for gender-affirming medical and surgical treatment require a single opinion for the initiation of this treatment from a professional who has competencies in the assessment of transgender and gender-diverse people wishing gender-related medical and surgical treatment.

Although limited, current research suggests that two independent opinions prior to surgery may impact TGD people's autonomy and access to care [4,5]. The SOC-8 tailors the assessment recommendations based upon the individual's clinical circumstances. The assessment should be performed by professionals experienced in TGD healthcare. The SOC-8 makes the following recommendations for any provider performing surgical assessments:

Statement 5.1

We recommend healthcare professionals assessing transgender and gender-diverse adults for physical treatments:

5.1.a *Are licensed by their statutory body and hold, at a minimum, a master's degree or equivalent training in a clinical field relevant to this role and granted by a nationally accredited statutory institution.*

5.1.b *For countries requiring a diagnosis for access to care, the healthcare professional should be competent using the latest edition of the World Health organization's International Classification of Diseases (ICD) for diagnosis. In countries that have not implemented the latest ICD, other taxonomies may be used; efforts should be undertaken to utilize the latest ICD as soon as practicable.*

5.1.c *Are able to identify coexisting mental health or other psychosocial concerns and distinguish these from gender dysphoria, incongruence, and diversity.*

5.1.d *Are able to assess capacity to consent for treatment.*

5.1.e *Have experience or be qualified to assess clinical aspects of gender dysphoria, incongruence, and diversity.*

5.1.f *Undergo continuing education in health care relating to gender dysphoria, incongruence, and diversity.*

The SOC-8 recognizes that the TGD community is diverse. As such, the assessment process may require two evaluations in some circumstances.

Surgery for adolescents

Appendix D of the SOC-8 includes a list of criteria for gender-affirming surgical procedures for adolescents:

Summary criteria for adolescents: surgery

a. *Gender diversity/incongruence is marked and sustained over time.*

b. *Meets the diagnostic criteria of gender incongruence in situations where a diagnosis is necessary to access health care.*

c. *Demonstrates the emotional and cognitive maturity required to provide informed consent/assent for the treatment.*

d. *Mental health concerns (if any) that may interfere with diagnostic clarity, capacity to consent, and gender-affirming medical treatments have been addressed; sufficiently so that gender-affirming medical treatment can be provided optimally.*

e. *Informed of the reproductive effects, including the potential loss of fertility and the available options to preserve fertility.*

f. *At least 12 months of gender-affirming hormone therapy or longer, if required, to achieve the desired surgical result for gender-affirming procedures, including breast augmentation, orchiectomy, vaginoplasty, hysterectomy, phalloplasty, metoidioplasty, and facial surgery as part of gender-affirming treatment unless hormone therapy is either not desired or is medically contraindicated.*

Unlike for the surgical criteria for adults, the SOC-8 recommends adolescent patients should be stable on GAHT for at least 12 months prior to surgery; however, the SOC-8 also recognizes that GAHT may not be desired or may be medically contraindicated in some patients. The SOC-8 suggests 12 months of GAHT to allow the patient to psychologically adapt to the physical changes of GAHT during a critical time of pubertal development. GAHT may also be needed to optimize anatomical changes prior to surgery. While surgery on adolescents is rare, and typically entails gender-affirming mastectomy for transmasculine people, vaginoplasty may be indicated in specific circumstances.

Surgical care for nonbinary people

The SOC-8 also includes a chapter dedicated to the care of nonbinary individuals. The term nonbinary includes gender identities that fall outside the traditional gender binary. This may include people who identify along a gender spectrum, and may also include people who identify as agender, polygender, or gender fluid. Access to healthcare can be particularly difficult for nonbinary people [1]. Nonbinary people may feel the need to present as binary in order to access care.

The SOC-8 makes the following recommendations for nonbinary people:

Statements of Recommendation:

8.1. *We recommend healthcare professionals provide nonbinary people with individualized assessment and treatment that affirms their experience of gender.*

8.2. *We recommend healthcare professionals consider gender-affirming medical interventions (hormonal treatment or surgery) for nonbinary people in the absence of "social gender transition."*

8.3. *We recommend healthcare professionals consider gender-affirming surgical interventions in the absence of hormonal treatment, unless hormone therapy is required to achieve the desired surgical result.*

8.4. *We recommend healthcare professionals provide information to nonbinary people about the effects of hormonal therapies/surgery on future fertility and discuss the options for fertility preservation prior to starting hormonal treatment or undergoing surgery.*

The SOC-8 recognizes that not all people desire GAHT. Gender-affirming surgery is an option for nonbinary people who are not receiving GAHT. However, the SOC-8 also recognizes that GAHT may be required if hormones are necessary to achieve a certain anatomic result (i.e., clitoral hypertrophy prior to metoidioplasty). Nonbinary people may desire individually customized procedures. For nonbinary people assigned male at birth (AMAB), surgical requests may include penile-preserving vaginoplasty, vaginoplasty with preservation of the testicles, or surgery to remove external sexual characteristics. It is important for the surgeon to work collaboratively with the patient and their healthcare team, including primary care and mental health professionals. Preoperative planning and preparation helps to understand goals and expectations as well as the benefits and limitations of surgery.

Postoperative care plan

The SOC-7 features a broad set of recommendations for ensuring follow-up for people after gender-affirming surgery. The SOC-8 takes a more specific approach, with emphasis on creating a comprehensive aftercare plan prior to surgery:

Statement 13.3

We recommend surgeons inform transgender and gender-diverse people undergoing gender-affirming surgical procedures about aftercare requirements, travel and accommodations, and the importance of postoperative follow-up during the preoperative process.

Providing patients with details about aftercare requirements during the preoperative period is helpful for planning, preparation, and recovery. As many patients travel for surgery, consideration regarding postoperative follow-up, scheduling of staged procedures, and coordination of care with the person's primary care team (and/or local surgeons) should be planned. Additional considerations include anticipation regarding time off work, activity restrictions, and financial estimates for costs, which are not covered by insurance providers. Gender-affirming surgery is a significant life event for which patients must allocate substantial time and money. Providing patients with the details of their aftercare plan prior to surgery helps to facilitate a smooth postoperative recovery period. These details should be shared as early as possible to allow patients to make the necessary arrangements.

The SOC-8 also elaborates on the need for gynecologic care after vaginoplasty:

Statement 13.10

We recommend surgeons caring for transgender women and gender-diverse people who have undergone vaginoplasty encourage follow-up with their primary surgeon, primary care physician, or gynecologist.

Postoperative follow-up to monitor progress and evaluate healing, including assessment for granulation tissue, delayed wound healing, dilation, and pelvic floor functional concerns are important. Routine gynecologic care should be performed annually. Speculum exams can be performed by a primary care physician, gynecologist, or the gender-affirming surgeon. Prostate exams performed through the vaginal canal should be a component of routine annual care.

Adjunct therapies can also enhance the postoperative recovery period. Chapter 12 of SOC-8 discusses the importance of pelvic floor physical therapy as an important intervention after genital gender-affirming surgery for managing voiding and sexual function. Having these services available in the surgeon's practice or assisting the patient in coordinating these services can be very helpful in optimizing postoperative pelvic floor function.

Conclusion

Published in 2022, the SOC-8 provides updated guidelines for gender-affirming surgery, including vaginoplasty. Ultimately, the goals of these updates are to increase patient access to high-quality gender-affirming care and improve outcomes for those undergoing gender-affirming procedures. The effects of these updates will continue to shape the landscape of gender-affirming care in our healthcare system.

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CHAPTER

3

Cultural aspects of transgenderism

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Introduction

If we, as in the Cambridge Dictionary, define culture as "the way of life, especially the general customs and beliefs, of a particular group of people at a particular time there is ample evidence that there have always been traces of gender variance in all cultures [1]. But due to the deep sociocultural roots of the concept of "gender," it is difficult to depict a global prevalence of transgenderism as the concept is shaped by cultural and social norms and is subjected to a time frame [2]. Even if we assume that a similar proportion of gender-nonconforming individuals *should* exist in various parts of the globe, we can safely assume that cultural differences would alter observable expressions and as such the visibility of these individuals in that society. We see a more complex view of gender in, for example, the Native American, Indian, Indonesian, Thai, or Samoan culture [3]. In addition to that, gender externalizes in a multitude of ways. Some may want to align their physical presentation with their gender identity, while others will not search for surgical intervention or hormonal therapy. The ultimate choices one makes will significantly be influenced by the level of approval one anticipates receiving from both their personal circle and from society at large. Approval and support in return will be intertwined with factors such as labor division, inheritance laws, chances at reproduction, etc.

In the following chapter, we will try to discuss cultural aspects of gender-affirming procedures in different societies and through time. But to do this, we must first briefly look at the concept of gender.

Gender as a concept

Though the first gender-affirming vaginoplasty took place in 1931, it is at the origin of modern gender studies in the late 1960s; that the chains binding gender and a "natural"

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00003-0

sexual order were broken, thus paving the way for the temporocultural analysis of these concepts [4,5]. In the 1970s, a significant expansion of genital gender-affirming surgery occurred, and with it, an increased visibility of transgender people occurred [1]. This led to a shift from discussing transgender people as case studies in psychiatric and medical literature to seeing "the transsexual" as an identity group with cultural significance [6]. Between the 1970s and mid-1990s of the previous century, two clear paradigms dominated the field of gender studies: (1) the gender deviance paradigm, with its roots in the social constructionist approaches, and (2) the gender difference paradigm [6].

The deviance paradigm can broadly be viewed as a critique of the medicalized aspects of gender transition that are creating the cultural deception that one's biological sex can be molded. "Passing," as a female in this context, is a central theme and stands for the "*interactional strategy that social actors can adopt to hide a stigmatized identity or characteristic from others*" [6–9]. Eichler even goes so far as to describe GAS as "*bodily mutilation—the willful destruction of physically healthy portions of the body for purely social reasons*" [10].

Gender deviance theorists felt that instead of allowing self-acceptance, people who felt out of place in given cultural gender expectations were pushed to undergo "normalizing" surgical interventions to force themselves into the gender binary system. On a more defensive note, some feminist theorists argue that trans women are appropriating and colonizing female bodies and hence invading the sanctity of female-only spaces [11].

The fierce activism of the 1980s and 1990s criticizing marginalization in all fields of society gained ground relocating transgender people away from pathological spheres. The "gender difference paradigm" was the resulting counteracting wave in the field of sociology. Gender lost its static innate status and was seen in a poststructuralist light as fluid, making the concept more inclusive [12,13]. A more empiric strategy was used in this body of research by using transgender people's perspective within institutional contexts, e.g., health care, schooling, prison… and across class, race, and religion. This leads to the implication of the older concept of "intersectionality," or how intersecting forms of marginalization, using gender, race, socioeconomic class, etc. mold social interactions and experiences of transgender people [6,14–20]. Gender is thus not seen as a naturally occurring category, but as a product of social marking [14].

The gender binary

Most of the Western world has historically viewed gender as dichotomous or classified in two distinct forms, masculine and feminine [21–23]. Being appointed to either group, one is anticipated to conform in terms of behavior, attire, communication, and physical gestures, among other aspects. This view is often conceived as a reference, and as such used to measure other societies and depict them as "cultured" [24]. This simplistic view forgoes the fact that Western society is a hypercultured space in which nonnormative bodies are molded to fit the binary genital system. Spade points out that crossing normative gender boundaries is denunciated. An example of this is the historical forced corrective treatment of intersex children, even though their genital ambiguity has no bearing on their overall physical health [24,25]. These practices of early genital surgery are now debunked based on poor long-term outcomes in aesthetics as well as psychological well-being [26–28]. Pornography has been labeled as the culprit in the rise of genital cosmetic procedures, but critical analysis shows that there is a broader societal construct at work [29,30].

Colonialism and eugenics

The latter half of the 1800s was marked by an ambitious colonial scramble, justified by the belief that the global dominance of the Western powers stemmed from centuries of cultural, scientific, and industrious advancement. Using race as a fundamental hierarchic principle, Caucasians were placed at the pinnacle of moral and intellectual superiority [31,32]. Indigenous manners of living were belittled as inferior and dysfunctional, thus affirming the comprehensive authority over the various facets of societal existence [33,34]. Of specific interest to our topic is the mechanism of control over family life by enforcing bounds only by direct descendancy, a system that can only abide where gender binary rules [35]. As late as 2019, the Congregation for catholic education released a report titled "*Male and Female He Created Them: Towards a Path of Dialogue on the Question of Gender Theory in Education*" in which the nuclear family, formed by one male father, one female mother, and a child that is either male or female, is described as the imperative scaffold for a child's sexual identity and differentiation [36,37]. The 19th–early 20th-century enforcement of the nuclear family on indigenous people unhinged long-standing bonds of kinship and care for children beyond the linear reproductive [36].

Around the same period, a major concern for the general decline of the white race, due to miscegenation, poverty, and alcoholism, dwelled through scientific milieus. Fueled by Darwinism and Malthusian population control, defense strategies were developed to safeguard the "more civilized races" against further deterioration [38]. The term eugenics was introduced by Galton to describe a rationalized, controlled reproduction by only letting "*the finest and most suitable natures, mental, moral, and physical*" reproduce [32,39]. Apart from the racial strategy, eugenics had important gendered implications since women were significantly more sterilized than men [32,40,41]. Related to this, gender nonconformity was bound to be demonized since it imposed a danger to a keenly devised system. It was stated that the greater the visual difference between males and females the higher in the racial ladder a given culture would be. Sexual differentiation was seen as a step up from primitivism or the animalistic, a marker for civilization [42,43]. As beautifully described by O'Sullivan, even in archeological readings of the past renderings of gender outside of the binary are "*configured as metaphysical and not representative of actual, living people[…]abject or alien representations, rather than figurative representations of living people from the past*" [36]. The same goes for ethnic representation in contemporary museums rendering a static, reduced, and gendered image of past and contemporary lives [44].

While it is evident that numerous precolonial societies did not endorse gender variance, it is noteworthy that many did and still do not adhere to a binary concept of gender. Sociology views gender as being constructed through the externalization of gender-specific signs, such as hairstyle choice, voice, and mannerisms in a given society [4]. The strength of each culture depends on the willingness of the majority of individuals to act true to their appointed position in their society so that deviant behavior will be frowned upon in the best situation or lead to exclusion or penalty in the worst [45]. Choosing not to conform hereby might lead to the severing of familial ties, loss of social support systems, forfeiting inheritance, experiencing profound isolation and financial hardship, and encountering challenges related to healthcare accessibility [46]. This multifaceted dynamic is further compounded by the influences of cultural beauty standards.

A complete history of all cultural gender variance would be impossible, but in the following paragraph, we will briefly elaborate on several contemporary societies.

Hijras of India

During the Mughal reign between the early 16th to the mid-18th century, the transgender Hijra community in India, being neither men nor women, occupied significant religious and administrative positions. They were regarded as individuals possessing the capacity to bestow blessings, and their presence was sought during crucial religious ceremonies [47]. Despite their historical recognition, the Hijras still reside among the most marginalized segments in a highly traditional and hierarchically structured society. Since its inception in 1858 under British colonial law until the abolition on September 6th, 2018, section 377 of the Indian legislature describing "carnal intercourse against the order of nature" has served as a basis for justifying the discrimination and ill-treatment faced by the LGBTQ+ community [48]. Confronted with stigma and exclusion, the Hijras often find themselves with limited livelihood options, typically resorting to begging, dancing, or engaging in sex work [47,49]. Hijras are often subjected to police and government violence in their strive for survival since most of the above-listed activities have been considered criminal offenses since the colonial era [47].

The third gender was officially recognized by the Supreme Court of India in the 2014 NALSA judgment. This means that Hijras could determine their gender identity on official documents such as driver's licenses and passports and recognize their entitlement to protection against gender identity-based discrimination [47,49]. Unfortunately, many basic rights such as marriage, inheritance, and adoption procedures are not addressed.

The Pacific Islands—Mahu and RaeRae

The gender variance among male-bodied individuals in Polynesian culture is composed of RaeRae and Mahu, both displaying characteristics traditionally associated with both genders. While Mahu are highly regarded members of Polynesian culture and were never seen through a medical or psychiatric lens, the RaeRae suffer a more negative connotation [50]. The RaeRae term originated in the 1960s when the French came to Polynesia. They are more likely to undergo gender-reaffirming surgery or treatment and have ties to poverty, sex work, and homosexuality. According to Elliston, the RaeRae are, due to their conspicuous sexuality, at clash with a ruling epistemological principle in Tahitian culture that gender takes precedence over sex [51]. In other words, one's gender is defined and is constant through life and determines one's sexuality, not the other way around.

Kathoeys in Thailand

Bangkok, the capital of Thailand, harbors one of the largest and most vibrant gender-diverse subcultures in Asia, the Kathoeys [52,53]. As is the case in many cultures worldwide, numerous practices conducted openly, such as gambling or prostitution, often possess a degree of ambiguity regarding their legality. The same goes for Kathoeys, particularly within economic or cultural sectors that present themselves with a cosmopolitan image through the adoption of Western modernization [52]. Job opportunities outside of the sex and entertainment business seem to be scarce.

Gender nonconformity in sub-Saharan Africa

Looking into the rich history of numerous precolonial tribes reveals a diverse range of gender identities and determination of gender. The Dagaaba Tribe, for example, who can in present-day be found in Ghana, Burkina Faso, and Ivory Coast, rejected anatomic-based gender instead of vibrance of energy [54]. The Igbo of Nigeria implied a flexible gender system where male daughters formed a solution when the continuation of the family lineage was endangered [55]. Chidera Ihejirika narrates how after the civil war in 1970 her aunt became a "female husband" marrying a wife instead of her late brother [56]. Effeminate males or Mudoku dako in Northern Uganda could wed other men and were generally treated as women [57]. In Zambia, the *Mwami* prophets of the Ila People wore female attire and executed traditional women's work, while still living platonically together with a women [57]. The Dogon tribe in Mali presents a fascinating perspective on gender, maintaining a unique form of gender binary expressed in an androgynous manner. According to their beliefs, everyone is born with duality, having a twin soul. The disruption of this gender symbiosis occurred with the cataclysmic birth of a male jackal. Hereafter the ancestral spirits, Nommo, who themselves are intersex mystical creatures, decided that male and female should be distinguished identities. A lingering duality is retained in the human genitalia, a clitoris is considered male, and the foreskin is considered female. The remains of the second sex are thus removed by ritual circumcision [58].

Despite the deep roots of queerness and gender nonconformity in precolonial times, contemporary Africa is renowned as a site for violence against sexual minorities [55,59,60]. Many present-day rulers are seen to make arguments against gender variety by dismissing it as a Western construct, thus leading to a significant prevalence of homophobia, discrimination against sexual minorities, and denial of human rights for people with nonconforming genders [61]. Queerness is still criminalized in 32 African countries despite ratification of the International Covenant on Civil and Political Rights by 30 of these nations [62,63]. The roots of this stem from, as Roxburgh puts it: "*the colonial project [which] baked transphobia into the fabric of postcolonial Africa*" [57]. Imperialism created offenses that were previously nonexistent in the invaded lands [57]. After gradually letting go of their colonial hegemony deep in the 20th century, the Western powers simultaneously decriminalized the queer identity. The freshly instated African leaders in contrast saw their repressive ammunition in the imported homophobic laws [57].

The medical magnifying glass and conformity as survival

The complex tapestry of gender perceptions in different cultures and times has challenged the intricate relationship between cultural norms and gender identity, resulting in the profound recognition of the obstinate marginalization, to everything in between of transgender individuals in society.

The evolving journey undertaken to go from early psychiatric and medical classifications of transgender individuals to their emergence as an identity group with cultural significance has shaped the contemporary scholarly discourse.

The imposition of a binary gender system, prevalent in Western societies, has historical roots tied to colonialism and eugenics, striving to enforce perceived superiority. Though numerous precolonial societies embraced diverse gender identities, challenging the assumption of a rigid binary construct. we need to be careful not to read precolonial cultural practices through a 21st-century loop and make them equal to contemporary gender categories. Examining specific cultural instances such as the Hijras in India, RaeRae and Mahu in the Pacific Islands, and Kathoeys in Thailand sheds light on the intersection between cultural practices, societal acceptance, and the challenges faced by gender nonconforming individuals. These communities navigate complex landscapes shaped by tradition, modernization, and global influences. Despite its rich array of precolonial gender identities, Africa currently grapples with widespread violence and discrimination against sexual minorities, rooted in colonial era legislation that continues to shape policy-making and societal attitudes.

The medicalization of gender conformity and the survival instinct to adhere to societal norms underscore the challenges faced by transgender individuals. Behavioral shifts during transition and the need to conform for societal acceptance reflect the intricate interplay between personal identity and cultural expectations.

As we continue to unravel the multifaceted layers of cultural dimensions intersecting with gender-affirming procedures, it becomes evident that acceptance, recognition, and support are pivotal for individuals navigating their gender identities within diverse cultural landscapes. In this ongoing journey of understanding, acknowledging, and respecting cultural diversity in gender identities, the need for dialogue, education, and advocacy remains paramount. Embracing differences and fostering inclusivity within cultural frameworks is essential for creating a world where individuals of all gender identities can thrive and live authentically.

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CHAPTER

4

Orchiectomy in transgenders and gender-diverse people

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Introduction

Transgenders and gender-diverse people may opt for genital gender-affirming surgery (gGAS). In most healthcare institutions involved in the care for persons wiht gender dysphoria, surgical options for genital feminization comprise simple bilateral orchiectomy, vulvoplasty without vaginal cavity, or gender-affirming vaginoplasty; the latter is frequently chosen by transgender women [1]. Of all these procedures, orchiectomy is the simplest one, with the lowest risk for complications; and, it can be chosen by both transgender women as well as nonbinary individuals [2].

Individuals may opt for orchiectomy because of multiple reasons. Some transfeminine individuals regard orchiectomy as their primary gGAS option because of (1) absence of genital dysphoria or other motivations related to their gender identity and/or (2) the wish to discontinue antitestosterone treatment [3]. Others regard (gender-affirming) vaginoplasty or vulvoplasty as their primary gGAS option, but are not eligible because of (1) somatic or psychiatric comorbidities and/or (2) because of the inability to reach institutional requirements with regard to smoking and obesity. Another group regards orchiectomy as a "bridge to vaginoplasty." Those individuals have a wish for a vaginoplasty procedure in the future, or do not exclude this option, however, opt for an orchiectomy first.

Advantages of the orchiectomy procedure are the relatively quick and easy surgical procedure without high risk on (major) complications, quick recovery, and the fact that antiandrogen medication (such as spironolactone and cyproterone acetate) can be cessated after surgery. In this chapter, motivations, surgical (contraindications), technical aspects, surgical considerations, and outcomes of gender-affirming orchiectomy are discussed.

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00004-2

Indications and contraindications

Every surgical healthcare provider for transgender individuals should adhere to the most current Standards of Care, as formulated by the World Professional Association for Transgender Health [4]. The five criteria for eligibility for orchiectomy in transfeminine individuals are stated here. They are as follows:

1. Persistent, well-documented gender dysphoria.
2. Capacity to make a fully informed decision and to consent for treatment.
3. Age of majority in a given country.
4. If significant medical or mental health concerns are present, they must be well controlled.
5. 12 continuous months of hormone therapy, as appropriate to the patient's gender goals (unless the patient has a medical contraindication or is otherwise unable or unwilling to take hormones). The reason of this is to introduce a period of reversible testosterone suppression, before someone undergoes irreversible gonadectomy.

Surgical technique

Preoperative workup

At the preoperative physical examination, the presence of inguinal hernias is checked and the testicles are palpated for possible palpable malignancies. In case of present inguinal hernia, this should be surgically addressed before or during the orchiectomy procedure. In case of palpable testicular abnormalities, an ultrasound should be made of the testicles and inguinal area and testicular cancer tumor markers should be assessed.

Furthermore, the procedure, anesthetic options, postoperative infertility, and possible complications, such as infection, postoperative bleeding, and postoperative pain, should be discussed and documented as informed consent. Because of certain infertility after surgery, before performing orchiectomy, individuals should be counseled on fertility preservation, even though there might be a low utilization and interest in sperm preservation in this population [5,6].

Surgical procedure

There might be small variances in orchiectomy techniques; however, most surgeons perform the same sequence of steps [7,8]. The procedure is generally performed under general or spinal anesthesia in daycare, but can also be performed under local anesthesia in selected cases. Perioperative estrogen therapy cessation is deemed not necessary in our institution [9]. Patients are placed in supine frog-leg position. Generally, intravenous antibiotic prophylaxis is not necessary; however, sometimes an exemption can be made in individual cases with high risk on postoperative infectious complications, such as individuals with severe obesity and/or comorbid diabetes. After sterile draping, a 3–4 cm midline incision is made in the scrotal raphe (Fig. 4.1). This incision location is ideal, because the surgical

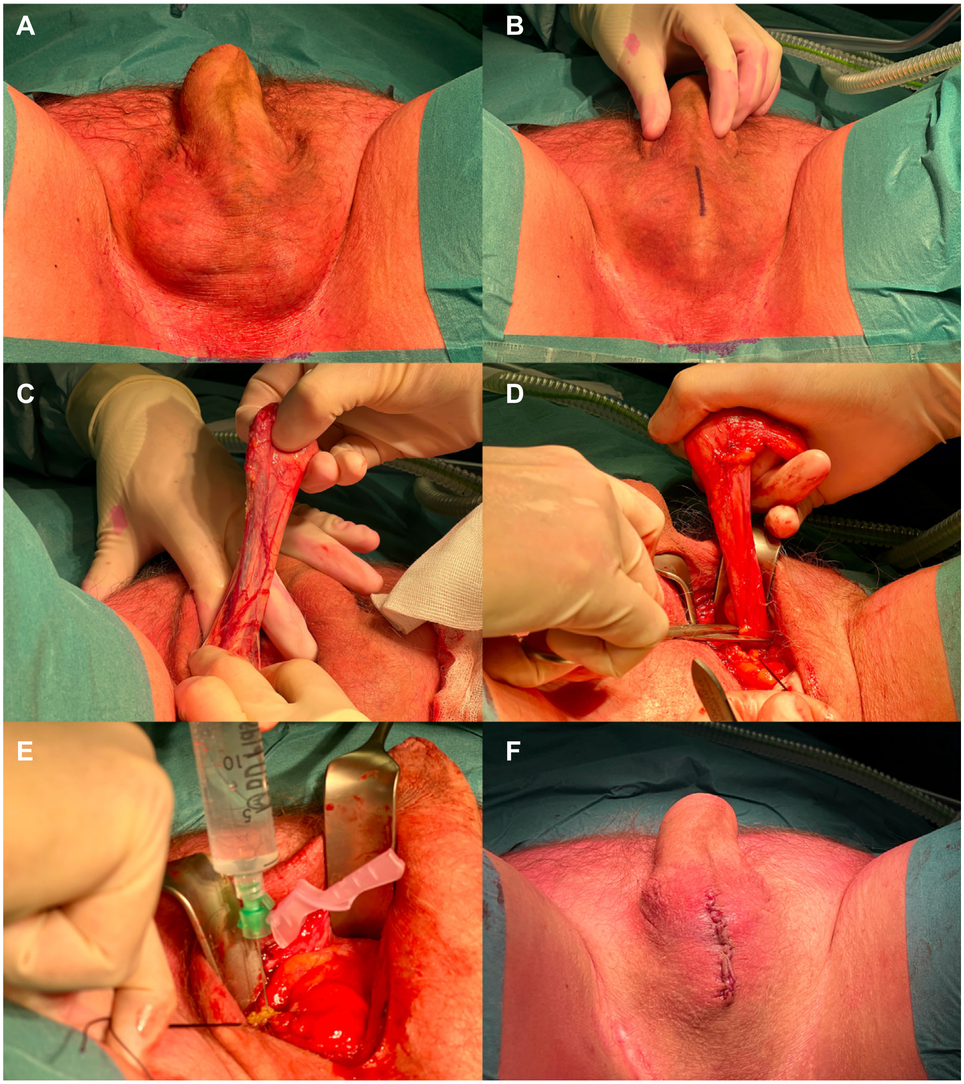

FIGURE 4.1 Orchiectomy procedure in our center. (A and B) A midline incision is made. (C) and (D) The spermatic cord is isolated to the external inguinal canal and ligated. (E) Nerve block of the genital branch of the genitofemoral nerve. (F) Immediate postoperative result.

area is easily approached, with good surgical overview and without hampering vascularization of tissue that might be used in a possible future penile inversion vaginoplasty procedure [10]. Diathermic dissection is performed to each testicle. When the tunica albuginea is reached, the spermatic cord is freed from its' surroundings bluntly, by traction with a gauze. When the external inguinal canal is reached, the spermatic cord is ligated and both testicles are removed. In most institutions, resection specimens are sent for histopathology; however, the number of incidentalomas encountered at the time of bilateral orchidectomy is low [11].

The funicular ligation suture is not cut yet and left long. The stump of the spermatic cord is subsequently infiltrated with a long-acting local anesthetic, such as bupivacaine. This is a nerve block of the genital branch of the genitofemoral nerve and leads to significant pain reduction in the direct postoperative phase. When there is no bleeding of the spermatic cord stump, the suture is cut short and the stump should retract in the inguinal canal. Before closing the wound, hemostasis is performed with diathermia, with blood pressure being normotensive or controlled hypertensive. A running suture is used to close the Dartos layer. The scrotal skin is closed in layers with absorbable sutures.

Additional perioperative considerations

Some surgeons also perform (partial) scrotectomy when individuals request this, which is technically not very difficult and can also be performed under local anesthesia. However, little is known on postoperative satisfaction, quality of life, and implications on future surgical procedures, such as vaginoplasty. Scrotectomy is not advisable in individuals desiring vaginoplasty at a later time, as (part of) the scrotal skin may be used for labia majora and/or lining of the neovaginal canal. In the latter case, extragenital skin grafts may be necessary. Individuals with a history of orchiectomy have less scrotal skin available, also without scrotal skin resection [12]. Hypothetically, shrinkage of scrotal skin happens in most cases after simple orchiectomy, because of the combination of testicular loss, which functioned as tissue expanders, and postoperative wound contraction.

Other gender-affirming procedures can easily be combined with an orchiectomy, such as breast augmentation or facial feminizing surgery [3,13].

Postoperative care

The procedure is performed in daycare. For 4–6 weeks, individuals are advised not to engage in higher-intensity physical activities and to refrain from bicycle and horse riding. Generally, the postoperative recovery is quick, and postoperative pain is well manageable with oral analgesics. Androgen suppression is discontinued immediately after surgery.

Discussion

Orchiectomy is a relatively simple procedure with relatively low morbidity and a quick recovery. It can be seen as a standalone option for gGAS or as bridge to a possible future vaginoplasty.

Current literature on surgical outcomes of orchiectomy in transgender individuals is scarce. To our knowledge, studies focusing on postoperative satisfaction and quality of life after orchiectomy in transgender individuals are not published.

In a retrospective study from Van der Sluis et al. (our own group) on motivation for orchiectomy, 43 transgender individuals were included, of whom 16 (37%) wished vaginoplasty, but did not meet institutional requirements or were not eligible for vaginoplasty because of somatic or mental health issues, 14 (33%) individuals regarded it as a preceding step to a future vaginoplasty procedure, and 13 (30%) did not report a desire to pursue vaginoplasty in the future [3]. Reported surgical outcomes were scrotal abscess (n = 3, 7%) and surgical site infection (n = 1, 2%). In a retrospective study from Hana et al., on 16 transgender individuals who underwent orchiectomy (two of them also underwent scrotectomy), at the 30-day day follow-up visit, there was a single postoperative sperm granuloma reported [14]. Two national database studies reported outcomes from the same database; the National Surgical Quality Improvement Program. Russell et al. reported on 241 individuals who underwent orchiectomy between 2015 and 2020 [15]. The reported 30-day surgical outcomes were organ surgical site infection (n = 3, 1.2%), sepsis (n = 2, 0.8%), and superficial surgical site infection (n = 3, 1.2%). Saltman et al. reported on 246 individuals who underwent orchiectomy between 2010 and 2020 [16]. The reported 30-day surgical outcomes were superficial incisional infection (n = 2, 0.8%), organ/space infection (n = 3, 1.2%), sepsis (n = 2, 0.8%), return to the operation room (n = 5, 2%), and unplanned readmission (n = 7, 2.8%).

Conclusions

To conclude, gender-affirming orchiectomy is a relatively quick and easy surgical procedure without high risk on (major) complications. Future research should focus on postoperative satisfaction and (sexual) quality of life as patient-reported outcomes are rarely mentioned in current literature.

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CHAPTER

5

Psychological support around gender-affirming vaginoplasty

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Introduction

Over the past decades, vaginoplasty has been the cornerstone of surgical gender-affirming care for transfeminine transgender and gender diverse (TGD) individuals. With the increased ability of shared decision-making and less binary thinking of both identities and treatment protocols, other feminizing or demasculinizing surgical procedures such as zero-depth vaginoplasty or vulvoplasty, and orchidectomy have gained attention [1]. Often, the increase in surgical options and treatment wishes has also influenced the way care is organized. This includes not only surgical and postoperative planning but also the nature of preoperative information counseling, decision-making, as well as the organization of peri- and postoperative support services [2,3]. This chapter will highlight the current state of mental health involvement around feminizing gender-affirming surgery, including preoperative assessment, the nature of shared surgical decision-making, and possible contribution in peri- and postoperative care. While acknowledging the different models in which care is globally provided, we will argue the key role surgeon—mental health professional collaboration plays in optimizing the care for this group.

Mental health assessment

Vaginoplasty and other feminizing/demasculinizing gender-affirming surgeries ultimately have the aim of reducing mental health distress, and improving overall psychosocial

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00005-4

functioning and quality of life. Among the surgical options, vaginoplasty is the most researched, both prospectively and retrospectively. Key findings include consistently high rates of overall outcome satisfaction (generally at least 90%–95%), and low rates of regret (generally below 5%), [4]. Psychological measures on which postoperative improvements have been observed include body image, the degree of gender dysphoria, and psychiatric symptoms [5]. For quality of life, an improvement in life satisfaction and health-related quality of life has been observed [6]. In gender-affirming surgery research (including other surgeries as well), several patient characteristics have been associated with postoperative gains in patient-reported outcomes (PROs). Repeated findings include that psychological characteristics (e.g., overall psychiatric symptomatology, low self-esteem) and social difficulties (e.g., few available support) were often associated with postoperative outcomes along with surgical technique, complications, or other medical characteristics [7,8]. One could therefore say that if surgeons aim to improve PRO after feminizing genital gender-affirming surgery, sufficient attention should be paid to both surgical-technical improvements as well as mental health assessment and support.

The involvement of mental health professionals in preoperative assessment shows substantial geographical differences. The WPATH Standards of Care provide a set of general directives for mental health assessment before surgery, which are often translated into local guidelines based on healthcare organization and financing [2]. Two key areas of recommendation for mental health assessment include (i) the recommended clinician characteristics to perform qualitatively sufficient assessment and (ii) the recommended areas to cover during mental health assessment. Regarding the first, clinicians are recommended to be masters-level locally certified professionals in degrees that enable the person to reliably assess the areas relevant to the population. Often this will be psychologists or medical doctors in the fields of clinical psychology, psychiatry, and sexual medicine. In addition, clinicians are expected to have participated in significant (professional) education to have sufficient knowledge on gender identity development, gender dysphoria, classifications, and the nature and possible outcomes of medical gender-affirming treatments. While TGD healthcare education has not been institutionalized in many (under)graduate and professional education programs globally [9], a substantial number of educational efforts have been made in the recent decade, both initiated by local clinics, universities, support groups, and professional organizations [10].

Key areas of mental health assessment prior to surgery include the assessment of gender dysphoria or incongruence—possibly accompanied by a classifying diagnosis—an overview of coexisting mental health problems along with an assessment of their expected interference with gender-related distress and anticipated recovery, and the person's capacity to provide informed consent for treatment at the time of assessment (Fig. 5.1). First, assessment of gender incongruence and possible distress (dysphoria) will be assessed. Classification models such as those the DSM or ICD can, and in some countries are expected to, be used to structurally describe gender incongruence experiences as well as the degree of suffering accompanied. In many countries with collective healthcare systems, a formal classifying diagnosis is required for TGD individuals to access reimbursed surgical care. At the same time, mental health professionals are advised to remain salient on the pathologizing effects of the use of disease labels to describe the experiences of TGD individuals. To reduce negative effects such as internalized stigma and reduced provider–patient trust, clinicians best address the

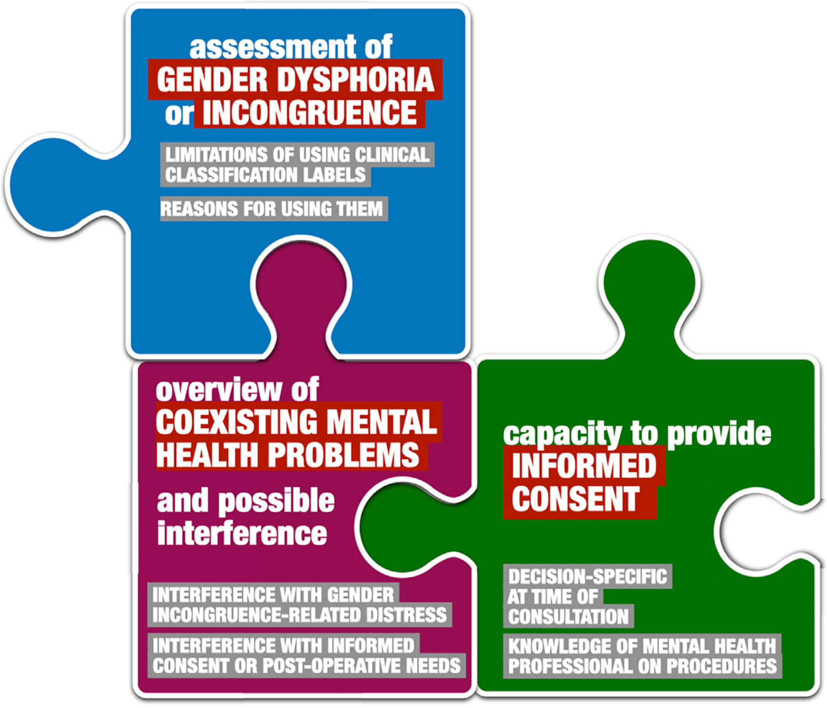


FIGURE 5.1 Key areas of mental health assessment prior to surgery, according to the Standards of Care.

limitations of using clinical classifications and the pragmatic reasons for introducing them during mental health assessment (i.e., they grant access to the desired medical care). At the same time, providers have to remain attentive to ethical considerations around (the level of) mental healthcare involvement to provide responsible care [11].

When seeing people prior to medical gender-affirming care, mental health providers are recommended to assess whether the experienced gender incongruence (and wish for medical treatment) is marked and sustained [2]. Recognizing the subjectivity of these qualifications, topics such as the nature, length, and consistency of cross-gender identification and role can be explored. Depending on the setting, one can discuss a change of name, legal documents, pronouns, etc. Distress may or may not be present, depending on factors such as social support, level of bodily dysphoria, and/or the presence of psychological traits that mitigate distress (e.g., level of agency, positive thinking).

A second area of mental health assessment includes the identification of coexisting mental health problems. This provides not only an insight into psychiatric problems that can present as gender incongruence (e.g., psychosis) or that can interfere with gender incongruence-related distress (e.g., depression or anxiety), but also into problems that can interfere with the ability to provide informed consent for surgery and/or cope with postoperative recovery requirements. Many mental health problems will not be absolute contraindications for feminizing genital gender-affirming surgery; in contrary, they often underline the necessity for undergoing surgery as well as for adequate planning for mental healthcare along with surgery. For mental health conditions such as having neurodiversity based on autism spectrum disorders (ASD) or ADHD, adequate mental health assessment will provide the healthcare team with directives on how to communicate and structure care to limit the level of distress for the patient and adequately convey all relevant information [12,13]. In the light of treating people holistically, preoperative mental health assessment can inform both the TGD individual and the care team of nonsurgical care that may be included into a treatment plan to maximize the psychosocial gains after surgery. This can include social work involvement to ensure transportation, stable housing and organize social support, but may also include psychotherapeutic treatments of trauma, anxiety, or mood disorders that are understood as relatively independent of gender-related distress and gender-affirming care.

Lastly, mental health assessment structurally objectifies the individual's ability to provide surgical informed consent. Following general consent assessment models, this includes the cognitive ability to oversee the procedure, alternatives, possible risks and gains, weigh these against one's personal preferences, and verbalize one's information needs and a final decision [14]. Decision options should be considered broadly and can include refraining from surgery, delaying the decision, choosing nonsurgical (medical) interventions, as well as choosing between different surgical options or variations. Informed consent is generally understood as decision-specific (i.e., the assessment relates to the choice at stake) and does therefore not have to align with one's informed consent abilities on other areas of life. Also, the assessment describes the ability at the time of consultation, and a good-quality evaluation likely (also) depends on the knowledge the mental health professional themselves has on what the actual procedures entail. Depending on the nature of the collaboration, mental health and surgical professionals can design the surgical informed consent procedure sequentially (i.e., the surgeon takes over the process when the mental health professional finishes) or parallel/intertwined (i.e., both professionals inform within the same time frame and actively discuss and adjust until a final outcome is reached; Fig. 5.2). This means that the mental health assessment and surgical "workup" go hand in hand, and one can speak of a *process* of informed consent.

FIGURE 5.2 Models for mental health professional and surgeon collaboration prior to surgery.

Surgical decision-making

As aforementioned, the nature of the preoperative collaboration between the surgeon and mental health professional can be organized in different ways, ranging from referring to one another to fully integrated services. Regardless, professionals are expected to organize some level of multidisciplinary cooperation or consultation when providing gender-affirming care to TGD individuals [2]. Such collaboration not only enables adequate information on the relevant treatment options but also enables for the most integrated way of surgical decision-making.

Given the aim of making the body more congruent with one's gender identity and of improving psychosocial wellbeing, there is an inherent subjectivity in choosing for (a type of) genital gender-affirming surgery. Key considerations in the decision-making process are (i) the feasibility and availability of the surgical procedures, (ii) the TGD individual's wishes and anticipated gains, as well as (iii) the possible risks, and the individual's risk adversity and capacity to cope with such negative outcomes [15]. Where this decision-making was earlier thought of as binary in feminine TGD individuals (vaginoplasty or no surgery), currently, many centers provide options such as vulvoplasty (without vaginal cavity), and orchidectomy as legit options as well. The process of shared decision-making in feminine TGD individuals has received little attention, however. This is in contrast with masculine TGD individuals where evidence-based decision aids have been developed and evaluated [15,16].

Data that were collected as part of the development of the evidence-based decision aid for feminizing genital gender-affirming surgeries (www.genderaid.org/en) showed that the primary motivation for any of the surgical options generally was to be affirmed in one's gender and that what was considered as gender-affirming differed per person and might crystallize over time (author's unpublished data). In focus groups with experts by experience, participants identified eight key domains which they considered informative when choosing specific surgical options (or none) (Fig. 5.3):

- **Fertility**: Will one be able to have children in a natural way, and does one have to consider preservation at this point?
- **Hormones**: Will endogenous hormone production be intact, and what kind of medication is required?
- **Preoperative preparations**: What lifestyle and preoperative counseling is required at this point (e.g., hair removal, pelvic floor therapy)?
- **Genital appearance**: What will the genital look and function like, and how will it likely be perceived by others?
- **Daily life**: What does the option mean for tucking, how one compares to cisgender anatomy and what surgical recovery will likely be?
- **Sexuality**: What will be the effect on sexual function and satisfaction?
- **Surgery**: What will be the intensity of the procedure, the time for physical recovery, the chances of complications, the options for reversal surgery, and current waiting lists?
- **Aftercare**: Is (lifelong) dilation or vaginal douching required?

Likely one's surgical preferences will not naturally align with all preferred outcomes. For example, a wish for vaginal depth can go along with a wish for quick recovery and low risks.

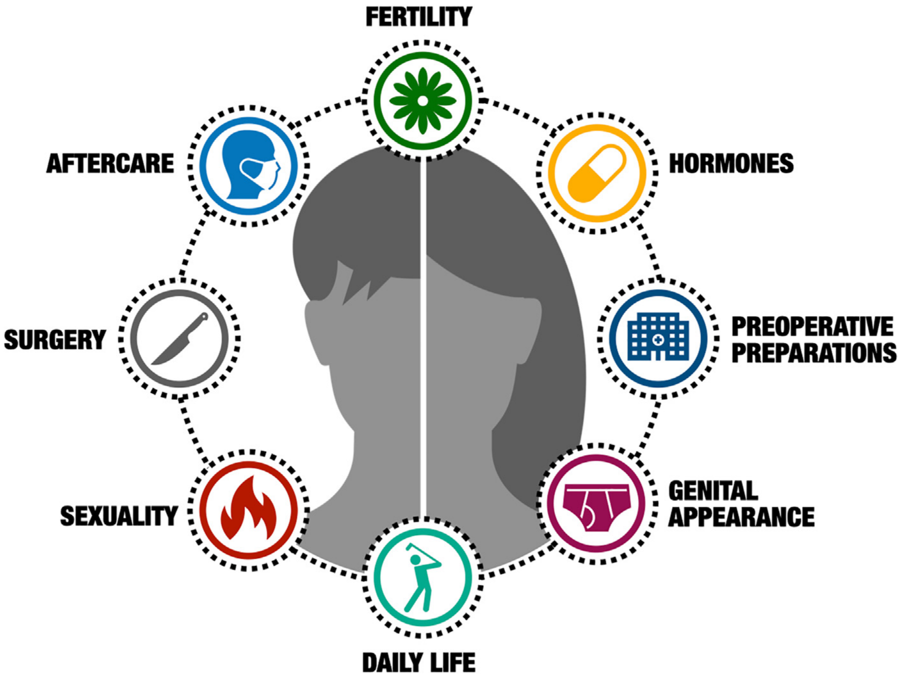
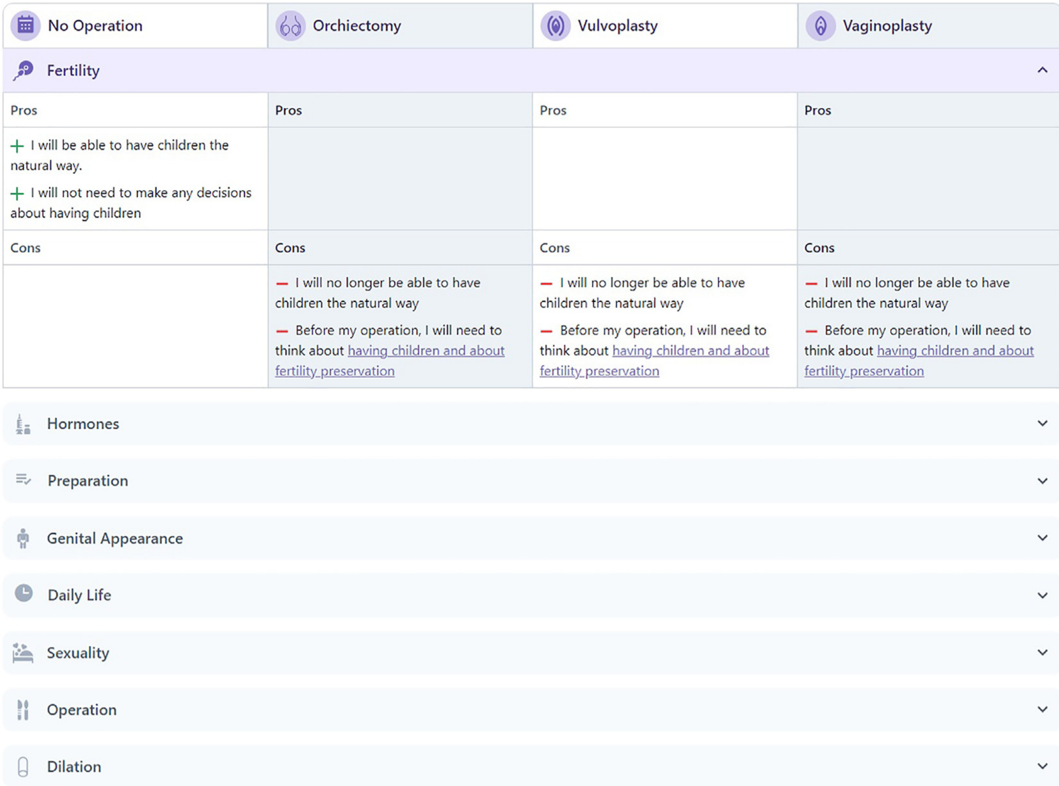


FIGURE 5.3 Central areas of informed consent during shared decision-making around feminizing genital gender-affirming surgeries.

However, care-seekers should be informed how treatment options will generally be associated with both wanted and unwanted outcomes. As a result, TGD individuals will need to make a well-informed trade-off between anticipated gains and risks in different areas of life. This requires not only information from multiple disciplines, but also an integrative approach to how to come to this decision. Decision aids such as the GenderAid can support TGD individuals in getting full and unbiased information across the different treatment options, as well as the opportunity to systematically weigh the risks and gains, altogether to support a decision closest to one's personal values (Fig. 5.4). Such a decision aid was found to contribute to the improvement of experienced "shared decision-making" and reduction of decision uncertainty (author's unpublished data). This systematic approach can support not only patients but also different professional disciplines in obtaining the relevant information of the other discipline. Also, providing orderly information prior to a consultation can make the patient–provider contact more efficient as they can focus on elucidating remaining questions and synthesizing the information into a final decision. Close collaboration and even shared consultations between surgeons and mental health professionals can improve this process. It remains an area of development on how different disciplines work best, being supported by decision aids, to come to optimal surgical decision-making.



No Operation	Orchiectomy	Vulvoplasty	Vaginoplasty
Fertility			
Pros	Pros	Pros	Pros
+ I will be able to have children the natural way. + I will not need to make any decisions about having children			
Cons	Cons	Cons	Cons
	— I will no longer be able to have children the natural way — Before my operation, I will need to think about having children and about fertility preservation	— I will no longer be able to have children the natural way — Before my operation, I will need to think about having children and about fertility preservation	— I will no longer be able to have children the natural way — Before my operation, I will need to think about having children and about fertility preservation

FIGURE 5.4 Example of structured information provision to systematically compare surgical options in a decision aid. *Retrieved from https://genderaid.org/en/ on January 16th, 2024.*

Psychological care prior to surgery and during clinical admission

The psychological care prior to feminizing gender-affirming genital surgery can include a range of activities. Most in line with the decision-making process is the care directed at "managing" preoperative expectations. The surgical information often tends to emphasize the direct surgical outcomes, particularly regarding the direct postoperative period of recovery and development of (feminine) genital functioning and appearance. This includes information on complications and other unwanted (side) effects. In practice, it is far more difficult for individuals to emphasize what the larger implications would be in case of an unwanted outcome. Mental health counseling can assist individuals in creating an image of such an outcome, to make a well-informed decision. Also, (very) long-term implications of undergoing surgery and more general effects on life deserve attention. While unrealistic expectations are not necessarily a contraindication for undergoing surgery, they are often associated with disappointing outcomes [17,18]. High expectations of positive outcomes and minimizing possible negative outcomes increase the chance of feelings of regret [19]. Unrealistic expectations can pertain to stereotypical binary notions of female appearance, but also to the large effect surgeries are thought to have on areas where little effect can be expected (e.g., work, finances, or housing). Mental health providers can help signaling such expectations and help individuals in developing a more nuanced view of the effects of surgery. Also, nonsurgical support can be introduced at this point.

In the light of unrealistic expectations of surgery, mental health professionals can also support in diagnosing and supporting coexisting associated mental health problems. Recognizing the gender minority stress and resilience model [20], stereotypical or unrealistic treatment expectations can be associated with minority stressors such as internalized transphobia (e.g., surgery motivated by the wish to erase shame or self-rejection about being TGD) and/or with identity concealment (e.g., surgery motivated by the wish to completely nondisclose any aspect of ones TGD identity). Such factors are associated with (persisting) stress and poorer mental health, and deserve adequate mental health support [21]. Other mental health conditions that should be considered in the light of exploring expectations include the presence of a body dysmorphic disorder (BDD), eating disorder, or ASD. When suspecting any of these conditions, a specialized mental health assessment is generally required. The existence of BDD does not have to exclude a TGD identity, and people can benefit from undergoing gender-affirming surgery. When distinguishing BDD, one can explore the degree of physical appearance distress and to which degree it expands beyond gendered body parts. Also, assessment of obsessive behavior of such nongendered physique should be addressed, such as excessive mirror-checking, seeking reassurance, ruminating, or comparing to others. In case of eating disorders, similar directives apply: surgical treatments can be beneficial, but adequate mental health support for coexisting problems is advised. Lastly, unrealistic expectations can also be observed in individuals with ASD. ASD has been associated with cognitive issues possibly related to surgical decision-making ability and anticipating postoperative expectations [12]. A tailored approach should therefore take into account the information processing speed, possible inflexibilities in beliefs, and/or difficulties with emphasizing possible future/alternative needs.

Regarding the uncertainty of how the operative and postoperative period will take place, psychological support can focus on strengthening "transdiagnostic" skills, such as problem-solving coping skills, as well as supporting emotional regulation. Adaptive coping can help mitigate the negative effects of adverse events and mental health challenges during surgical recovery [22,23]. Psychological care can support individuals in preparing for scenarios, support in help-seeking and alternative-seeking, and learning to apply cognitive strategies such as logic analyses (e.g., listing alternatives) or positive reappraisal (e.g., challenging catastrophic thoughts). Such preparations can be done on an individual level, but can also include community members (e.g., peer support, group therapy) or include family members, friends, or partner(s).

Although being strongly desired and having low chances of regret, going through feminizing gender-affirming surgery is generally an intensive process. This frequently has an emotional effect on individuals, accompanied by mixed feelings of euphoria and happiness, but also anxiety, hopelessness, or sadness/grief. Preoperative support can prepare individuals with emotional regulation through practicing skills such as mindfulness, sharing emotions with relevant others, journaling, maintaining a good energy balance, etc. In case of an anticipated risk of emotional crisis, a signaling plan can be developed with the individual and close others. Such a plan can help everyone around the person to recognize signals of emotional crisis and act adequately. For the individual involved, it usually grants an overview and sense of safety/agency.

Mental health professionals often do not have a leading role during surgical admission. Much of the work has been done preoperatively, yet in many multidisciplinary services, mental health providers will be on call in case of emergency during admission. Mental health providers can respond to mental health crises, such as severe emotional problems or suicidality, inadequate collaboration between the care seeker and care team, or cognitive/behavioral problems that hinder adequate recovery (e.g., problems with dilating or other self-care issues). The mental health provider can act upon the signaling plan, perform in-clinic gender-affirming mental health treatment or counseling, and actively reach out to psychosocial healthcare providers outside the clinical facility. Lastly, mental health providers can serve a role in educating team members about the mental health problems at play, signal countertransference, and/or support team members with relevant training resources.

Psychological care during recovery

Past research has shown that many TGD individuals state that the levels of psychological care in the different stages of medical gender transition do not match their needs [24]. Specifically, preoperative care is often experienced as redundant with unwanted gate-keeping, while many express a lack of aftercare. Specifically after genital surgery, and in those with mental health issues, psychological aftercare is wished for. This lack of attention to aftercare is reflected in both the dominant treatment protocols and body of scientific literature. Mental health professionals can be helpful in formulating such an aftercare plan (Fig. 5.5). A plan can focus on areas such as follows:

- **Coping with physical rehabilitation**: Along with surgeons, individuals can be supported in what to expect at each stage of recovery and when to reach out in case of complications. Uncertainty around "normal" recovery can be stressful and increase emotional problems. Also, informing about the range of "normal" outcomes can provide understanding (e.g., of genital appearance, vaginal length). An educational genital exam by a medical provider (and if required) in the presence of a mental health provider can help in supporting genital body image (e.g., mirror exposure) or in preventing anxiety to dilate.
- **Embodiment of the altered body**: After completing feminizing genital gender-affirming surgery, individuals will have to deal with both a long period of having lived with a body that triggered dysphoria, and with a surgically constructed genital. It may be difficult to feel the body and experience this as oneself. Psychological care can be one of the disciplines involved in supporting this process. Possible interventions include directing the attention again to sensory information (i.e., introception), visualizing exercises, as well as working on a cognitive model of oneself. Other relevant disciplines include pelvic floor or nonverbal therapists (e.g., movement or drama therapy).
- **Intimacy and sexual rehabilitation:** A special area of postoperative recovery includes sexual rehabilitation. Mental health professionals, and especially sex therapists, can support in teaching to relax the pelvic floor muscles, as well as seeking erotic stimuli, and feeling signs of arousal. Given the low levels of testosterone, changes in genital

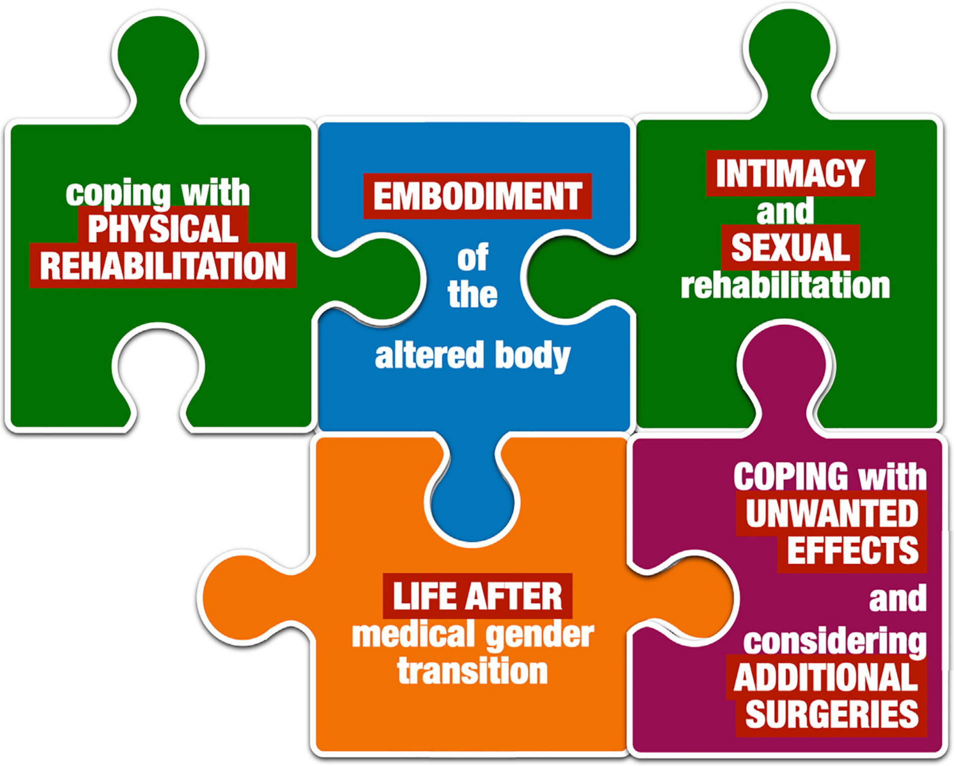


FIGURE 5.5 Areas to cover in psychological care as part of a recovery plan after gender-affirming surgery.

anatomy, and possible little preoperative sexual activity, adequate knowledge of sexual stimulation is important for physiological sexual response. Noticeably, recent data also showed that it was mostly the gender-affirming aspect of sexuality that supported sexual satisfaction in feminine TGD individuals, despite a challenged sexual function [17,18]. Sex education, masturbation exercises, and couple therapy are among the possible interventions to support postoperative sexual rehabilitation.

- **Coping with unwanted effects and considering additional surgeries**: Despite being well-informed, coping with the unwanted effects of surgery can be challenging [24]. While such outcomes generally do not result in regret or wish to detransition, they can significantly reduce the (health-related) quality of life of people. Individuals may require support in coping with disappointment or disability, and may have to adjust their lives. Aside from practical support, mental health professionals can be involved in processing emotions such as anger, grief, or sadness. General psychotherapeutic strategies such as cognitive–behavioral therapy or acceptance and commitment therapy can often be applied in such treatments. Lastly, providers can support individuals in making informed decisions on additional (repair) surgeries.
- **Living after medical gender transition**: TGD individuals often describe similar experiences when finalizing medical gender transition. These experiences are generally

relief, happiness and self-esteem, but can include feelings of exhaustion after many years of waiting, uncertainty, and dysphoria, but also effects of traumatic experiences along the way. Others describe finally being able to reflect on the trajectory, losses, and how to make meaning. While many receive community support, or help from close others, some may experience (relapse in) mental health symptoms, such as trauma or depression. People may have to deal with the notion that they reached the end of the medical options for physical transition, and they may need to accept that there are no medical treatments available to support their mental health. Providers can be of help with exploring nonmedical options to support these individuals.

Future directives

In this chapter, we have outlined how mental health care involvement is pivotal in all stages of feminizing genital gender-affirming surgery, ranging from the first consultation, decision-making, preoperative preparation, to postoperative care. Adequate collaboration between surgical and mental health providers helps optimize the preoperative process and maximize the postoperative benefits. Regardless of the model of care, good cooperative skills and proactive sharing of information between professions are key in providing gender-affirming surgical care. After all, surgical care is being provided to support psychosocial improvements in life.

The field of transgender medicine, as well as the societal attitudes toward TGD individuals, has rapidly changed over the past decades and will likely be subject to change. Though the societal perceptions on and hostility toward TGD individuals differ per geographical region, transgender medicine keeps developing including more methodologically sound outcome research, development of patient-reported outcome measures, and an increasing use of aids such as decision tools, artificial intelligence, and big data sets. TGD individuals and healthcare providers will have to keep navigating this changing field.

Two areas in development to highlight considering surgical–mental health collaboration include (i) the increasing share of nonbinary identifying TGD individuals and/or of individuals with nonbinary surgical requests (i.e., surgeries aiming for a nonbinary physical outcome), and (ii) the development of appropriate services for those expressing regret and/or a wish for detransition (or retransition) after feminizing genital gender-affirming surgery. For both areas, there is a dearth of scientific literature, nor formalized specialized healthcare services. Scientific research should inform to which degree "generic" gender-affirming practices can be applied to these groups, if/how these should be adapted, and what surgical and psychological skills are required to provide this care [25]. One can expect that in these subgroups of care-seekers, adequate collaboration between surgeons and mental health providers will be of great importance as well.

Acknowledgments

Dr. van de Grift received funding from ZonMw as part of the project "Supporting positive mental health and adaptation after transgender medical transition—new perspectives on care and research" (project ID: 636320015). No (financial) conflicts of interests apply.

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CHAPTER

6

Patient preparation for gender-affirming vaginoplasty

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Introduction

In this chapter, we describe patient preparation for gender-affirming vaginoplasty (GAV) according to a review of the literature and current standards of care (SOC) provided by the World Professional Association for Transgender Care (WPATH) [1].

The current literature fails to provide a comprehensive review of this topic. In fact, searches of PubMed using keywords, such as "preparation," "surgery," "gender affirming," and "vaginoplasty," yielded only 27 results (most recent search date: November 6, 2023). Of these, only one study performed at the Mount Sinai Health System [2] compared preoperative patient-selection criteria with those offered by seventh version of the WPATH SOC. However, these findings are no longer relevant given the release of eighth version of the WPATH SOC (SOC-8).

Notably, the WPATH SOC demonstrates a limited capacity to guide on preparation to surgery. In fact, neither the existing literature nor WPATH SOC presents in-depth information on preoperative consultation(s), group and psychological counseling, informative material, physical and instrument-directed anatomical examinations, epilation, or therapy suspension. Thus, we present the methods currently employed for routine preparation for surgery based on the best available evidence and our experience.

WPATH SOC

WPATH SOC-8 [1] provides healthcare professionals with clinical guidance to assess possible avenues available to assist persons presenting with gender incongruence and gender dysphoria. This includes pathways that optimize the overall health and well-being of the patient in an effort to help them achieve self-fulfillment.

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https://doi.org/10.1016/B978-0-443-21776-0.00006-6

The SOC-8 is based on the best available science and expert professional consensus related to topics in transgender health. Recommendations were developed from independent systematic literature reviews and, when these were unavailable, background reviews, and expert opinions. Chapter 2 in this book specifically discusses SOC-8 guidelines relevant to GAV. In this section, we highlight SOC-8 recommendations that focus on preparing patients for GAV.

SOC-8 establishes general criteria for gender-affirming surgery and relevant to preparation for GAV. Appendix D (Summery Criteria for Surgery) describes the following patient criteria that should be met prior to undergoing GAV:

a. Gender incongruence is marked and sustained
b. Meets the diagnostic criteria of gender incongruence prior to gender affirming surgical intervention in regions where a diagnosis is necessary to access health care
c. [For adults] Demonstrates capacity to consent for a specific gender-affirming intervention
d. [For adolescents] Demonstrates the emotional and cognitive maturity required to provide informed consent/assent for the treatment
e. Understand the effect of gender-affirming surgical intervention on reproduction and they have explored reproductive options
f. Other possible causes of apparent gender incongruence have been identified and excluded
g. Mental health and physical condition that could negatively impact the outcome of gender-affirming surgical intervention have been assessed, with risks and benefits have been discussed
h. Stable with their gender-affirming hormonal treatment regime (which may include 6 months of hormone treatment [or at least 12 months for the adolescents], or a longer period if required to achieve the desired surgical results, unless hormone therapy is either not desired, or if this is medically contraindicated).

Criteria for adolescents differ slightly (as seen a point c.), with emphasis placed on two areas: (1) mental health status that could interfere with diagnostic accuracy and the capacity to consent to the procedure; and (2) understanding of information on the reproductive effects of surgery, potential loss of fertility, and options available for its preservation.

This chapter describes the methods used to prepare patients for GAV at the Department of Plastic Surgery, Sahlgrenska University Hospital. We particularly focus on preoperative psychological and social support, preoperative consultations, and preoperative instrumental examinations, epilation, and hormone suppression.

Preoperative psychological and social support

The role of the psychologist during surgery preparation

Managing patient expectations is key to the success of any given surgical intervention. The surgical team should be able to clearly describe the techniques being used, limits of the surgery, possible risks, the preparation required, and the postoperative recovery period. However, surgeons are not adequately trained to predict the emotional status and support patients before, during, and after surgery. Furthermore, surgeons are unable to assess patients' expectations, and more specifically, they are unable to predict patients' responses to either positive or negative surgical outcomes.

A previous study highlighted the role of mental health professionals in these settings [3]. For GAV, preoperative psychological counseling should explore the potential impact of GAV on patient mental health, alleviate stress, enhance social and peer support, strengthen patient body image, promote resilience, and support the surgeon–patient relationship. The requirement for psychological counseling represents a form of responsible care rather than negative discrimination.

At our institution, all patients are followed by a team of mental health professionals during the entire perioperative period. This allows a patient to terminate or postpone the surgery, as needed, or to get reassurance and confidence. This team includes social counselors and sexologists. Additionally, we have a multidisciplinary team that meets once a month to assess the status of each patient and address their respective path to care. A final assessment of each patient's psychological status is performed ~3 months prior to surgery.

Other forms of preoperative social support include group sessions with healthcare professionals, peer resources, community organizations, etc.

Since 2015, our institution has organized group support sessions led by previous patients [4] and with access to nurse specialists and social counselors. These groups usually comprise seven participants and last ~2.5 h, with attendance offered on at least five separate occasions prior to surgery. The first session starts with a joint discussion, with the agenda for subsequent sessions determined according to patient feedback. Frequent topics include aspects of hormone treatment, surgical procedures (preparation, techniques, and possible outcomes), legislation, issues related to family, and questions concerning reproduction. Each session is designed according to the expectations of both patients and healthcare professionals to maximize the usefulness of the information being provided. During the final session, participants evaluate the group format and the content to allow assessment of its value. Our findings demonstrate the utility of these sessions for preparing these patients for GAV, as well as for the postsurgical outcomes [4]. The goal is to decrease feelings of exclusion, prepare patients for future treatments, and offer a broader understanding of the health care system. This increases patient empowerment within their social and healthcare transition processes.

Preoperative consultations

First consultation

The current literature offers no insight into patient consultation prior to GAV. At our institution, initial preoperative consultation is structured in four parts: information provided by the surgeon; physical examination; addressing patient questions; final clarifications by the nurse specialist, and planning. Specifically, during the first consultation, surgeon and nurse are both conducting the first preoperative consultation, with the surgeon leading the informing phase as well as the physical examination phase, with the side presence of the specialist nurse; then, the nurse (alone) is leading the final clarifications and the planning phase.

Consultation setting. The patient is invited to sit on the side of the surgeon; in fact, side sitting, rather than sits separated by the board; in fact, care should be taken to remove any perceived barriers between patient and physician. This promotes a feeling of collaboration that puts the patient at ease, promotes the process of education and instruction on the procedure, and ultimately enhances the patient—physician relationship [5—7].

Informing

Following review of patient medical history and diagnostic confirmation of gender dysphoria, the surgeon describes the technique that will be performed and potential complications. Usually, the following parts of the procedure are generally described: cavity dissection between the prostate and rectum, invagination of the penile skin into the cavity, and preparation of the clitoris from the penile glans.

The following possible complications are thoroughly explained: rectovaginal fistula/damage to the rectum; venous thromboembolism (VTE) and lung embolism; bleeding/hematoma; infection; wound dehiscence; excessive scarring; urethra stenosis and urine leakage; problems with direction of the urinary flow.

Concerning surgical outcomes, the patient is informed that there is no guarantee of sensitivity to the clitoris, experiencing orgasm according to expectations, specific depth and breadth of the vagina according to patient request, or that vaginal and vulvar appearance will meet expectations [8].

It is also noted that there could be an absence of a cavity as expected by the patient (as, for example, following the inability to dilate following a rectovaginal fistula) through no fault of the surgeon. Failure in cavity formation does not necessarily suggest surgical malpractice. Ultimately, final cosmetic results depend on individual anatomy and the healing process, which preclude guarantees of a specific cosmetic outcome.

Concerning the perioperative period, patients are admitted to the hospital the evening before surgery, which will last ~3 h. Following surgery, the patient will be bedridden for 3 days before being allowed to walk. At 5 days postsurgery, the dressing will be removed, and instruction will be given on how to dilate the vagina. The dilation regimen is generally as follows: 1 h three times daily for 3 months, twice daily for the following 3 months, and then once daily for the following 6 months (followed by twice weekly in the absence of penetrative sex). The catheter will be removed on day 6, and patients are usually discharged on day 7 after surgery. In cases of urination problems, the catheter may need to be maintained for an additional 10 days.

Information concerning alternative surgical techniques to penile inversion are also provided, including vulvoplasty without a vaginal cavity, and bowel vaginoplasty. For those patients not planning to dilate the vagina, engage in penetration, or concerned about the risk of rectovaginal fistula, we suggest vulvoplasty without a vaginal cavity. At our institution, bowel vaginoplasty is reserved for secondary cases either following intra- or postoperative rectal damage/rectovaginal fistula, or at a later stage upon patient request for reoperation. In cases of rectovaginal fistula, the patient might require an abdominal stoma for 6—12 months, during which vaginal dilation would be impossible; in this case, patient might require a secondary vaginal reconstruction with a bowel segment.

Patients curious about primary vaginoplasty via the bowel or peritoneum are informed that there are no studies suggesting the superiority of these methods in terms of surgical outcomes or patient quality of life. Moreover, use of bowel of peritoneum segments adds additional risks (such as peritonitis, etc.) and is generally limited to research purposes in government-based hospitals, such as ours.

Throughout the entire information phase of the consultation, patients are periodically asked whether they understand what is being explained, whether they have got questions, and answers are immediately given.

Physical examination

In all cases and to ensure the safety of both the physician and patient, the physical examination of genitalia is conducted in the presence of a nurse. Indeed, some patients may be uncomfortable with the examination during the initial consultation, making it necessary to explain the mandatory nature of the procedure to allow proper planning for the surgery. For those not prepared for surgery, the physical examination can be postponed.

The physical examination is performed in a standing position to allow evaluation of the presence and location of testicles, preputial skin, penis length and girth, presence and location of pubic hair, and amount of fat in the genital area (see Table 6.1 for the explanation of the meaning of these structures).

Following physical examination, the surgical technique is discussed with the patient. This includes details, such as whether a scrotal skin flap or skin graft will be used and whether additional preparation is required in the form of epilation.

TABLE 6.1 Genital structures and their clinical significance.

Structure	Clinical significance
Testicles	These are palpated. In case of an undescended testicle, instrument examination is required to remove it from its location during the vaginoplasty procedure.
Preputial skin	The mobility of prepucial skin is evaluated for uncircumcised patients. If the prepucial skin is constricted, the patient is instructed to move the prepucial skin back and forth, and a cortisone cream may be prescribed. These cases should be followed periodically prior to surgery. For circumcised patients, use of either a skin graft or scrotal flap in addition to the penile skin flap for vaginal lining is considered.
Penis length and girth	Patients with a short, circumcised penis presenting small girth will need to use a skin graft or scrotal flap in addition to penile skin for the vaginal lining.
Hair	Prior to using any part of the penile body or scrotal flap for the vaginal lining, epilation should be considered to avoid future complications and the need for reoperation(s).
Fat tissue in the genital area	A large amount of fat in the genital area may cause the following: (1) increased difficulty in cavity creating during dissection; (2) a final bulky appearance to the labia majora. Although a body mass index (BMI) < 30 is recommended to reduce the risk of VTE/lung embolism, we suggest a BMI >26 for optimal cosmetic and surgical results. Furthermore, it is important to provide photographs of surgical results from patients with a similar BMI to that of the patient when discussing possible outcomes.

The nurse specialist then informs the patient of potential surgical results and answers questions. Specifically, the nurse repeats information provided by the surgeon and provides clarifications, as needed. Additionally, nurses are responsible for administrative details, including managing the schedule and waiting list for surgeries, ensuring certifications and other paperwork are complete, and maintaining consistent communication with patients. Final consultations with the nurse specialist are either in person or virtual and occur weeks after the first consultation with the surgeon. In some cases, it can be easier for the patient to ask questions to a nurse, who will follow the patient for the entire perioperative period. However, a minimum of two consultations with the surgeon(s) is required prior to GAV, with the second generally focusing on details requested by the patient.

Preadmission consultation with the nurse specialist

Preadmission consultation usually occurs 2–4 weeks prior to the scheduled surgery. At this time, the nurse does the following:

- Verifies patient information and completion of all paperwork
- Updates patient medical records
- Confirms that the patient understands the procedures and potential complications
- Evaluates any recent blood tests or radiological examinations (as requested)
- Coordinates medical information with the anesthesiologist
- Ensures that the patient understands how follow up will occur during the perioperative period, including information regarding dilation, wound care, and follow-up visits.

At hospital admission, the nurse specialist ensures the patient undergoes preoperative bowel preparation, and provides medications; whereas after surgery, nurse specialist will be responsible for the following:

- Maintaining overall perioperative care
- Removal of vaginal swabs and performing the first dilation
- Providing training on the pelvic floor muscles to ease dilation and prevent urinary retention
- Administering and managing medications to support the dilation regimen
- Managing catheterization and urinary function
- Ensuring proper wound healing
- Scheduling follow-up visits

Preoperative instrumental examinations

Magnetic resonance imaging

Although there is no evidence that preoperative MRI to the pelvic area improves the final outcomes of GAV, recent literature is trying to define its role [9]. In our practice, we use to perform a preoperative MRI to the pelvic area to accurately assess the size of the prostate, distance from the prostate to the rectum, and the (minimal) distance from the prostate apex to the perineal skin. This information might be useful for surgical planning, as well as advising patients on the likelihood of achieving a certain depth in the vaginal canal [9]. Further discussion on cavity dissection is presented in Chapters 9 through 13. For patients undergoing a zero-depth vaginoplasty, MRI is unnecessary.

Colonoscopy

A colonoscopy is recommended prior to bowel vaginoplasty to evaluate the presence of bowel diseases. This can affect surgical planning regarding the choice of a specific part of the colon required for creation of a vagina.

Epilation

Hairless mucosa tissue constitutes the superficial lining of the vaginal cavity in a cis woman; the areas around the urethral meatus and clitoris are also hairless. For GAV, tissue used to line the vagina and create the labia minora and clitoral hood may be either hair-bearing or hairless. Presence of hair inside the vagina could cause pain during dilation and sexual intercourse, and this could lead patients to request help with hair removal postoperatively. Similarly, presence of hair around the clitoris could be aesthetically unappealing, uncomfortable, and potentially cause infection.

Given that surgical techniques differ according to patient variability in terms of hair type and amount, as well as the tissue used for the vaginal lining and clitoris, preoperative epilation is frequently considered; in fact, postoperative epilation might requires several surgical sessions in general anesthesia; thus, preoperative epilation is recommended. Epilation may be required for the dorsal root of the penis (to eliminate hair around the clitoris/urethra or dorsal entrance of the vaginal cavity), the penis body and base, and scrotal area.

Some surgeons that avoid epilation suggest that skin grafts from the scrotal area can be epilated intraoperatively. Indeed, when the surgical plan involves using only skin grafts to line the vaginal cavity, the donor area for the skin graft does not require epilation. Additionally, it may be possible to trim hair follicles underneath the penile flap; however, there is no evidence of the success of such procedures. Moreover, it is possible that the hair follicles will be difficult to detect, thereby making their complete removal difficult or impossible. However, when large amounts of periglandular skin are used to create the clitoral hood, there should be no issue with residual hair.

When penile skin is used to line the vaginal cavity (partially or totally), thinning the penile skin flap to remove hair follicles might jeopardize tissue vascularization, thereby suggesting the importance of preoperative epilation of penile skin. Similarly, preoperative epilation should be required when using a scrotal flap (instead of a graft) to line the posterior vaginal wall, large amounts of periglandular skin for the vaginal lining, and skin from the base of the penis to create the clitoral hood.

At our institution, we frequently use penile skin to line the vaginal cavity and use skin grafts only for the deepest part of the vagina, when there is insufficient penile skin to line the dissected cavity. For the clitoris and clitoral hood, we use either hairless periglandular skin or hair-bearing skin from the base of the penis. In these cases, patient-specific plans for epilation are established at consultation based on the physical examination and surgical plan.

Laser versus electrolysis hair removal

There are limited studies comparing the effectiveness of laser or electrolysis for permanent epilation in the context of GAV. [10−12] recently compared laser hair removal with electrolysis epilation in patients preparing for GAV, concluding that for patients with dark genital hair, laser epilation should be recommended as first-line treatment. Additionally, a recent systematic review reported that the average percentage of long-term hair reduction following removal using three different lasers ranged from 30.0% to 73.6% (neodymium:yttrium−aluminum−garnet), 35.0%−84.2% (alexandrite), and 32.5%−69.2% (diode) [10]. For all three devices, the greatest long-term reduction was observed from trials targeting leg hair (1-year growth cycle) versus the lowest from targeting facial hair (6-month growth cycle). The authors concluded that greater long-term hair reduction was observed on body sites with longer hair-growth cycles, and that future trials should account for variations in these cycles across body sites to provide accurate long-term data on treatment outcomes [10].

Electrolysis has been performed since 1875 and can guarantee complete and permanent hair removal. However, proper techniques, including accurate needle insertion and appropriate intensities and duration, are required to avoid scarring [13]. Electrolysis epilation is more time-consuming relative to laser-specific methods, because electrolysis requires burning individual hairs. A specific disadvantage of electrolysis epilation of the penile/scrotal area is that the needle needs to enter the follicle to prevent pain and/or adversely affect the skin in this region. The possible need for a local anesthetic in these situations could be a complicating factor in the procedure. However, use of a laser can also damage the surrounding skin during hair removal, reinforcing the importance of preoperation planning to choose the appropriate procedure.

Because hair-growth cycles in the penile area last 2−4 months, electrolysis epilation is advised once every 1 or 2 months to increase the number of hairs to maximize the effectiveness of the procedure. Additionally, shaving 1−5 days before electrolysis greatly increases efficacy by ensuring that only hairs growing in the anagen phase are epilated [13].

In conclusion, both laser and electrolysis epilation are indicated for preparation of the genital area prior to GAV. Upon choosing the specific surgical technique and assessing the location and type of hair needing to be removed, the patient can be referred for either technique accordingly. Notably, because an inflammatory response occurs following laser and electrolysis epilation, a 3-week period is suggested between the final epilation session and GAV.

Suspension of hormone therapy

A recent systematic review and metaanalysis of the risk of VTE among patients assigned male at birth and using perioperative estrogen revealed that this therapy does not increase VTE risk in patients undergoing GAV [14]. As a result, we do not require patients to suspend hormone therapy prior to GAV and currently provide heparin (5000 UI/day) from the day prior to GAV until complete mobilization at days 6−7 postsurgery.

Conclusions

Patient preparation for GAV is key to achieving optimal results, including patient satisfaction and reduction of perioperative complications. Patient consultations with mental health practitioners and social workers, as well as health care professionals, are essential for patient selection and choice of surgical technique and timing. These processes ensure that the patient understands the benefits and potential complications of GAV. Approaching this process as a multidisciplinary team optimizes patient preparation to ensure the best possible outcomes.

Funding

No external funding was received or used to facilitate the performance of this study. The authors declare no conflicts of interest.

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CHAPTER

7

Relevant anatomy of penile inversion vaginoplasty

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Female genital anatomy review

The goal of gender-reaffirming surgery is to create an external genitalia that is consistent with the patient's desired gender. In the case of transgender women, it means the transformation of the penis, scrotum, and perineum into a labia, clitoris, and vagina (Fig. 7.1).

Crucial external anatomic landmarks and measurements are highlighted in this section. The clitoris on average is 1.5–2 cm in length and 1 cm in width but can vary in size depending on racial ethnicity and body habitus. A prospective cross-sectional study by [1] showed that among 657 women 15–84 years old in Switzerland, the average clitoris length is 6.89 mm (range 0.5–34 mm) and 4.62 mm (1–22 mm) wide, the labia majora at 75–80 mm in length, the labia minora at 30–50 mm in length, and 10–15 mm in width. Most dimensions are greatest in the middle decades of life and eventually decrease later on. They also showed that the distance from clitoris to urethra is 22.63 mm (range 3–65 mm) [1]. The female urethra begins at the internal urethral meatus at the bladder neck and opens in the vestibule of the vagina. These crucial clinical measurements can serve as a guide in the creation of the vulva for transgender patients while still taking into account the overall anatomy and habitus of each patient. Taking everything into consideration, we will deconstruct and describe male pelvic anatomy as it progresses toward the reconstruction of penile inversion vaginoplasty.

Pelvic anatomy

It is necessary to discuss first the pelvic anatomy to gain a better understanding and appreciation of this exciting yet very challenging topic. The perineum is the area between the vulva or scrotum and the anus. Pubic symphysis is the anatomic landmark anteriorly, ischiopubic

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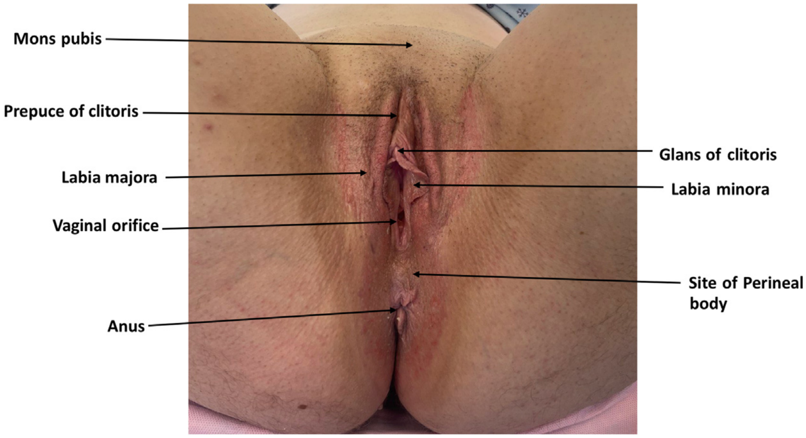


FIGURE 7.1 AFAB genitalia.

rami and sacrotuberous ligament laterally, and coccyx posteriorly. The perineum is divided into two crucial triangles namely **urogenital triangle**, which is located anteriorly, and **anal triangle**, which is located posteriorly. These two triangles are separated by a line running between the ischial tuberosities [2] (Fig. 7.2).

The urogenital triangle houses the external genitalia and distal extent of the urinary tract. Going from superficial to deep, the layers encountered are the following: skin, subcutaneous tissue, superficial layer of the perineal fascia, deep layer of perineal fascia, perineal membrane, and pelvic muscular wall (Figs. 7.3 and 7.4).

Pelvic floor muscles in AMAB person form a dome-shaped structure. The superficial layer consists of the bulbospongiosus, ischiocavernosus, superficial, and deep transverse perineal muscles. The deep layer is comprised of the levator ani, coccygeus, and along with endopelvic fascia constitute the pelvic diaphragm. The levator ani consists of three

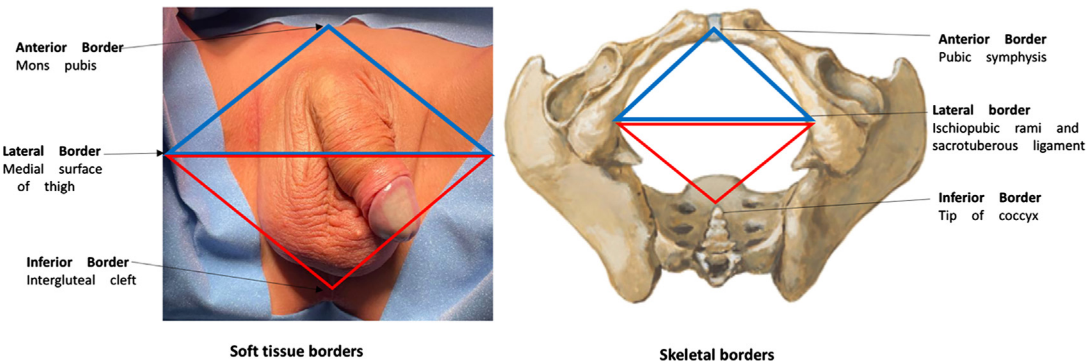


FIGURE 7.2 Perineal triangles and borders. *(a) External genitalia in AMAB person. (b) F.H. Netter, Atlas of Human Anatomy, fifth ed., Saunders Elsevier, 2011.*

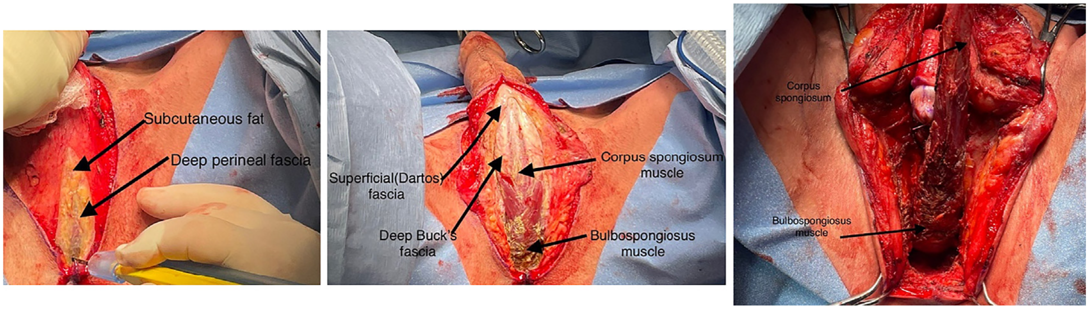


FIGURE 7.3 Soft tissue anatomy in AMAB person.

muscles, namely, puborectalis, pubococcygeous, and iliococcygeous (Fig. 7.4) [3,4]. The next photo shows an actual photograph of the levator ani muscles before and after dissection (Fig. 7.5).

The pelvic floor has parasympathetic, sympathetic, and somatic nerve supply. Originating from the ventral branches of S2–S4 of the sacral plexus, the pudendal nerve makes its way between the piriformis and coccygeal muscle as it passes through the greater sciatic foramen,

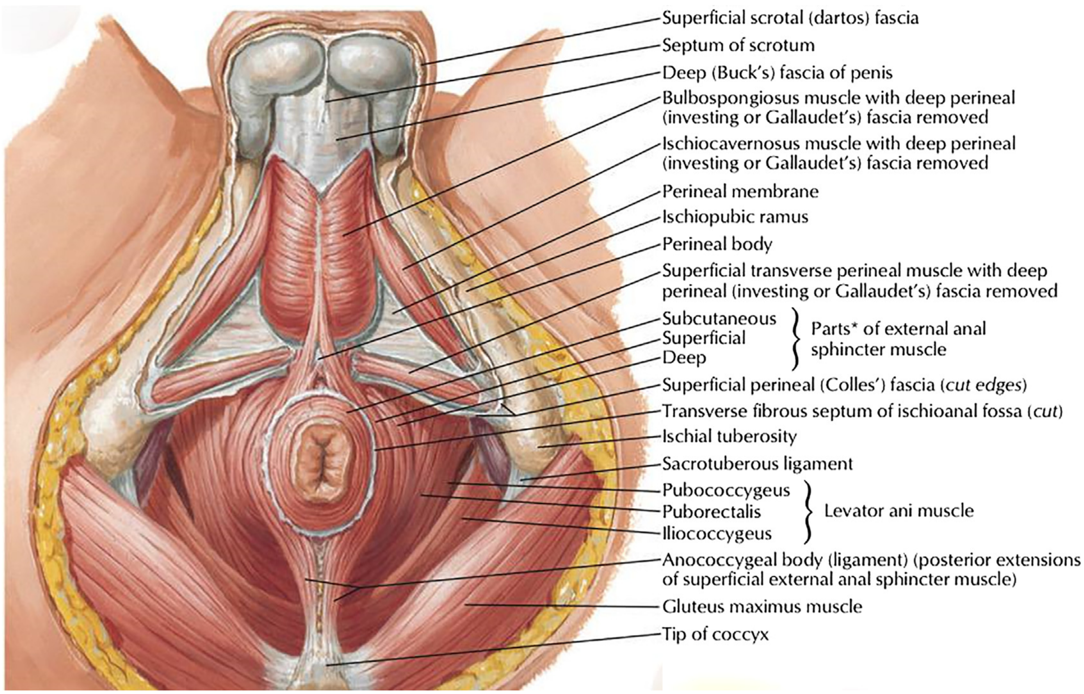


FIGURE 7.4 Muscles of the pelvic floor in AMAB person. *F.H. Netter, Atlas of Human Anatomy, fifth ed., Saunders Elsevier, 2011.*

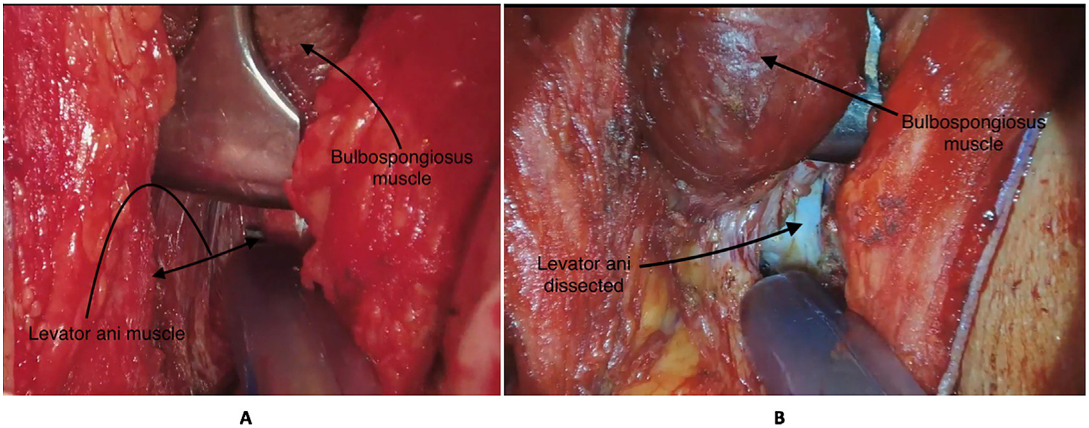
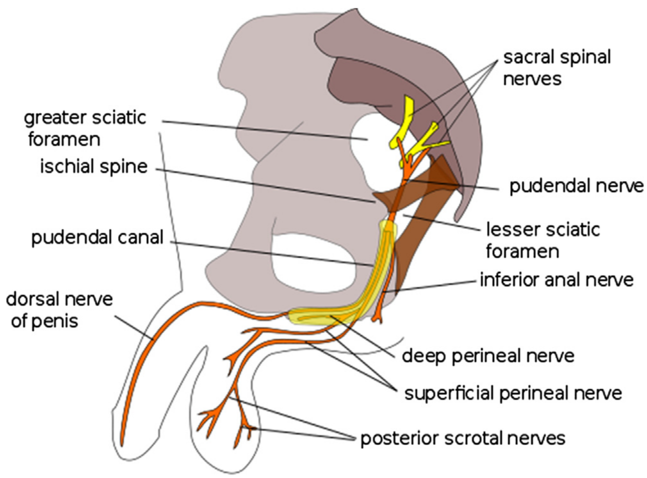


FIGURE 7.5 Levator ani muscle. (a) Prior to dissection. (b) After dissection.

ischium spine, and back to the pelvis through the lesser sciatic foramen. The terminal branches of the pudendal nerve comprise the inferior rectal nerve, perineal nerve, and dorsal nerve of the penis. The pudendal nerve is involved in external genital sensation, bowel and bladder continence, ejaculation, and orgasm. It innervates the penis, the bulbospongiosus and ischiocavernosus muscles, the perineum, the anus, the external anal sphincter, and the urethral sphincter [3] (Fig. 7.6). The muscles of the levator ani are believed to have direct innervation from sacral nerve roots S3–S5 [4].

FIGURE 7.6 Nerve supply in the male pelvic floor.



Penile anatomy

External genitalia in an AMAB person consists of the penile shaft or body, glans penis, and scrotum, which are utilized to create part of the labia majora and minora, neoclitoris, and vaginal wall (Fig. 7.7).

The structures of the penis from outer to inner most layers are as follows: skin, superficial dorsal vein, lateral superficial vein, superficial Dartos fascia, Buck's fascia (deep), deep dorsal vein, dorsal artery and nerve, corpus cavernosum and its tunica albuginea, deep penile artery, and corpus spongiosum. The dorsal neurovascular bundle provides nerve and blood supply to the glans. It is important to note that during penile disassembly, dissection continues between Dartos and Buck's fascia, which is a relatively avascular plane (Figs. 7.8 and 7.9a). During the neurovascular bundle dissection from the remaining corporal tissue, it is crucial to dissect on the underside of the dorsal tunica albuginea to prevent injury to the sensory and blood supply [5] (Fig. 7.9).

The penis receives its blood supply from the internal pudendal artery branching out to become the dorsal artery, cavernous artery or deep penile artery, and bulbourethral artery. The dorsal artery, which lies in between the deep Buck's fascia and the tunica albuginea, provides supply to the glans, which can then be converted to neoclitoris. The deep penile artery courses through and supplies the corpus cavernosum (Fig. 7.10). The pair of cavernous artery or deep artery is ligated during penile amputation (Fig. 7.8). The bulbourethral artery supplies the corpus spongiosum and the urethra. It is worth noting that the urethra has a dual blood supply coming from the bulbar artery proximally and dorsal artery distally [6]. During urethral flap reconstruction, spongy tissue is resected and some branches of the bulbourethral artery may be encountered and suture ligated. The glans penis normally drains via the superficial dorsal vein, which eventually drains to the saphenous vein. The spongiosum is drained by the urethral and circumflex veins that join with the deep dorsal vein. Deep dorsal veins and circumflex veins drain the mid- and distal cavernosa.

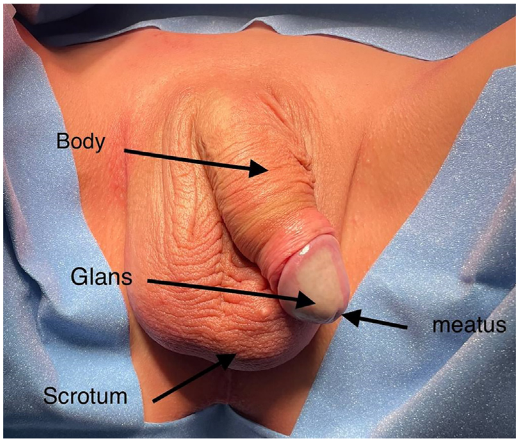


FIGURE 7.7 External anatomy in AMAB person.

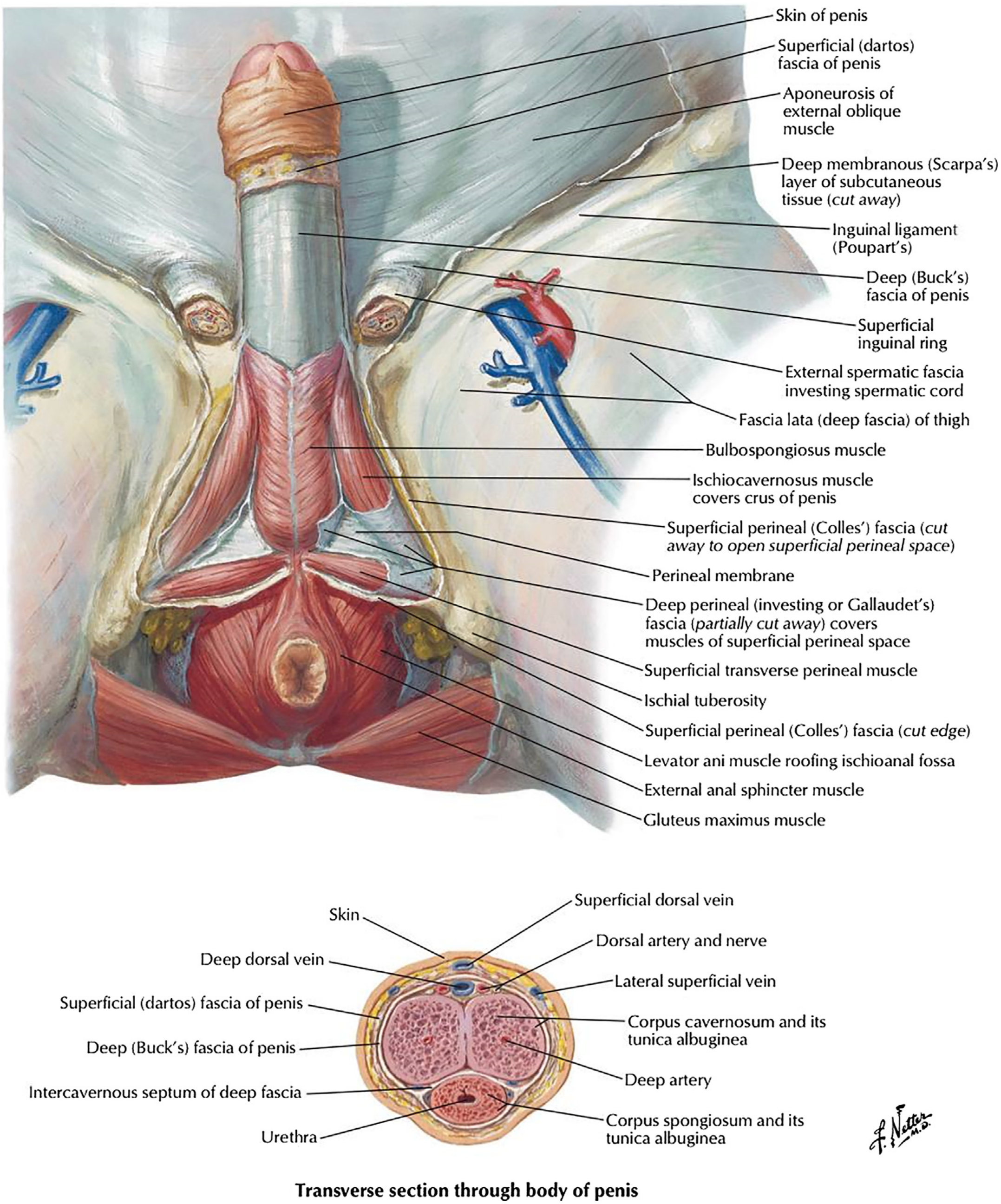


FIGURE 7.8 Penile anatomy superficial to deep layers *F.H. Netter, Atlas of Human Anatomy, fifth ed., Saunders Elsevier, 2011.*

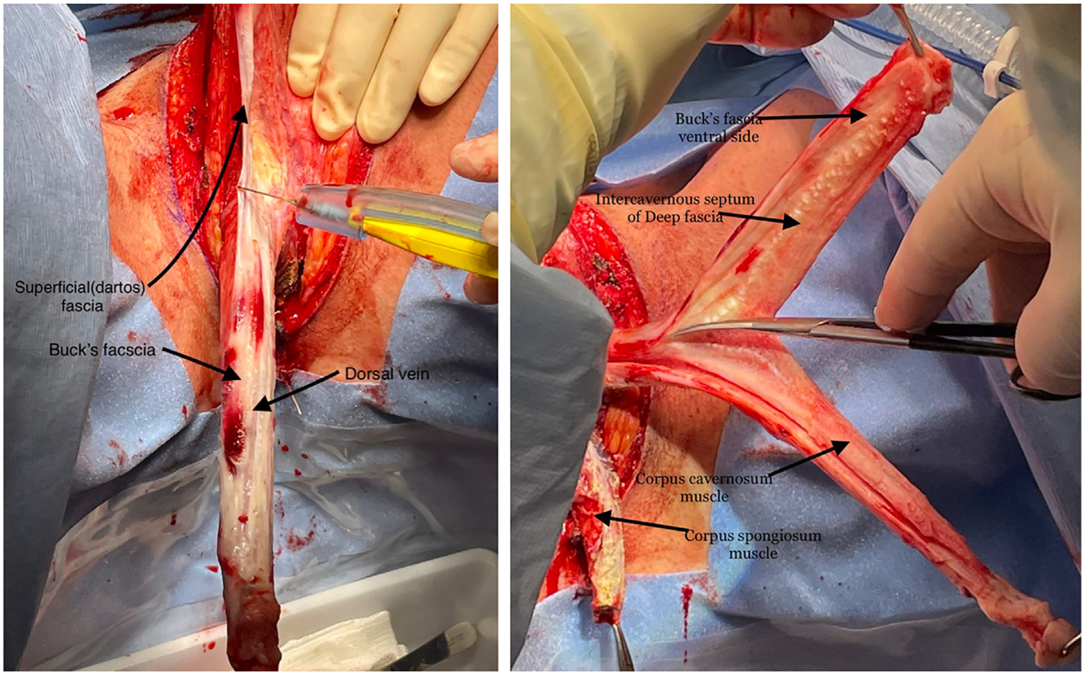


FIGURE 7.9 Penile flap dissection. (a) Dissection between Buck's and superficial Dartos fascia. (b) Dissection of the neurovascular bundle away from corpus cavernosum.

The skin of the penis overlies the Buck's fascia and is contiguous with the prepuce. The penile skin flap has collateral arterial supply to the skin and subcutaneous tissue providing cutaneous flow. The superficial and deep external pudendal arteries primarily supply this area with collateralization across the midline. It is believed that superficial vessels from the groin and perineum, which originates from internal and deep pudendal arteries, also provide supply to the region. During the penile skin flap elevation, when the Dartos fascia is mobilized, the subdermal plexus is able to sustain the skin [7]. Giraldo et al. showed that the abdominally pedicled penile skin flap has robust vascular properties and regarded as the most commonly used flap for male to female gender-affirming surgery [6].

Scrotal anatomy

The structures of the scrotum from the outer to innermost layer include the skin, thin layer of subcutaneous tissue (inferior portion), superficial dartos fascia, external spermatic fascia, cremaster muscle and fascia, internal spermatic fascia, parietal layer of tunica vaginalis, visceral layer of tunica vaginalis, and tunica albuginea. The scrotum houses the testis,

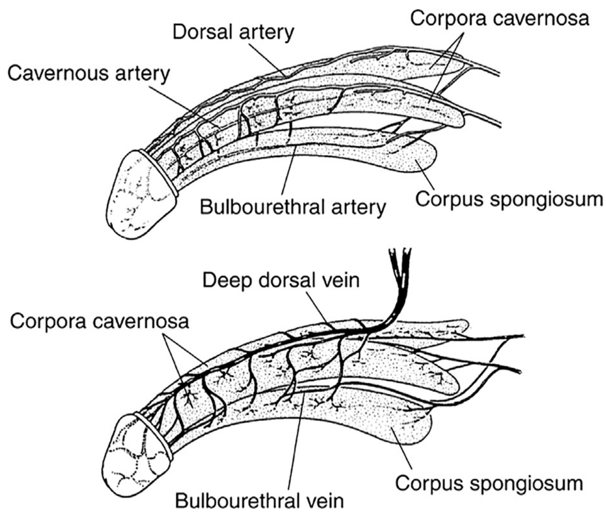


FIGURE 7.10 Blood supply of the penis. *Adapted from National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health.*

epidymis, and spermatic cord. For brevity, we limit the discussion only for relevant scrotal anatomy (Fig. 7.11).

The scrotum is well vascularized receiving its blood supply from both the internal and external iliac arteries and has robust interconnected anastomoses. The anterior part of the scrotum is supplied by the anterior scrotal artery, which is a branch of the external pudendal artery from the external iliac artery. The posterior aspect of the scrotum is supplied by the posterior scrotal artery arising from the internal pudendal artery, which comes from the internal iliac artery. The main source of blood supply to the testis is via the testicular artery, which arises directly from the aorta. The deferential artery from the internal iliac artery supplies the vas deferens. Testicular and deferential arteries are ligated during orchiectomy [8].

The scrotum is drained by the superficial and deep venous network. Superficial network drains the scrotum, and these veins tend to follow the arteries. The anterior scrotum drains into the great saphenous vein through the external pudendal branches while the posterior

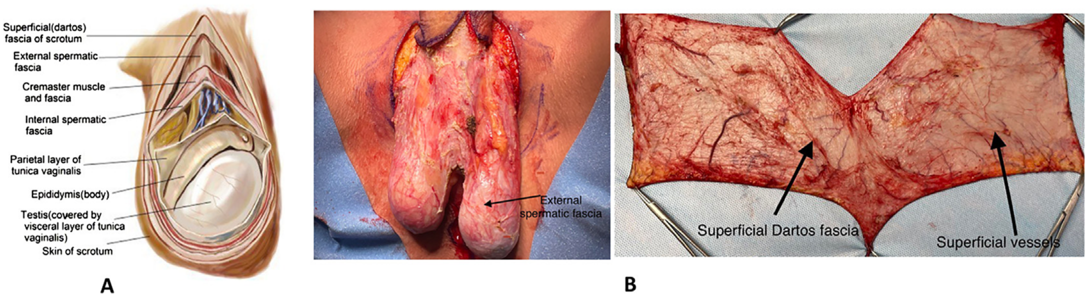


FIGURE 7.11 Scrotum anatomy. (a) Layers of the scrotum. (b) Male scrotal skin dissection. *Adapted from (a) Liu A. 2018. Layers of the Scrotum and Spermatic cord December 07, 2024.*

scrotum drains via the internal iliac vein through the internal pudendal branches. L1-L2 and S2-S4 nerve roots through the iliohypogastric, ilioinguinal, genitofemoral, and pudendal nerves provide somatic supply to the testis and scrotum. The ilioinguinal nerve innervates the upper anterior scrotum. The genital branch of the genitofemoral nerve supplies the upper two-thirds of scrotum, while the femoral branch of the genitofemoral nerve innervates the cremaster muscle and tunica vaginalis. The posterior aspect of the scrotum is innervated by the scrotal branch of perineal nerve and perineal branch of posterior femoral cutaneous nerve [2,8,9].

Anal triangle

The anal triangle houses the external anal sphincter, rectum, ischiorectal fossae, and anal aperture. The pudendal nerve from the S2-S4 ventral rami is the primary innervation of the perineum. It tends to travel with the internal pudendal artery, which is the dominant blood supply of the perineum. The internal pudendal artery arises from the pudendal artery, which is a branch of the internal iliac artery in the majority of the population [2]. For simplicity, we will focus the discussion on the perineal body and rectum.

Perineal body anatomy

The perineal body is a crucial structure that spans the anal and urogenital triangle. It is characterized as an irregular fibromuscular mass at the center of the perineum. This area is composed of skeletal muscle, smooth muscle, elastin, and dense collagen fibers. It serves as an attachment point of the pelvic floor muscles and perineum. The pelvic floor component of the levator ani, bulbospongiosus, transverse perineal muscles (superficial and deep), and both the external urethral, and anal sphincters have attachment and insertions to it (Fig. 7.12).

Rectal anatomy

It is important to include rectal anatomy in the discussion because it is the area associated most at risk during surgery. Rectovaginal fistula (RVF) is one of the most challenging complications to manage for surgeons worldwide. In addition, patients with RVF have been shown to be prone to developing depression and anxiety. Rectovaginal fistula is defined as an abnormal communication between epithelialized surfaces such as rectum and vagina. It is therefore pragmatic to master the anatomy of the rectum and its adjacent structures.

The rectum and anal canal constitute the last portion of the large intestine. Before we proceed to its location, the rectal layers from outside to inside consist of the following: serosa, muscle layers, submucosa, and mucosa. Its location begins at the level of the sacral promontory and extends approximately 12–18 cm distally. The peritoneum covers the upper two-thirds of the rectum anteriorly and one-third laterally. The peritoneal reflection is variable, and it is located approximately 6–8 cm from the anal verge [10]. It is important to note

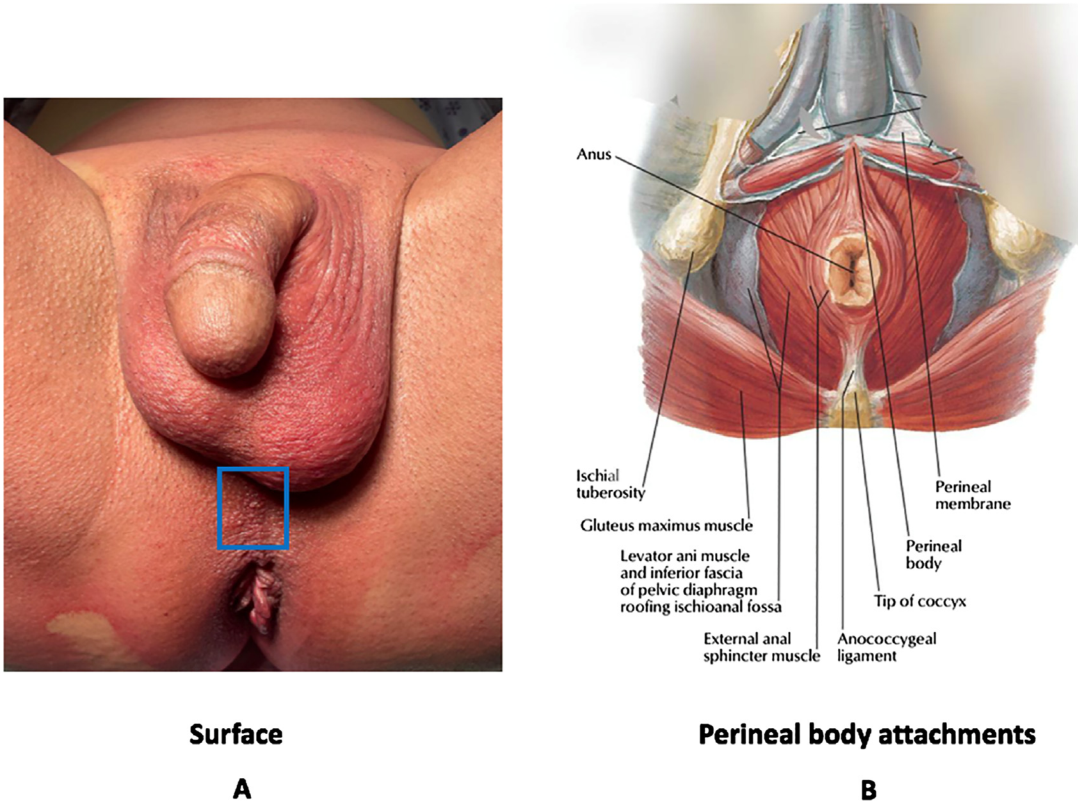
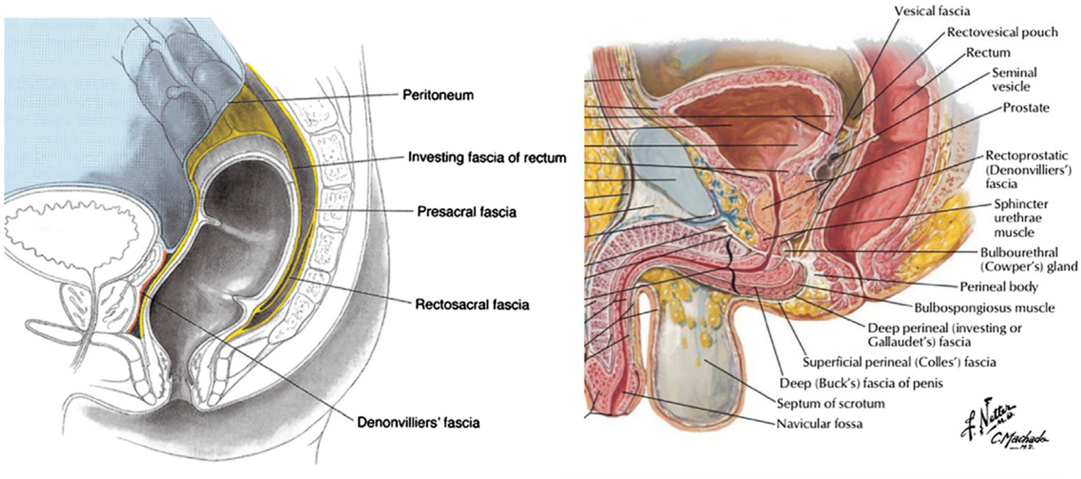


FIGURE 7.12 Perineal body at surface and its muscular attachments. *(a) Perineal body in AMAB person. (b) F.H. Netter, Atlas of Human Anatomy, fifth ed., Saunders Elsevier, 2011.*

that the distal one-third of the rectum has no peritoneal covering. The Denonvilliers' fascia, also known as the retroprostatic fascia or endopelvic fascia, envelopes this aspect of the rectum (Fig. 7.13a and b). Viewed from a sagittal plane, Denonvilliers fascia is a monolayered structure and, along with the peritoneum, comprises the peritoneal reflection creating a Y-shape appearance. It originates from the peritoneal reflection extending caudally between the seminal vesicles, prostate, and rectum [11]. During the cavity development, a generous amount of lido-epinephrine tumescent solution should be administered at the base and lateral aspect of the bulbospongiosus muscle targeting the projected area of the neocavity. It is important to dissect the base of the bulbospongiosus muscle wherein the Cowper's gland is often encountered. The identification of this gland is important because immediately posterior to it is the wall of the prostate gland. After developing a plane below the prostate fascia, the plane of dissection continues above the Denonvilliers fascia and below the prostate capsule. The dissection proceeds parallel to the direction of the rectum. Denonvilliers fascia appears as a membranous whitish reflection, while the bulbospongiosus muscle is retracted using a right angled retractor as shown in the photo (Fig. 7.14).



A B

FIGURE 7.13 Rectal anatomy. *(a)* Adapted from Gordon PH, Nivatvongs S. Principles and *practice of surgery for the colon, rectum, and anus. third ed. Informa Healthcare; 2024 (b) F.H. Netter, Atlas of Human Anatomy, fifth ed., Saunders Elsevier, 2011.*

Neurovascular supply

The superior rectal artery from the inferior mesenteric artery supplies the rectum and the upper third of the anal canal. The distal rectum is supplied by middle rectal arteries, which originates from the internal iliac arteries. The inferior rectal arteries from the internal pudendal artery, which also originates from the internal iliac arteries, supply the sphincter muscles. Rich collateralization exists between the superior and inferior rectal arteries situated at the dentate line in the submucosa. This explains the low incidence of rectal ischemia. Majority of blood from the rectum drains into the superior hemorrhoidal vein, which eventually drains into the portal system via the inferior mesenteric vein. The most distal portion of the rectum drains straight into the internal iliac veins via middle rectal veins and inferior rectal veins

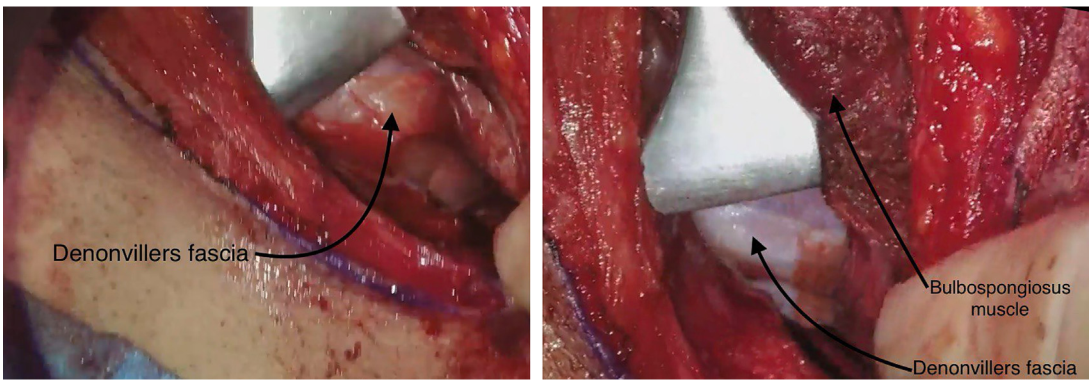


FIGURE 7.14 Denonvillers' fascia during cavity dissection.

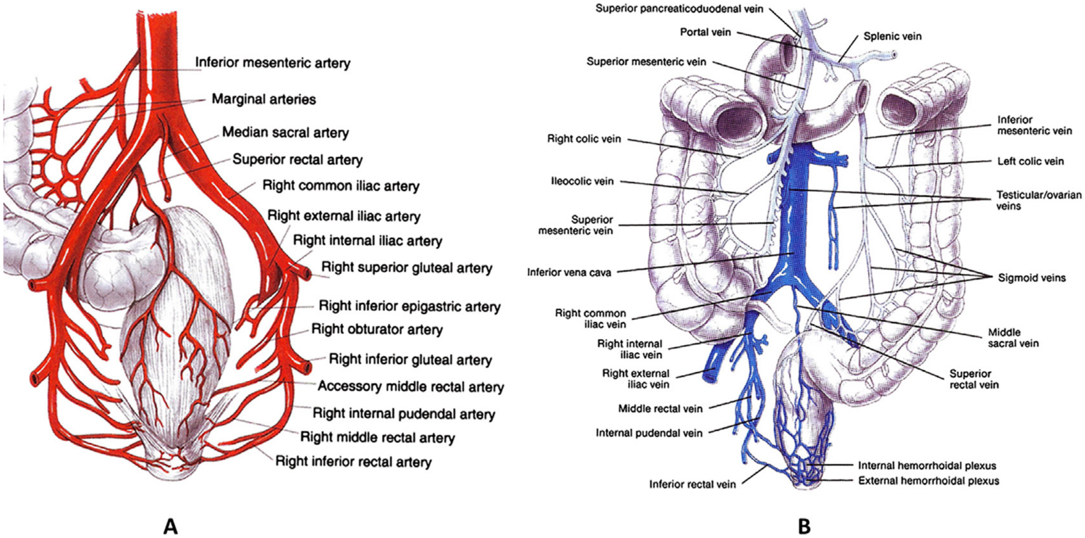


FIGURE 7.15 Vascular supply of the rectum. (a) Arterial. (b) Venous. *Adapted from Gordon PH, Nivatvongs S. Principles andpractice of surgery for the colon, rectum, and anus. third ed. Informa Healthcare, 2024.*

through the pudendal vein. Sympathetic nerves from L1-L3 are responsible for the innervation of the rectum. Nervi erigentes from the caudal 3 sacral nerve roots provides parasympathetic supply to the rectum [10] (Fig. 7.15).

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CHAPTER

8

Bowers gender-affirming vaginoplasty: Modified penile inversion technique

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Introduction

Penile Inversion Vaginoplasty (PIV) has been the gold standard for gender-affirming vaginoplasty ever since Dr. George Burou popularized the approach as definitive in the 1950s. Subsequently, there have been a number of modifications to the original technique [1].

Although alternative approaches such as colovaginoplasty and the more recent Robotic Peritoneal Flap Vaginoplasty (RPFV) have been introduced during the past decades, we continue to perform PIV as the definitive first choice technique for gender-affirming vaginoplasty for transfeminine patients with gender dysphoria (GD), so long as there is adequate penoscrotal material available. Penoscrotal hypoplasia is a phenomenon whose recent increase in incidence is attributed to common use of puberty blockers in early adolescence. Use of puberty blockers at Tanner Stage 2 became widespread in the late 2000s. Blockers, which prevented masculinizing puberty-associated changes as a trade off for markedly reduced penile and scrotal material typically used in penile inversion. Preference for PIV is consistent with the practice patterns and clinical judgement of most surgeons who perform vaginoplasty globally [2,3]. Consensus expertise suggests that PIV with skin grafting (-if needed-, from scrotum or other hairless body areas) should be the primary choice for vaginoplasty while intestinal and peritoneal vaginoplasties are reserved for secondary cases, or for patients with underdeveloped penile skin following puberty suppression therapy.

This chapter will discuss surgical refinements to the penile inversion technique with the addition of skin graft, as developed by the author.

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00008-X

Preoperative requirements

We follow the WPATH Standards of Care (SOC) Version 8 in our approach to patients [4], specifically in terms of diagnosis and readiness to surgery, as well as hormonal therapy [5]. We do not currently operate on patients less than age 18, the adult age of emancipation in the United States and much of the world. However, many feel that it is cruel to force an AMAB adolescent with GD to wait until 18 when they have already spent years of socialization as females. That said, vaginoplasty is also accompanied by potential challenges and responsibilities regarding dilation. Having actively involved parents' help with aftercare, parental involvement can be crucial in achieving a successful outcome. Pelvic floor therapy is increasingly recommended by academic centers as an adjunct for successful dilation aftercare following vaginoplasty. Delaying surgery to the summer before college or post–high school can add additional challenges to aftercare for a busy young adult. The importance of dilation cannot be over-emphasized.

A letter of support remains a part of the SOC and is required within 6 months of surgery in addition to HIV status and an up-to-date medical history. We no longer restrict patients to a BMI cutoff although do retain final approval from the preoperative examination. Medical clearance is utilized selectively depending upon the health problem. Diabetics are required to maintain a HgbA1c below 7.5 or show evidence of ongoing diabetes care.

Although we perform a two-pronged approach to hair riddance—hair follicle excision in addition to simple cautery at the time of surgery—we do recommend that patients undergo at least five sessions of electrolysis/laser beginning at least 6 months prior to surgery. We do not recommend hair depilation closer than 3 weeks prior to surgery. Patients are required to undergo a mechanical bowel prep the day prior to surgery. Although rectal injury at the time of surgery is rare, advantages of the bowel prep also includes the absence of possible stool in the rectum while operating anterior to the colon and potential fecal contamination in the day or two following surgery.

Operative procedure

Surgery is composed of three phases: deconstruction, dissection, and reconstruction, which are hereby explained in detail.

Deconstruction

With the patient in high lithotomy, we use a standard prep of the external skin and low rectum, then mark the patient. In general, we use three incisional types—a *groin incision* if the patient has adequate pelvic fat, allowing the scars to be hidden in the groin creases. When patients are younger and/or thinner, the groin crease incision can come under more tension, which widens the incision. It is also not ideal for patients who wish to wear less coverage in their choice of underwear or bathing suits. A groin scar could be potentially noticeable. In these cases, we use a so-called *scrotal incision*, confining our incisions to the circum-scrotal areas of the neovulva (Fig. 8.1). In other cases, we use *peri-labial incisions*,

FIGURE 8.1 Classic scrotal incision markings.

which have the advantage of hiding relatively vertical scars within the labial creases. We do not inspect or dissect with devices, drapes, or fingers within the rectum as our later dissection course closely follows the urethra. If there are suspicions about a rectal injury, the rectum is evaluated.

The midline structures are first opened to expose the underlying cavernous bodies and bulbospongiosum muscle (Fig. 8.2). Orchiectomy is performed by dissection to the inguinal ring. We use a LigaSure type device to cut and cauterize the cord at the ring (Fig. 8.3). The ring is closed, if accessible, with 0-vicryl ligature, care taken not to involve the genitofemoral nerve whose course is lateral and inferior to the ring [6].

The urethra is catheterized distally and then freed from the underlying paired cavernosa until just below the pubic symphysis. Attaining a dissection that is low enough is key if the patient is to pee without an excessively anterior stream

At rest, the foley and spongiosum should settle below horizontal. The glans is then marked. We attain a chevron shape for the neoclitoris by utilizing a 10th of the glans cut in an inverted V-shape in the glans dorsum. 3-0 Vicryl is used throughout (Fig. 8.5). Another 75% of the glans is retained inferiorly by deepithelialization of that portion.

The penis is then degloved, and the cavernous bodies are scored along their length to the symphysis pubis (Fig. 8.4), then transected using a LigaSure device (Fig. 8.6).

The ventral portions of the paired cavernosa are removed sharply with scissors or cautery or both. The tunica sheath is retained if the patient is significantly overweight. If the patient is thin, we dissect the neurovascular bundle from the tunica sheath, which is then discarded. In general, retention of the sheath is helpful in offering some protection to the neurovascular

FIGURE 8.2 Surgical dissection showing the exposed spermatic cords, the midline corpora spongiosum, the deeper paired cavernosum, and the bulbspongiosum muscle.

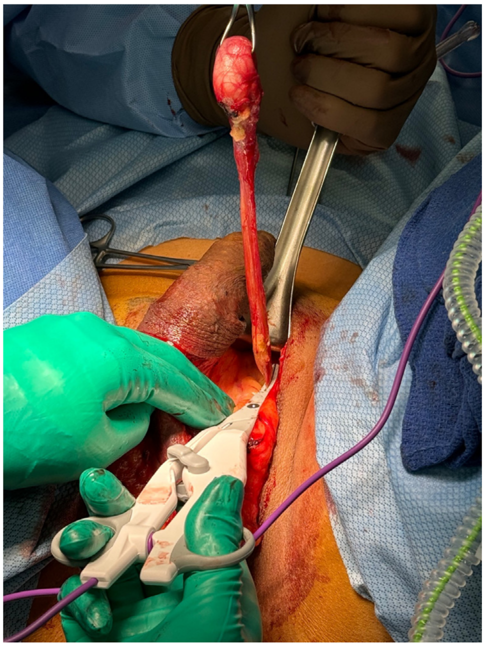

FIGURE 8.3 Ligasure ligation of the spermatic cord at the inguinal ring.

FIGURE 8.4 Cautery separation of the urethra/spongiosum from the underlying cavernosa.

FIGURE 8.5 Midline approximation of glans edges to create chevron-shaped neoclitoris.

FIGURE 8.6 Ligation of the ventral portions of the corpora cavernosa.

bundle with less likelihood of twisting and/or potential clitoral necrosis. We use the LEEP electrosurgical excision technique (Valleylab E1567 10 mm × 8 mm SQ) (Fig. 8.8) on the cut setting to excise the erectile tissue, leaving the sheath down to the tunica albuginea thinned completely, then narrowed (Fig. 8.7).

If the sheath is present, it is folded upon itself and sewn along its lateral edges with the clitoral placement at the level of the insertion of the adductor longus muscle (Fig. 8.9).

The excised scrotal skin is prepared as a full-thickness skin graft by securing it to a Coban-wrapped cutting board with Metzenbaum scissors with attention to also *removing the hair follicles* individually, then cauterizing any remining follicles to assure a lack of hair in the vagina (Fig. 8.10).

Dissection

The perineal dissection for creation of the neovagina is the Holy Grail of vaginoplasty, at least for surgeons who use the transperineal approach exclusively. It is every bit as safe and reliable as robotic assistance in experienced hands but does rely upon strict rules and technical precision. To the best of my knowledge, these are my three cardinal rules: (1) Follow the central tendon assiduously from the base of the bulbospongiosum muscle to the prostate. Cautery coagulation setting is utilized throughout with a horizontal plane established immediately posterior to the retractor blade. For patients with a BMI of greater than 35, we use a longer retractor blade in order to account for abdominal obesity which mechanically puts the urethra at risk. The retractor is advanced with each cautery pass. Make each pass wide enough, usually at least 3 cm (Fig. 8.11).

FIGURE 8.7 Square electrosurgical excision of ventral erectile tissue.

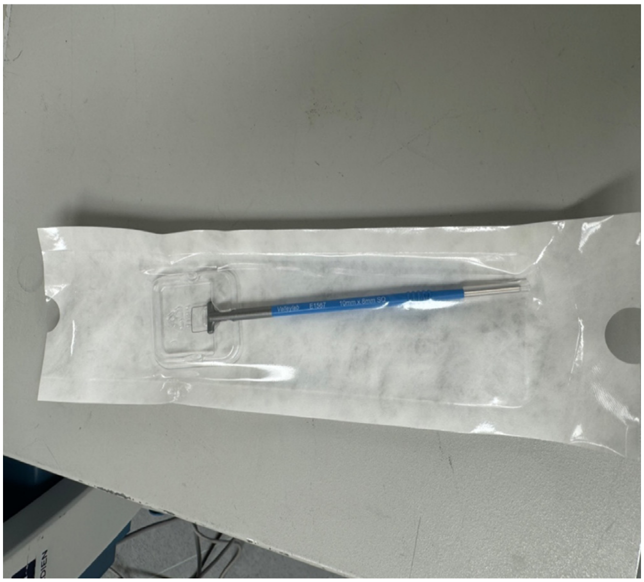

FIGURE 8.8 Valleylab LEEP electro excisional loop.

FIGURE 8.9 Neoclitoris anchored to its final location near the adductor longus.

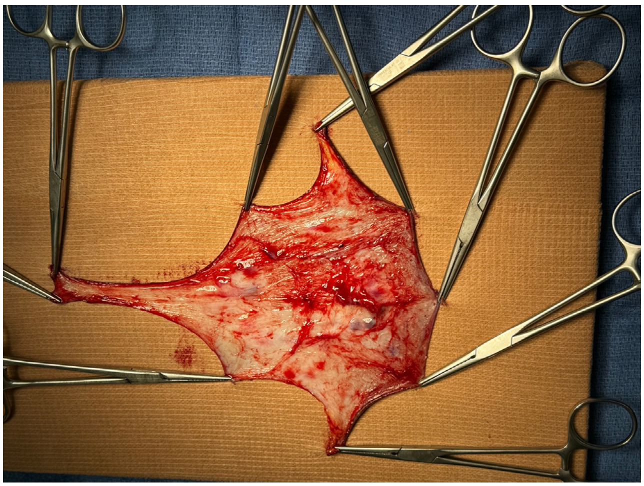

FIGURE 8.10 Thinning of the scrotal skin graft with hair follicle excision.

The prostate is encountered after several passes with the cautery. Upon entering the prostate, 1% lidocaine/epinephrine is injected for hemostasis. (2) At the prostate, surgeons may decide to dissect *around* the prostate. For me, this approach needlessly brings the dissection

FIGURE 8.11 Positioning for the perineal/neocavity dissection.

closer to the rectum. We remain close to the urethra throughout the dissection, especially *through the prostate* and utilize this proximity to reach Denonviller's fascia with reduced concerns regarding rectum integrity. The prostatic urethra is simultaneously identified and respected. Bilateral superior prostate arteries are cauterized. (3) Upon reaching the glistening surface of Denonviller's fascia, cautery is no longer utilized except for bleeding or an occasional band of connective tissue. Blunt dissection completes the cavity with the surgeon's two fingers curled upwards and used to sweep tissue away from the bladder. Finger pressure is applied anteriorly and laterally in reaching fascia and developing adequate neovaginal depth (14+ cm). Once the dissection has been safely carried cephalad to the Foley bulb (palpable anteriorly from the surgeon's dissection fingers), sequential vaginal dilators are passed—not as tools of dissection but to objectively document both depth and diameter of the dissection plane and pelvis.

Reconstruction

The urethra/spongiosum is divided vertically down to the level of the bulbospongiosum muscle, approximately where the urethra should exit (Fig. 8.9).

Pro tip: Do not open the urethra as low in larger patients allowing the extra urethral length to better reach the vulvar surface.

Excise the erectile tissue along the lateral aspects of the divided spongiosum (Fig. 8.12). Also, remove erectile tissue as low as possible and as much as possible as this area which will swell during arousal after surgery, causing partial obstruction of the vaginal entry, a major reason for revision surgery. Much of the bulbospongiosum muscle is removed as well.

Use a single figure-of-eight ligature to close the dead space between the anchored clitoris and the neourethra. This tissue consists of fat and endopelvic fascia. The splayed open

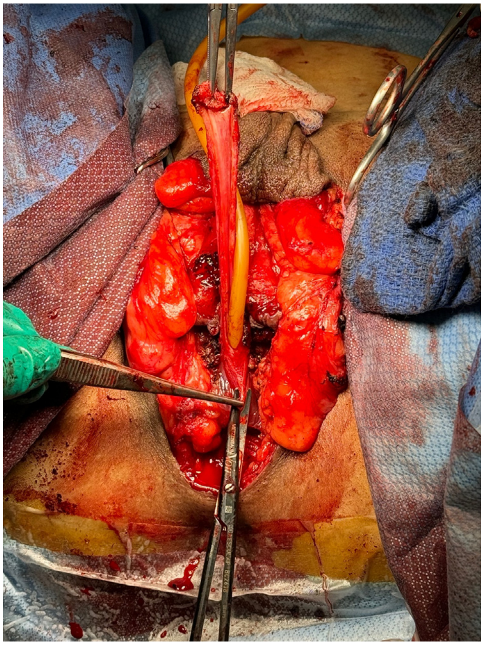

FIGURE 8.12 Removal of the lower midline spongi tissue.

spongiosum creates the urethral plate but also the inner labia mucosa. At its superior aspect, it is trimmed to fit into the clitoral notch that was created in closing the clitoris. The inverted urethral "V" is anchored to the clitoral notch in two layers of 3-0 Vicryl and 3-0 Monocryl. The prepuce superiorly and the urethral plate bilaterally are sutured along the neolabial edges and clitoral hood.

The depilated scrotal skin graft is then sewn to the inverted penile skin tube with 3-0 Monocryl, which should cover most of the stint (Fig. 8.13). The inverted penile skin is divided down the midline to allow the graft and dilator complex to bend around the pubic bone and into the neovaginal cavity (Fig. 8.10).

The posterior aspect of the penile skin tube is sewn to the perineal notch in two layers of 3-0 Vicryl/3—0 Monocryl. A 2-0 PDS retention suture is placed along each side of the graft internally and sewn to the pelvic floor to less tension on the graft. A speculum is inserted to pack the neovagina with Metrogel and lubrication-soaked vaginal packing.

The midline is documented, and a vertical incision is created for the labia—clitoral-urethral plate complex, which is drawn through and anchored circumferentially with 3-0 Monocryl running ligasure (Fig. 8.14). This attachment will include the length of the prepuce skin laterally, the urethral mucosa inferiorly, and the neoclitoral hood superiorly. The labia minora are then imbricated with 3-0 Vicryl in a final layer to further define the inner labia, interrupted at the top of each labia minora (Fig. 8.15).

Hemostasis is documented beneath each incision and a 10-French JP drain placed to drain both sublabial spaces. The drain is brought out via a trocar through the perineal skin and tethered with 0-Vicryl. The labial incisions are closed deeply with 3-0 PDS running followed by 3-0 Monocryl interrupted subcutaneous sutures followed by 3-0 Monocryl subcuticular closure of the skin.

FIGURE 8.13 Scrotal skin graft best fit around the vaginal stint.

FIGURE 8.14 With the urethral plate sewn to the base of the neoclitoris, the neovagina is inverted and packed.

FIGURE 8.15 The labia edges including prepuce are sewn to the urethral plate.

The wound is dressed with Dermabond and a pressure dressing (Fig. 8.16).

FIGURE 8.16 After imbrication of the labia minora, closure of both labial incisions and placement of the JP drain. Scrotal incisions.

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CHAPTER

9

Cavity dissection: Personal approach (Dr. Bellringer)

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A history of the development of the perineal approach

The urological approach to the formation of the vaginal cavity in transgender women is drawn from the approach to remove bladder stones. Removal of stones (lithotomy; which gives its name to the surgical position) is described in Ancient Greece and referred to by Hippocrates [1,2]. The surgeon Ammonius Lithotomos (ca 276 BCE) is described as being the first to crush or split a bladder stone via a perineal incision (lithoclastic cystotomy) [1], and his techniques were further referenced in the detailed writings of Celsus in the first century [3]. This approach required the surgeon to push the stone down from above by pressing on the abdomen, then cutting directly onto it through the perineum [2–4]. Approaches through the abdomen in an unanesthetized patient were invariably fatal [2], and remained so until the early 20th century. For this reason, perineal approaches to stones were refined to follow the known anatomy to attempt to reduce the death and fistula rate. The plane in front of Denonvilliers' fascia anterior to the rectum (see below) was a safer approach to the bladder, and this approach is that used by modern urologists in the creation of a vaginal cavity.

In the United Kingdom, lithotomy was performed in winter, when there was a supply of ice, so that the patient could be sat in a bucket of ice for an hour before the procedure, which provided some anesthesia (the remainder provided by a bottle of whisky or gin). This was less than fully effective, and four to six strong men were usually employed to hold the patient still in the lithotomy stirrups while the surgeon performed the operation. An incision was made in the midline or paramedian aspect of the perineum and deepened onto the prostate, which was pushed down into the perineum by a sound in the bladder [4] (identical

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https://doi.org/10.1016/B978-0-443-21776-0.00009-1

instruments are still in use today and are used during vaginoplasty). A sharp curved instrument would be pushed up into the bladder through the perineum via the prostate or bladder neck [4] and the stone would roll down the groove on the instrument's upper surface. The wound was left open to heal by secondary intention [4].

Given the intense pain experienced, speed was of the essence. William Cheselden at St. Thomas' Hospital in London, United Kingdom, was renowned for being able to remove a stone in less than a minute [4]. It remained a very hazardous undertaking, with mortality around 20% [5], and rectal fistula a regular complication, which was usually fatal. The diarist Samuel Pepys had his stone removed in this way, and after noted that he would in future celebrate both his birthday, and the anniversary of surviving his lithotomy each year [4].

By the end of the 19th century, the approach had been modified to operate on the prostate. Abdominal surgery was still considered exceptionally dangerous, and an approach was developed for removal of hypertrophic prostates through the perineum. This was later modified by Hugh Hampton Young for a total prostatectomy for cancer, and it was probably Young who first described the important plane anterior to Denonvillier's fascia. He described it as "pearly white," and it allowed the dissection of a safe space behind the prostate and in front of the rectum [6]. Conventional anatomy teaching at that time held that there were two leaflets of Denonvillier's fascia, and Young, and almost every urologist who followed, incorrectly believed that he was identifying the plane between the two leaflets of Denonvillier's fascia [6]. It was not until later in the 20th century that the development of radical prostatectomy, especially by laparoscopy, refined our knowledge of anatomy. We now know that the two layers of Denonvillier's fuse during development into one tough layer [7], which protects the rectum while a plane is developed between Denonvillier's fascia and the capsule of the prostate when dissected.

Development of the surgical technique for neovaginal cavity creation

The first transgender woman to undergo formal genital gender affirmation surgery was Dora Richter in 1931 [8,9]. This procedure incorporated a vaginoplasty performed by German surgeon Erwin Gohrbandt [9] although details on his surgical technique are sparse. Probably the first *description* of the creation of a neovaginal cavity was published by the plastic surgeon Harold Gillies in 1957, where he describes that the "cavity was artificially produced by dilation and blunt dissection between the uro-genital membrane and the anterior rectal wall" [10].

They did not seem to use the technique of entering the Denonvillier's plane by dissecting onto the prostate, but instead used the technique still used by plastic surgeons worldwide, where a finger or instrument in the rectum is used to guide the operator. Georges Burou started to perform vaginoplasty in around 1957, but he never published, so his technique for formation of the vaginal cavity is a matter of speculation. As he was not a urologist, it is probable he used the rectum-guided technique. This is further supported by those who subsequently stated they had been informed by Burou's technique and used an anoscope placed in the rectum during their dissections [11].

It seems likely therefore that the first surgeon to use the prostate-directed technique for cavity dissection was Peter Phillip at Charing Cross Hospital in London. He was a urologist and would have been trained in perineal surgery, so modifying it to permit safe creation of a vaginal cavity would have been obvious to him. He started performing vaginoplasties in 1966, and his technique was passed down to subsequent generations of surgeons at Charing Cross (including the senior author of this chapter).

Stepwise surgical technique for neovaginal cavity creation

(See the accompanying video.)

The technique itself is simple. No radiographic investigations are required for planning the dissection. A midline skin incision (or flap-shaped incision for patients requiring a scrotal inlay/scrotal skin flap technique) is made in the scrotum and perineum and deepened through the subcutaneous fat until the base of the penile urethra is found. The urethra is then dissected posteriorly until the entire bulbar urethra, covered in the bulbospongiosus muscle, is demonstrated. The midline fibrous attachment of the bulbospongiosus to the perineal body (central tendon) is divided, and dissection continues until the perineal body is found. At this point, a urethral sound is passed through the urethra into the bladder, and this sound is used to push the prostate down towards the perineum. The sound is kept in the bladder by the bladder neck, and also by downward pressure from the surgical assistant. The sound used for this maneuver is probably the fundamental instrument for the cavity dissection. The apex of the prostate may now be palpated through the perineal incision, and the perineal body is incised until the prostate itself is reached. It is important during the dissection not to leave any tissue posterior to the prostate capsule, as if this happens, subsequent dissection will probably go backwards into the rectum, for which reason it is the author's preference actually to incise the prostate capsule to demonstrate that the plane in front of Denonvillier's fascia has now been opened. The incised tissue posterior to this incision in the prostate is then held in forceps, allowing a small vaginal retractor to be passed into the space which now develops, posterior to the prostate, anterior to Denonvillier's fascia. A second retractor can then be placed anterior to the first retractor, and the vaginal cavity developed by blunt dissection using gauze, and also by the addition of longer retractors. Once the dissection is complete, the vagina is packed with gauze. It is the author's preference to use gauze soaked in adrenaline 1:100,000 (1 mg/100 mL saline) and 1% tranexamic acid (1 g/100 mL saline) in 100 mL saline solution, as this reduces bleeding in the cavity while the remainder of the operation is performed.

Supplementary material

Supplementary data related to this article can be found online at https://doi.org/10.1016/B978-0-443-21776-0.00009-1

The following are the Supplementary data related to this article:

TABLE 1 Accompanying information for the dissection of the neovaginal cavity.

Instruments held in the dominant (D), and in the non-dominant (ND) hand during surgery	• 10 blade surgical scalpel (D) • Gillies forceps (ND), spatula tip monopolar diathermy (D) • Clutton urethral sound (D) • Metzenbaum scissors (D) • Gillies forceps (ND), Langdon vaginal retractor (D) • Langdon vaginal retractor (ND), Gillies forceps grasping a large gauze
Role of the assistant while the surgeon is progressing with the cavity dissection	Throughout the dissection, the urethral sound is kept in position in the bladder by downward pressure from the surgical assistant
The fundamental instrument for the cavity dissection	The Clutton urethral sound used to push the prostate down towards the perineum is probably the fundamental instrument for the cavity dissection
No radiographic investigations are required for planning the dissection.	

AI Disclosure

During the preparation of this work, the author(s) used Clipchamp, which is Microsoft's video editing software, to edit the video that accompanies this chapter. The authors take full responsibility for the content of the publication.

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CHAPTER

10

Cavity dissection: Personal approach (Prof. Buncamper)

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Introduction

The alleviation of gender dysphoria by reshaping the physical characteristics congruent to the person's gender identity has been the goal of gender-affirming surgery (GAS). It is estimated that 66% of transfeminine persons either have or desire to undergo a vaginoplasty [1,2].

A functional vaginoplasty should have a depth of at least 10 cm and a width of at least of 3 cm to facilitate penetrative intercourse as described by Karim et al. [3].

Though in the past decade the option to undergo a "vulvoplasty" (which means no cavity dissection), has gained in popularity [4,5], the majority of patients in our center still wish to have a neovagina that can accommodate for penetrative intercourse. This makes the dissection of the vaginal cavity an integral part of the vaginoplasty; but it is also the most precarious and most difficult part of the vaginoplasty to learn and to teach. The difficulty lies in the possibility of causing injury to the rectum while severing the perineal ligament when dissecting the neovaginal cavity where there was no cavity before.

In this chapter, we describe the senior author's technique for dissecting the neovaginal cavity; this is part of the technique described earlier in literature [6,7]. The technique described here forth is demonstrated in the attached video.

Technique

No preoperative radiographic investigation is required. The day before surgery, the patient is admitted to the hospital and receives bowel preparation to cleanse the intestines. On the day of surgery, the patient is placed in the supine position under general anesthesia

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https://doi.org/10.1016/B978-0-443-21776-0.00010-8

and is prepped and covered with a transurethra resection (TUR) prostate drape that incorporates a silicone rectal guide. This drape allows for sterile rectal access.

The preoperative drawings are made at about 1 cm above the anus, just inferior to the perineal body, a posteriorly based triangular flap measuring one by 1 centimeter is drawn. From the most superior point of this triangle, a line is then drawn of about 6–8 cm over the raphe to at least 6 cm under the corona. The drawn midline along the penal and scrotal raphe is incised and deepened with cautery. By maintaining this central incision, it is easy to dissect the first layers of tissue almost bloodlessly until you reach Bucks' deep fascia. The penile body is then completely isolated from the shaft skin along this plane. With cautery, this dissection is achieved nearly bloodlessly. The dissection is then continued caudally, removing further tissue from the bulbospongiosus and the ischiocavernosus muscle.

Both muscles are detached from their most distal insertion on the corpora cavernosa and the corpus spongiosum. A forceps is then placed bluntly between the muscle and the underlaying corpora until the bulbar urethra is reached. The cautery is then used to separate both muscles from both corpora. Using the forceps reduces the risk of causing injury to the corpus spongiosum. Should there still be any laceration to the corpus spongiosum, it will have to be oversutured as the resulting bleeding will reduce visibility.

Once both sides of the bulbospongiosus muscle have been resected, it is left pedicled at the base of the urogenital diaphragm to be used as padding should any rectal injury occur.

Once this part is completed, a mosquito clamp is placed on the bulbar urethra and used to pull this structure upward to create tension and to have a better view of the central tendon of the perineal ligament.

The nondominant index finger of the main operator is then placed into the rectal sheet and by gently pushing the rectum downward while an assistant pulls up the mosquito clamp, the tendon is then transected with cautery. Once this is done, blind dissection of the cavity between the rectum and the urethra along Denonvilliers' fascia can start.

Thus, by digitally dissecting the first 3–4 cm with both fingers, one can gently push away the tissues from 12–3 o'clock as well as 12–9 o'clock while simultaneously feeling the amount of tissue covering the rectum. Once the first few centimeters have been created, a speculum is inserted. A mounted swob is than utilized to further blindly dissect the neovaginal cavity. By using the speculum, it is easy to extend the cavity while pushing the rectum caudally and the urethra cranially. One must make sure to remain in the plane external to the prostate capsule. As the prostate is not removed—to avoid excessive blood loss—urethral strictures and incontinence, this should be a bloodless dissection. Once you have passed the prostate capsule, the largest of the speculum is inserted and the mounted gauze is utilized to further expand the cavity according to Denonvilliers' space. Once the peritoneal reflection is seen at the level of the seminal vesicles, blunt dissection should stop because the peritoneum can easily be penetrated at this junction.

To ensure that the desired depth of the neovagina has been achieved, a silicone dilator [7] is then inserted; this should be inserted completely and easily, with a cavity measuring 15 cm in length.

The widest speculum is reinserted, and with cautery, the levator (puborectalis and puboanalis) and ischiocavernosus muscles are partially divided to widen the vaginal cavity. Once this has been done, hemostasis is checked, and the speculum is then rotated 90 degrees and the cavity is reassessed for any rectal injuries. Then, the bulbus spongiosum muscles are then resected, and a gauze with diluted adrenalin is then placed into the cavity while the rest of the vaginoplasty takes place.

However, the incidence of intraoperative injury in literature ranges between the 0.45% and 4.5% and postoperative incidence of rectovaginal fistulae is between the 0.8% and 17% [8]. When seen intraoperatively, most patients are then sutured in layers, but if noticed postoperatively, most of these lesions are then treated by the gastrointestinal surgeon and might need temporary bowel diversion [6,9−13].

Supplementary material

Supplementary data related to this article can be found online at doi: https://10.1016/B978-0-443-21776-0.00010-8

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CHAPTER

11

Cavity dissection: Personal approach (Dr. Brassard)

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Introduction

Gender-affirming vaginoplasty is a surgical procedure made of multiple steps that must be adequately performed to give the best possible functional and aesthetic outcomes. One of the steps that is often dreaded by surgeons is the dissection of the neovaginal cavity. This chapter aims at providing reliable and reproductible tools to achieve consistency while remaining safe during the neovagina cavity dissection.

We believe that one of the prerequisites to be successful is to perform gender-affirming vaginoplasties often. It is with repetition that mastery can be achieved, thus putting the emphasis on the need for gender-affirming procedures to be centralized in expert institutions. Knowledge of the pelvic anatomy is also of paramount importance. Depending on the field of surgical expertise (urology, gynecology, plastic surgery), the initial degree of anatomy knowledge can vary. It is important to confront what has been learned during training to the reality of practice, and to make all necessary efforts to bridge any existing gap.

Technical aspects of neovagina cavity dissection following the Montreal approach (Dr. Brassard)

Depending on the chosen technique, the dissection of the neovagina cavity can happen at different steps of the procedure, and the timing of the dissection remains a personal preference. In the Montreal technique, the dissection of the neovaginal cavity takes place between the deconstruction and reconstruction phases (Fig. 11.1).

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00011-X

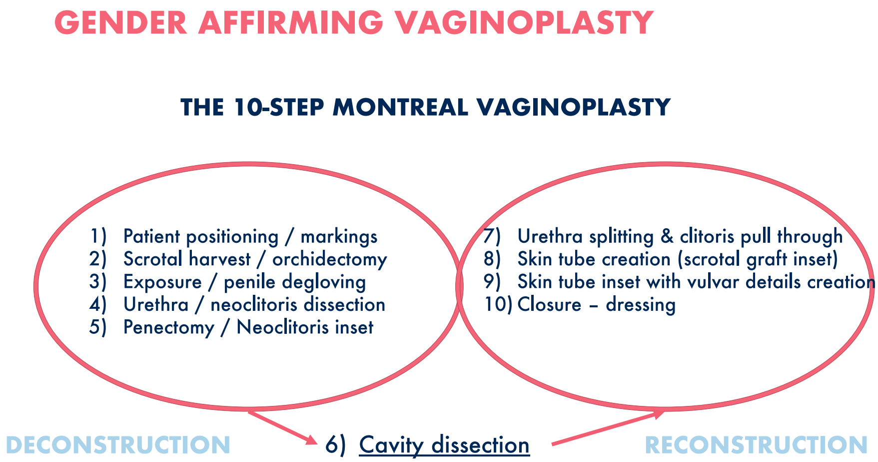

FIGURE 11.1 The steps of the Montreal vaginoplasty technique. *Courtesy of Dr. Laungani.*

Planning, positioning, and instruments

There is no use of preoperative imaging for surgical planning as the dissection is straightforward and reproductible from patient to patient. Patients are prepared with administration of an enema 12h prior to the procedure. In Montreal, there is also no rectal access during the dissection. As explained in the following, it is not the rectal plane that will guide the dissection but rather the prostate. However, it is not uncommon for surgeons to perform a bimanual palpation of the plane with a finger in the rectum. While we feel that this is not needed at our center, we certainly advise for extra caution during the neovagina cavity and therefore recognize this palpation as a safety adjunct, especially for early-career surgeons.

The patient is placed in a lithotomy position for the entire duration of the case. For the neovagina cavity dissection, the operative table is placed in a Trendelenburg position and raised. The surgeon should ideally be wearing a headlight as it will provide a more adequate lighting for the deep dissection rather than the ceiling operative light alone. A foley catheter is inserted in the urethra and secured by inflation of the balloon. The rest of the instrumentation is minimal and requires a Senn retractor, an insulated tip cautery, a pair of Metzenbaum scissors, and a long pair of forceps.

Surgical dissection

The dissection starts by a generous infiltration of saline with epinephrine along the envisioned path of dissection. The operative assistant stands on the side of the patient and provides a gentle pull on the Foley catheter, which displaces the prostate anteriorly and provides a target for the surgeon. The surgeon is in a sitting position between the patient's legs.

A Senn retractor is placed below the bulbospongiosus muscle covering the bulbous of the urethra, which is retracted up by the second hand of the assistant (the first one providing the gentle pull on the Foley catheter). Using electrocautery in the surgeon's dominant hand, the dissection starts posterior to superficial transverse perineal muscle by dividing the anterior extension of the superficial part of the external anal sphincter and identifying the central tendon, which is then divided. During the entire dissection, the surgeon's nondominant hand should aim at pulling the tissues posteriorly to stay away from the rectum. Cowper's glands should then be identified. At that level, palpation of the prostate should be performed, and the dissection should be carried with scissors following a plane parallel to the rectum and aiming at the most caudal aspect of the prostate. Once the prostate capsule is achieved, the dominant index of the surgeon is inserted, and the prostate is once again palpated. Using a gentle sweeping motion, a plane is created between the prostate capsule and the Denonvillier's fascia around the prostate. To ensure that no tissue is left posterior to the prostate, the prostatic capsule can sometimes be incised. A blunt dissection is then performed to achieve more depth to the neovaginal canal. This can be done with a long pair of forceps gently pushing the rectum down while a Langenbeck retractor has been placed between the prostate and the Denonvillier's fascia. The peritoneal fold is then visualized, indicating that maximal depth has been achieved.

To help with subsequent dilations and painless sexual function, it is necessary to widen the canal. The bilateral puborectal portion of the levator ani muscle complex is then scored transversely to reach approximately 3–4 cm in width and a depth of around 1–1.5 cm using an electrocautery on the dominant hand, while the nondominant hand holding a gauze is exerting a downward pressure over the rectum to prevent rectal injury. Large pelvic veins can be encountered during this step, and any bleeding should be addressed by cautery or ligation of the veins. The length and depth of the levator ani dissection scoring are made on a case-to-case basis depending on the thickness and volume of the muscle and whether adequate diameter of the cavity can be achieved. The depth and diameter of the cavity is reassessed ensuring that there is no rectal injury. Blunt dissection using a DeBakey or any blunt instrument is performed with the goal of achieving the following dimensions for the cavity: a depth of 15–17 cm and a diameter of 4–5 cm. Hemostasis is performed using electrocautery except on the posterior aspect of the neovaginal canal to avoid any thermic injury to the rectum.

After the neovaginal cavity is dissected, it is packed with gauzes with the goal of providing a tamponade effect on the side walls of the neovagina, thus limiting bleeding for the rest of the surgical procedure. The bulbous of the urethra is then excised after the urethra has been split opened on its posterior surface and splayed to create the labia minora. The excision of the bulbous and bulbospongiosus muscle is important as the engorgement of this structure after arousal could cause an obstacle to penetration of the neovagina and resulting in dyspareunia. During the excision, branches of the bulbo-urethral arteries are often encountered and ligated with figure of eight stitches of 2–0 Vicryl.

Supplementary material

Supplementary data related to this article can be found online at doi: https://10.1016/B978-0-443-21776-0.00011-X

CHAPTER

12

Cavity dissection: Personal approach (Dr. Bowers)

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No radiographs are normally required. With the patient in dorsal lithotomy position, the patient is prepped and draped. A foley catheter is inserted and used to drain the bladder fully. As an aside, the perineal/scrotal skin is concurrently being prepped for grafting and the orchiectomy is completed. The rectum is not examined during the dissection. Lingerman drapes are not used, and there are no examiner fingers in the rectum unless there are concerns. Rectal integrity is documented multiple times throughout the dissection but only transvaginally unless there are suspicions of injury. The dissection is carried out in three steps: (1) perineum to prostate, (2) prostate to Denonvilliers', and (3) blunt dissection.

Depth of no less than 14 cm is normally attained unless minimal depth is requested by the patient or if there is a likelihood of less available lining. The role of the assistant is to maintain the right-angle retractor at a steady 90-degree angle. The retractor is replaced by the operating surgeon with each transverse pass of the cautery. The crucial equipment is an excellent *lighted* right-angle retractor and a steady assistant. Blade width is 1 inch and blade length is 12 cm—these are critical considerations because a wider blade stretches the available internal diameter, which inadvertently brings the rectum further anterior, placing the rectum at potential risk. Similarly, the standard retractor blade can alter the dissection when faced with significant pelvic obesity, specifically abdominal obesity. Abdominal obesity pushes the assistant's angle forward, which inadvertently tilts the distal blade anterior, potentially placing the urethra at risk for injury. In the case of increased abdominal obesity (arbitrary BMI greater than 35), we use a longer retractor blade. We also use a long bovie tip and bovie suction to evacuate smoke while dissecting.

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https://doi.org/10.1016/B978-0-443-21776-0.00012-1

The operating surgeon holds cautery stick in his/her dominant hand, with suction in the nondominant hand until past the prostate; once passed the prostate, the operator's index and middle fingers are used to bluntly dissect.

- The bulbospongiosum muscle is identified. A lighted right-angle retractor is placed as the central tendon of the perineum is cut transversely with electrocautery on Coag function. The role of the assistant cannot be overemphasized as they must maintain the retractor blade in a generally horizontal position throughout the dissection. The central tendon of the perineum is always obvious as the aponeurosis of the bulbospongiosum muscles in the midline, seen as a thin white vertical structure, until reaching the prostate. Each advance cephalad is performed by drawing the cautery transversely in the same plane and as anteriorly as possible, hugging the under surface of the retractor blade, which protects the urethra anteriorly. The retractor is readvanced with each passage of the cautery. The prostate should be reached within 4–8 passes of the cautery. Presence of the prostate is obvious by texture change and mild bleeding, typically. In patients with prior orchiectomies or long-standing hormone use, the prostate is occasionally almost nonexistent, meaning the texture change and bleeding is less obvious if present at all.
- Once the prostate is reached, the body of the prostate is infiltrated with 6–8 cc of lidocaine/epinephrine. This greatly reduces prostatic bleeding. Once the prostate is reached, rectal injury is unlikely so long as the surgeon continues the dissection within the prostate. There are numerous surgeons whose approach is to circumnavigate the prostate along the under surface. In my opinion, this approach needlessly brings the dissection plane closer to the rectum than is ideal. By remaining within the prostate, the surgeon only needs to be mindful of the prostatic urethra. By leaving 2–3 mm of prostate between the surgical plane and the retractor, the urethra will avoid injury. Once the texture changes from the spongi appearing prostate to smooth and glistening, cautery dissection is normally ended. Care must be taken to dissect widely enough to achieve adequate diameter but also to avoid a deep and narrow dissection field. Occasionally, this area of the midpelvis can be extremely narrow, adding additional challenge to the dissection due to the prominence of the ischial spines/pelvis.
- Upon reaching the glistening surface of Denonvilliers' fascia, the dissection is completed by advancing the dissection with the examiner's left index and middle fingers. Sweeping finger pressure applied laterally and anteriorly as the dissection is carried to and past the foley bulb should result in completion to adequate depth. It is essential to dissect to and past the foley bulb before checking depth with the vaginal dilators. The dilators, if applied prematurely or used to dissect, can result in injury, emphasizing the key role of the surgeon's fingers. Another useful aid in achieving final depth is a sponge-stick swept from anterior to posterior.

The neovagina is then inspected for integrity, packed with 4×4 sponges rolled into a firm tube soaked with dilute lidocaine/epinephrine. This rolled tube is placed internally until reinspection prior to placing the neovaginal penile/scrotal skin for final placement. The space is also copiously irrigated prior to graft placement (see video).

Supplementary material

Supplementary data related to this article can be found online at https://doi.org/10.1016/B978-0-443-21776-0.00012-1

Further reading

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CHAPTER

13

Cavity dissection: Discussion and personal approach

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In this chapter, the surgical approaches and techniques from four experienced surgeons who perform a high volume of vaginoplasties are discussed. Additionally, a personal approach that combines elements of all the aforementioned methods is presented. Special cases include patients with anatomical variations or redo cases where switching the surgical approach, combining approaches, or using laparoscopic dissection might be required.

Introduction

Assigned-male-at-birth persons (AMAB) with gender dysphoria (GD) might request genital gender-affirming surgery with or without vaginal cavity (see Chapter 15). For some patients, the presence of a vagina is fundamental for their sexual well-being and health (see Chapter 21). Thus, a certain vaginal depth is necessary for engaging in penetrative sexual intercourse.

Karim et al. [1] suggest that for achieving a "functioning vagina," it should be moist, elastic, hairless, and with a minimal depth of 10 cm, and a minimum diameter of 3 cm. These goals should be considered desirable but not mandatory. However, achieving these criteria can be challenging: (1) a moist and elastic vagina is not achievable with penile skin flap or any skin graft techniques; (2) although laser and electrolysis epilation, as well as intraoperative surgical folliculectomy, can yield good results, a complete hairless vagina has not yet been demonstrated and cannot be guaranteed; (3) a certain vaginal depth cannot be guaranteed as it depends on several factors such as the patient's specific anatomy [2], surgical technique, patient compliance with postoperative dilation (see Chapter 22), wound healing, and absence of complications (such as rectovagina fistula, see Chapter 20).

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https://doi.org/10.1016/B978-0-443-21776-0.00013-3

Damage to the rectum and surgical anatomy

Chapter 6 details how to inform and prepare AMAB patients before undergoing genital gender affirming surgery. Chapters 9–12 describe surgical approaches and techniques that allow for deep cavity creation with a low risk for complications.

The incidence of intraoperative or postoperative rectovaginal fistula ranges between 0.8% and 17% [3–5], with an estimated pooled prevalence of less than 2% (Chapter 20). The commonly accepted etiology is "overt or occult rectal injury during dissection of the neovaginal prerectal space" [4]; infection, hematoma, and partial skin flap necrosis may also contribute to the development of rectovagina fistula postoperatively [6,7]. Some rectal fistulas might also result from a misdirected dilator entering the rectum during postoperative dilation; therefore, blunt-ended dilators with ventrally pointing tip are recommended (see Fig. 3 in Chapter 22).

The risk of rectal damage is higher in patients with unusual anatomy or those who have undergone previous surgery in the area [8]. Surgical dissection can damage the rectum immediately or results in a late damage, such as from thermal injury leading to a delayed rectal wall wound. Anything causing a vascular insult to the front wall of the rectum can cause a damage. Two arteries supply this area: the inferior mesenteric from above, and the hemorrhoidal vessels from below. Stripping of this junction may result in ischemia of the anterior rectal wall, causing delayed wound formation.

The prostate and rectum are anatomically attached and separated only by a thin layer of tissue. Key to the dissection is creating a space between prostate and rectum without damaging the rectum. The retroprostatic or Denonvilliers' fascia comes down between the rectum and prostate and reaches the apex of the prostate, continuing with the pelvic peritoneum.

Two main approaches for cavity dissection can be used [8].

First approach: The surgeon inserts a finger (or a stent) into the rectum to use as a guide while dissecting the initial space with scissors or cautery until the central tendon of the perineal ligament is passed (switching point); the dissection then continues with a blunt instrument (fingers, gauze, stent).

Second approach: After inserting a guide into the urethra (e.g., urethral sound or Foley catheter) to push the prostate forward, the surgeon incises the perineal body with cautery until reaching the prostate and then uses scissors to open the prostate capsule (switching point). A retractor is inserted into the plane posterior to the prostate and anterior to the Denonvilliers' fascia, allowing safe dissection into the pelvis. This technique has been used for removal of bladder stones historically (Chapter 9) and, more recently, for radical perineal prostatectomy [9].

Comparison of approaches and techniques

Chapters 9–12 detail the approaches and techniques of four expert groups: the London group (Dr Pidgeon and Dr Bellringer; Chapter 9), the Ghent group (Buncamper, Claes, and Colle; Chapter 10), the Montreal group (Lungani, Poncio, and Brassard; Chapter 11), Dr. Bowers (Chapter 12). Watching their videos is recommended for further understanding. The following points summarize their approaches (Table 13.1):

TABLE 13.1 Details from surgical approaches and surgical techniques as described in Chapters 9–12.

	Pidgeon and Bellringer (London group)	Buncamper, Claes, and Colle (Ghent group)	Lungani, Poncio, and Brassard (Montreal group)	Bowers
Radiographic investigation	None	None	None	None
Infiltration of epinephrine along the path of dissection	None	None	Yes, copiously, along the entire cavity path	Only to the body of the prostate, once reached, with 6–8 cc of lidocaine (epinephrine)
Order in which instruments are used	Urethral sound Cautery, then Metzenbaum scissors Forceps to hold prostate capsule Langdon retractor Simon retractor	– Cautery and Mosquito Bimanual dissection Small speculum +mounted gauze Large speculum + mounted gauze Dilator for final dissection Larger speculum for allowing partial division of levator (puborectalis and puboanalis) and ischiocavernosus muscles) to widen the vaginal cavity	Foley catheter Cautery and Senn retractor Metzenbaum scissors Finger Langenback retractor and back of the forceps Cautery to the bilateral puborectal portion of the levator ani muscle complex is then scored transversely	Foley catheter Cautery Finger Mounted gauze Dilators
Phases of the dissection	**1)** Scissors until the prostate **2)** Langdon retractor **3)** Simon retractor	**1)** Cautery to cut central tendon of perineal ligament **2)** Finger dissection for first 3–4 cm, until prostate is reached **3)** Further dissection with mounted gauze **4)** Silicon dilator to complete dissection	**1)** Cautery to central tendon **2)** Scissors to the prostate **3)** Finger **4)** Back of forceps	**1)** Cautery from perineum to prostate **2)** Prostate to denonvilleurs **3)** Blunt dissection

(*Continued*)

TABLE 13.1 Details from surgical approaches and surgical techniques as described in Chapters 9–12.—cont'd

	Pidgeon and Bellringer (London group)	Buncamper, Claes, and Colle (Ghent group)	Lungani, Poncio, and Brassard (Montreal group)	Bowers
Role of the assistant while the main surgeon is progressing with the cavity dissection	Throughout the dissection, the assistant puts downward and forward pressure on the Clutton urethral sound, and keep it in position in the bladder The assistant is pulling the Clutton urethral sound out at the same time the main surgeon is inserting the Langdon retractor	The assistant pulls up the mosquito clamp, only during the first step of the dissection (i.e., when cautery is used for transection of the central tendon of the perineal ligament)	The assistant pull on the Foley catheter which displaces the prostate anteriorly and provides a target for the surgeon; with the other hand, the assistant is pulling the Senn retractor placed below the bulbospongiosus muscle covering the bulbous of the urethra, so to retract it up Later, the assistant is holding the Langenback retractor during phase 4	The assistant maintains the right-angle retractor at a steady 90-degree angle
Fundamental instrument for the cavity dissection	- The Clutton urethral sound used to push the prostate down towards the perineum is probably the fundamental instrument for the cavity dissection - Langdon retractor	- Speculum - Mounted gauze - Dilator	- The Foley catheter used to pull the prostate up and forward is probably the fundamental instrument for the cavity dissection	- Lighted right-angle retractor with a steady assistant - Cautery - Mounted gauze - Dilators
Timing for checking the rectum	At the end of the cavity dissection, only after the Simon retractor and gauze have been inserted	- During bimanual cavity dissection - And at the completion of the cavity dissection	At the end of the cavity dissection	During cavity dissection, while proceeding; since the light retractor is positioned superiorly, the anterior wall of the rectum is always under the visual control of the surgeon, underneath the finger(s) of the nondominant hand

How to check the rectum	- By direct vision of the dissected cavity - By sliding back the lower (posterior) Simon retractor, and holding gauze upward in the cavity (with forceps) to visualized posterior cavity wall (superior Simon retractor stays in place during rectum check, hold by the assistant) - Bimanual intrarectal palpation in rare cases of concerns	- Bimanual palpation, with Index finger of nondominant in rectum, and Index finger of the dominant hand in the cavity - By direct vision of the dissected cavity, rotating the speculum	By direct vision of the dissected cavity -Bimanual intrarectal palpation in rare cases of concerns	- By direct vision of the dissected cavity - Bimanual intrarectal palpation in rare cases of concerns
Minimal depth of the cavity, usually achieved	15 cm	15 cm	15 cm	14 cm

1. *Preoperative radiographic investigation:* Not requested by the experts, though recent literature suggests CT scan of the pelvis for anatomical information [10], particularly useful for less experienced surgeons and anatomical studies.
2. *Phase of cavity dissection:* Divided into three to four phases, dictated by the anatomy, with the initial cut of the central tendon of the perineal ligament being the first phase, and the final deepening of the cavity being the last.
3. *Switching point:* Reaching the prostate is the main switching point, which varies among surgeons between phase 1 and 2 or phase 2 and 3.
4. *Safety:* Surgeons feel safer once they have passed the prostate during dissection.
5. *Prostate as reference:* The prostate is the key reference for the London and the Montreal groups techniques, and it serves as a "switching point" for Dr Bowers, though not a target for dissection. The Ghent group avoids aiming for the prostate.
6. *Retraction:* Instrument retraction with the light retractor and counterpressure from fingers are crucial for Dr Bowers during the first phase. Retraction given by instruments is important in phase 2 and phase 3 of the London group; as well as when the Ghent group is using the speculum in their phase 3; as well as when the Montreal group is using the back of the forceps in their phase 4.
7. *Top-down tissue displacement:* Dissecting by displacing tissue from top to down is key to the Ghent group's technique in phases 2 and 3; it is also performed in Dr Bowers' technique in phase 2 (when using finger and/or mounted gauze), and by the Montreal group in phase 4 (when using the back of the forceps).
8. *Intrarectal positioning of the finger:* It is important to the Ghent group, but not for other specialists. In fact, the Ghent group enters the rectum for the bimanual finger dissection in phase 2. Differently, drapes are not prepared for allowing rectal exploration by the London group and by Dr. Bowers; in fact, these latter surgeons only perform intrarectal examination in rare cases of concern. The Montreal group highlights the importance of bimanual palpation for early-career surgeons.
9. *Mounted gauze:* Used by the Ghent group in phase 3 and Dr Bowers in phase 2. The London and Montreal groups use gauzes to dry blood during the dissection.

   All the experts pack the cavity with gauze, eventually soaked with epinephrine solution, at the end of the cavity dissection.
10. *Dilators:* used in Ghent group's phase 4 (only one dilator) and Dr Bowers in phase 3 (white dilator, then orange dilator, from Soulsource Enterprises).
11. *Standard cavity depth:* Most of the surgeons aim for the depth of 14 cm though the final depth may vary due to factors such as (1) availability and choice of the tissue for lining the cavity; (2) complications, including tissue necrosis and retraction; (3) patient compliance with dilation.

Personal learning curve

I spent most of my training as a plastic surgeon at UZ Ghent under the supervision of Prof Monstrey. My initial experience closely followed the technique described by the Ghent group in Chapter 10. Later, as a fellow at Charing Cross Hospital with Dr Bellringer, I became acquainted with the urological approach detailed in Chapter 9. I also visited several surgeons, including Dr Bowers (Chapter 12). Building on these foundational experiences and ongoing medical education, I developed my personal approach, which is described here.

Personal approach to cavity dissection

As mentioned, the key goals are to dissect a deep cavity without damaging the rectum or the urethra. Rectal damage would be the most devastating complication, which can occur during most of the dissection from the central tendon of the perineum ligament to the level of the prostate. This risk is present whether the surgeon directly aims at the prostate (as with the London and Montreal groups) or aims to avoid it (as with the Ghent group).

Currently, my approach mainly follows Dr. Bellringer's urological technique with some variations [11]. I find the London approach reliable for most patients and very efficient.

My personal variations include: draping preparation to allow for rectal palpation to check for rectal damage and to enable switching to bimanual dissection if required by unusual anatomy; using bipolar forceps for blood coagulation during dissection after passing the central tendon of the perineal ligament; cooling the tissue with saline solution to avoid thermal injury when near the rectal wall.

Specifically, I have incorporated into my practice: switching to blunt bimanual finger dissection, blunt mounted-gauze dissection, using a light retractor for difficult dissections. I am expanding on personal approach in the following section, which is explanatory for the complicated cases.

Complicated cases and switching of the technique

The approaches described by the London and Montreal groups both necessitate the ability to insert a urethral sound or Foley catheter into the bladder. Additionally, the London group's method requires the prostate to be able to move forward, while the Montreal group's method requires the prostate to move upward. In both methods, palpation of the prostate is crucial for accurate targeting.

In rare cases (less than 5%), I found it impossible to insert the Clutton urethral sound, making it impossible to palpate and aim for the prostate. Occasionally, although I could insert the Clutton urethral sound, the prostate was immobile, making it difficult or impossible to feel (I have no personal experience with attempting to pull the prostate upward using the Foley catheter as described by the Montreal group.)

More frequently, the prostate was either small or had a soft consistency, making it challenging to palpate and target, despite the ease of inserting the Clutton urethral sound and the prostate's mobility. Additionally, the presence of fat tissue, especially in patients with a high BMI, can reduce the space needed to insert a finger for palpating the prostate, particularly if the prostate is located deeper than usual.

The techniques described by the Ghent group and Dr Bowers offer an advantage as they do not depend on prostate mobility to guide the dissection. Therefore, in cases of urethral or prostate anomalies, the dissection can proceed as usual.

To address these difficult situations while performing a cavity dissection using the London group's approach, I adopt alternative techniques and steps, some of which are variations of the London group's approach, while others derive from the Ghent group's techniques. These approaches include:

- Inserting the urethral stent under the control of one finger placed in the initially dissected cavity to guide the urethral sound in the most anterior part of the urethra (rarely needed).
- Inserting the urethral stent under the control of a finger placed in the rectum to guide the urethral sound in the most posterior part of the urethra.
- Performing rectal palpation of the prostate when the urethral sound is not inserted, as the intrarectal finger would palpate the sound itself, making it useless if inserted.
- Conducting bimanual finger dissection without the urethral sound.
- Using mounted gauze dissection without the urethral sound.
- Employing a light retractor in the dissected cavity as described by Dr Bowers.
- Using an intrarectal Hegar dilator to show the rectal posterior wall (rarely used).

These alternative methods help navigate the challenges presented by difficult cases, ensuring the dissection process can continue effectively.

Re-do cases

An additional challenge arises with redo cases in genital gender-affirming surgery. Key issues include dealing with scar tissue from previous dissections and choosing the appropriate surgical approach for redissection. Redissecting a cavity filled with scar tissue poses difficulties due to inconsistent anatomy, the absence of natural planes for dissection, and challenges in identifying reference structures.

Redo cases can be categorized as follows:

1. *Patients who initially received vulvoplasty.* For these patients, the challenge is relatively minor. The surgeon will only encounter scar tissue during the initial few centimeters of dissection—specifically, until reaching the point where the previous surgeon's dissection ended. This point could be near the prostate. Beyond this area, the anatomy is typically untouched.
2. *Patients who dad a deep cavity and want it deepened.* In this scenario, a new dissection is necessary starting from the bottom of the original cavity. The only scar tissue may be located just behind the bottom of the existing vagina, unless:
   - The initial deep cavity was not fully lined.
   - The lining of the original vagina has retracted due to noncompliance with dilation or necrosis of the deepest part of the lining tissue (e.g., necrosis of an additional skin graft behind the inverted penile skin flap).
3. *Patients who lost most of the original depth.* This category encompasses cases with or without complications (such as flap or graft necrosis, rectal damage, or rectovaginal fistula). In these cases, most of the new dissection will occur within scar tissue.

Specifically, if the original surgery was complicated by a rectovaginal fistula, and the affected rectal tract was not resected during repair, the rectal wall remains a site of lower resistance, increasing the risk of further rectal damage.

According to Refs. [6,7], the risk of intraoperative rectal perforation is higher in secondary cases. The risk is 10% when laparoscopic dissection is used for intestinal vaginoplasty and 19% with standard perineal dissection for full-thickness skin grafting.

Our team's experience at Sahlgrenska University Hospital is similar. I generally prefer direct dissection and skin grafting for cases where a vulvoplasty was previously performed or when only minor deepening is required.

For full redos, our multidisciplinary team opts for laparoscopic dissection and intestinal or peritoneal vaginoplasty. Dissection via a perineal approach can be challenging, as it may be difficult to feel or mobilize the prostate, necessitating rectal palpation or intrarectal Hegar dilators for visualization. Techniques such as bimanual finger dissection or mounted gauze dissection may be ineffective due to hard scar tissue. In such cases, the approach described by Bowers—using a light retractor and cautery—might be safer, possibly supplemented by rectal palpation.

Finally, when a laparoscopic approach is chosen, dissection can be performed from both perineal and intraabdominal approaches. Instruments inserted by the surgeon via the perineal approach can guide the general surgeon in laparoscopic dissection, and vice versa.

Conclusion

Dissecting the cavity remains one of the most challenging aspects of genital gender-affirming surgery for AMAB individuals with gender dysphoria. It demands advanced anatomical knowledge and surgical skills. Expert groups have highlighted that, while approaches may differ, avoiding rectovaginal fistula while creating a deep cavity is a common concern. Despite variations in instruments and techniques, these procedures generally achieve good results with cavities usually deeper than 14 cm and a low risk of complications such as rectovaginal fistula.

Future scientific work should focus on providing detailed descriptions of challenging cases and additional strategies for addressing them. The insights and videos from these expert groups are invaluable resources for surgeons seeking to learn or refine their techniques for cavity dissection in genital gender-affirming surgery.

Funding

No external funding was received, or used, to facilitate the making of this study.

Disclosure

The authors declare no conflicts of interest.

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CHAPTER

14

Scrotal flap and skin grafts in gender-affirming vaginoplasty

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Introduction

Gender-affirming vaginoplasty serves two functions in parallel: (1) it eliminates the genital anatomy associated with the sex that the patient was assigned at birth, which is a significant source of gender dysphoria for many patients; and, (2) it creates normal-appearing and normal-functioning female genital anatomy [1–4].

There are numerous decision-making considerations for the patient to consider when deciding between feminizing surgery with versus without a vaginal canal. When a patient has finally decided to undergo genital gender-affirming surgery with creation of a vaginal canal, there are numerous planning and operative considerations for the surgeon to consider as well [5].

In this chapter, we begin by reviewing specific examples of key decision-making considerations patients must consider before finalizing a plan for genital gender affirming surgery with creation of a vaginal canal. We then focus on answering important questions associated with the use of skin to line the neovaginal canal space: (1) what mean vaginal canal depth can be reasonably expected with creation of a neovaginal canal; (2) we review our algorithm for deciding whether it is necessary to harvest skin from elsewhere besides the penis to line the neovaginal canal space, and, deciding what skin and surgical approach to use; and (3) we review two approaches utilizing scrotal skin to augment vaginal canal depth, with an emphasis on specific strategies to *maximize* depth.

A separate chapter is discussing genital gender-affirming surgery for assigned-male-at-birth (AMAB) persons with gender dysphoria (GD), and who do not wish to have neovaginal canal creation (also referred to as vulvoplasty).

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https://doi.org/10.1016/B978-0-443-21776-0.00014-5

Considerations for the surgeon

How much depth can normally be achieved with vaginoplasty?

To answer this question, it is important to consider the anatomy of the neovaginal canal space. The canal space is bordered anteriorly by the bladder and prostate, posteriorly by the rectum, which is covered by Denonvilliers' fascia [4,6].

Our experience during salvage vaginoplasty using an intestinal segment has shown that the distance from the vaginal introitus to the deepest part of the rectovesical peritoneal fold (Pouch of Douglas) is 10–12 cm (4.0–4.75 inches) (Fig. 14.1), as measured from where the vaginal canal passes the labia majora [7].

The mean intraoperative vaginal canal depth we achieve is approximately 15 cm (SD 1.1 cm) (Smith et al.; see Fig. 14.2) [7–9].

Our algorithm deciding on what skin and surgical technique to use

After a patient has decided that she wants to undergo genital gender-affirming surgery with vaginal canal creation, the surgeon must consider what skin to harvest to line the vaginal canal space with, and by what surgical technique [6].

The first consideration is whether the penis has sufficient width (i.e., girth) to accommodate a partner's erect penis (mean erect penis girth is 12 cm) during vaginal receptive intercourse. A simple measure for this is to examine the penis preoperatively. If visual inspection concludes that the penis is likely too narrow to accommodate an even moderate size penis, then, the surgeon should consider detubularizing the penile skin (to ensure that it can at least be used to cover the vulva), and then plan how to create the vaginal canal. The available options to line the vaginal canal are use of scrotal skin as a pedicle flap, versus use of scrotal skin

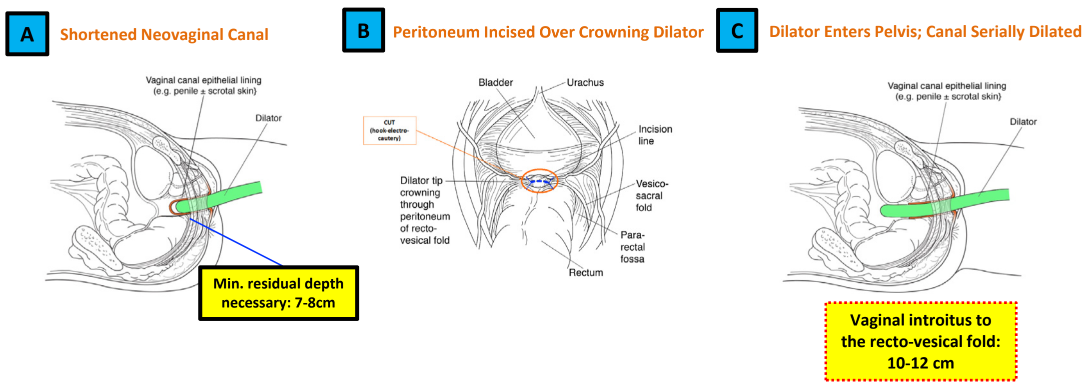

FIGURE 14.1 How we measured the mean distance between the vaginal introitus and the recto-vesical fold (Pouch of Douglas) among transgender women undergoing salvage vaginoplasty. In all cases, we were tasked with recreating a vaginal canal space following PV with and without scrotal skin. In all cases, we inserted a vaginal dilator with length markers from the dilator tip, into the vaginal canal space (a); the dilator was inserted until its tip could be seen crowning at the junction of the neovaginal canal space and recto-vesical fold (b); we found the mean length of the neovaginal canal space to the deepest part of the Pouch of Douglas was 10–12 cm (c).

Primary Vaginoplasty: Vaginal Depth							
		Tissues Utilized			Depth Measurement Standardized?	Intra-Op Mean Depth, cm (SD)	Long-Term Follow-Up Mean Depth, cm (SD) [days]
1	Buncamper *et al*, 2017 (n=100)	Penile skin	-	-	Yes	13.8 (1.4)	11.5 (2.5) [365]
		Penile skin	Scrotal skin	-			
2	Huang *et al*, 2023 (n=28)	Penile skin	Scrotal skin	-	Yes	12.7 (1.5)	11.9 (3.2) [217]
3	Smith *et al*, 2022 (n=60)	Penile skin	Scrotal skin	-	Yes	15.6 (1.1)	12.5 (1.7) [156]
4	Jacoby *et al*, 2021 (n=41)	Penile skin	Scrotal skin	Peritoneum	No	Unknown	14.2 (0.7) [114]

FIGURE 14.2 Average and standard deviation (SD) intraoperative and long-term follow-up neovaginal canal depth in studies utilizing penile skin, scrotal skin, (studies 1–3), and peritoneum (4); there was a nonsignificant contribution of peritoneum to final neovaginal depth in the study by Jacoby et al.

as a full-thickness skin graft (FTSG) (these techniques are discussed in the following) [6]. An FTSG can also be harvested from other glabrous part of the body, such as lower abdomen, groins, etc. There is no study in the scientific literature comparing grafts from different body parts for lining the vaginal cavity.

Another consideration for the surgeon is penile skin length (will it reach the vaginal introitus and is there sufficient penile skin to line the entire vaginal canal to yield satisfactory vaginal depth). The average length of an erect penis in the United States is 5.2 inches (13.2 cm) [10]. While it is not clear how much vaginal depth a vagina should have for satisfactory receptive vaginal intercourse, a reasonable estimate is that the neovaginal canal should offer at least 4 inches depth, and ideally 5.0–5.5 inches depth [1,6,7,11,12].

If the patient is circumcised, she will nearly always require harvest of additional skin to augment the penile skin to line the neovaginal canal space. A simple measure to confirm how much of the vaginal canal space the penile skin will help line is to pull the head of the penis to the location of the vaginal introitus. All penile length beyond what reaches the introitus will contribute to lining the vaginal canal.

Two approaches for using scrotal skin to augment neovaginal canal depth: the scrotal skin pedicle flap and the scrotal skin full thickness skin graft

When there is insufficient penile skin to line the neovaginal canal space with, scrotal skin can be used in one of two ways: as a pedicle flap, and as a full-thickness skin graft (FTSG). (Figs. 14.3 and 14.4).

Fig. 14.5 reviews the details of the scrotal skin pedicle flap. The skin is incised along the hatched lines but remains *intact over* a ~1.5-cm-wide segment at the flap base. The skin for the flap is stretched and ink-marked to be 12 cm in width, which corresponds to the mean circumference of an erect penis. The posterior limit of the flap is the same as for the vaginal introitus with any vaginoplasty: 2 cm anterior to the anterior anal ridge. The blood supply to the pedicle flap is preserved at two points: (1) through the 1.5-cm-wide skin

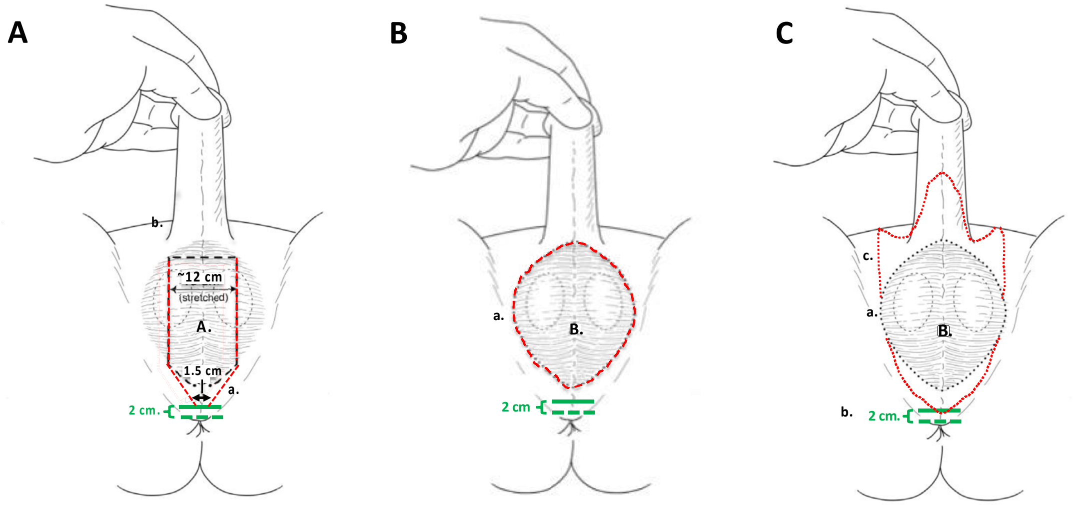

FIGURE 14.3 (a) Scrotal skin can be harvested as a *pedicle-flap* based of a ~1.5 cm posterior base utilizing a midline segment of scrotal skin with blood supply preserved through the 1.5 cm base and through Scarpa's fascia located along the posterior ends of the lateral edges of the flap; (b) scrotal skin incision can be extended either as a pedicle flap based posteriorly, or as a *full-thickness skin graft (FTSG)*, or (c) an FTSG maximizing skin from the proximal third of the ventral penile shaft skin and posteriorly beyond the border of scrotal skin (red-hatched line).

segment at the base of the flap, and (2) through preserved Scarpa's fascia located along the posterior ends of the lateral edges of the flap. Here, Scarpa's fascia is left intact as much as possible beneath the skin incisions, to augment blood supply to the flap.

If desired, the pedicle flap can be lengthened by extending its boundaries anteriorly, to incorporate the skin between the base of the penis and scrotum, and even, to incorporate the proximal third of the ventral penile shaft skin (semitransparent dotted arrows). This is because skin from the proximal third of the penile shaft *does not contribute to the lining of the vaginal canal.*

The scrotal skin pedicle flap is sutured to the end of the detubularized penile skin flap (Fig. 14.5).

A common challenge is determining how to maximize how efficiently the graft is used. A limitation of the scrotal skin pedicle flap is that, because the flap is never defatted, it cannot be stretched as far lengthwise and sideways, as could be done when we utilize scrotal skin as an FTSG [6]. Though there are no studies to cite for this, our personal experience has consistently been that defatting an FTSG results in an approximately 10%−15% increase in length.

In Fig. 14.4a, we see that all of the skin of the scrotum is outlined with an ink pen and is incorporated into the FTSG. The posterior limit of the graft harvest site can be extended posteriorly to the appropriate location of the vaginal introitus with any vaginoplasty: to 2 cm anterior to the anterior anal ridge. When the amount of either penile shaft and/or scrotal skin is limited, the FTSG graft harvest area can be maximized by incorporating skin anterior to the scrotum and posterior to the scrotum (*red asterisk*). The FTSG harvest area can include skin at the proximal third of the ventral aspect of the penile shaft because when this skin is

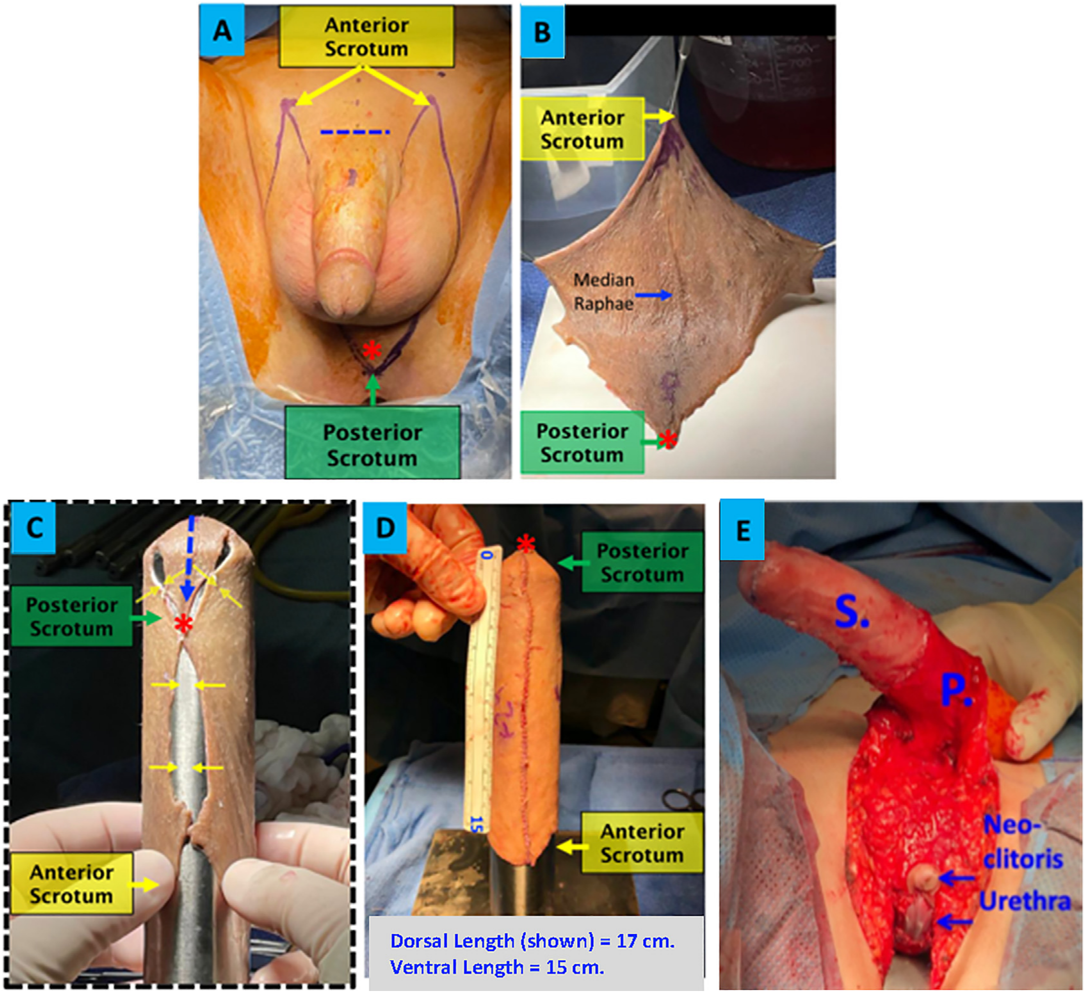

FIGURE 14.4 (a) The scrotal skin FTSG harvest site is outlined with an ink marking pen. The base of the penis is shown marked with a blue hatch line. The anterior (cephalad) limit of the FTSG area can be extended anteriorly to maximize FTSG area with the posterior (caudal) limit being 2 cm anterior to the anterior edge of the anus (*red asterisk*); (b) the FTSG is harvested as a single piece; (c) the FTSG is draped upon a custom-made metal graft stand (or similar dilator) 12 cm in circumference. We have found that positioning the FTSG in exactly this orientation with the posterior scrotum at the top of the stand maximizes final tubularized FTSG length, and if the edges at the end of the FTSG do not approximate easily (e.g., narrow scrotum), the very end of the FTSG (*red asterisk*) can be pulled downward, until the graft edges approximate easily (*top yellow arrows*), with any redundant skin ("dog ears") can be excised so with final suturing, the skin tube is smooth; (d) typically, the dorsal side of the skin tube (intact, unsutured) is *longer* than the ventral side (i.e., side shown in "c"). This asymmetry is useful, because the longer end of the penile skin tube (i.e., the ventral end corresponding to the penile frenulum) can be joined to the shorter (ventral) end of the FTSG tube; (e) penile (P) and scrotal skin (S) sutured together upon a dilator, before they are inserted into the canal space.

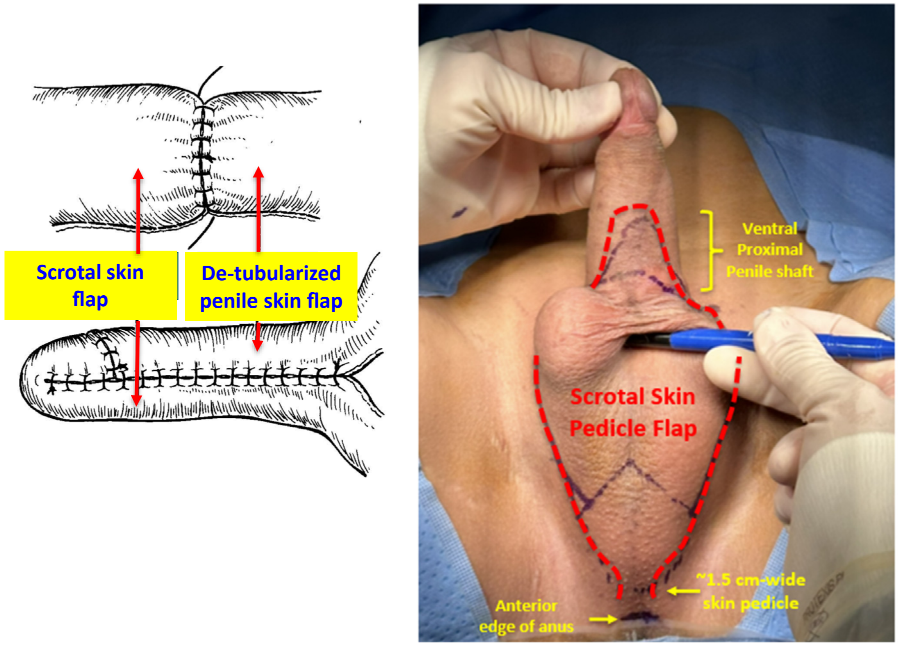

FIGURE 14.5 The pedicle segment of scrotal skin will be anastomosed to the intact penile shaft skin (tube). The scrotal segment will comprise the ventral aspect of the vaginal canal skin lining, in addition to the portion of the dorsal aspect of the canal. Note that the scrotal skin flap can be extended to include the proximal third of the ventral portion of the penile shaft, as, in our experience, the proximal third of ventral shaft skin is typically divided during inversion, and does not contribute to vaginal canal depth.

instead left intact with the penile shaft skin (as a tube that is inverted), it does not contribute to the lining of the vaginal canal. This is because during penile inversion, the ventral shaft skin at the proximal third of the shaft ends up residing on the posterior aspect of the vaginal introitus, where it has no functional or specific esthetic contribution. In our practice, if we do not utilize it for an FTSG, we typically excise and discard this skin.

The functional area of the FTSG is maximized when it is harvested as a single piece of skin [1,6]. Fig. 14.4 describes specific strategies to maximize the FTSG area. We have found that harvesting the FTSG as a single piece of skin, and then mounting it upon a graft stand, helps to maximize graft area. The anterior and posterior limits of the FTSG harvest area can be extended anteriorly and posteriorly.

The FTSG must be defatted before it can be used. All adipose and connective tissue deep to the dermis layer is excised sharply with scissors (Fig. 14.6). It is helpful to defat the graft on a hard plastic platform, and to use microserrated surgical scissors to defat the graft. If the graft is accidentally "button-holed," the hole can easily be sutured closed with a 3-0 Vicryl suture. The graft should be thoroughly defatted up to and including its deepest dermis layer [1,6].

In previous work by our group, we have shown that the length of scrotal skin tube that can be created intraoperatively corresponds to approximately 59% of the midline preoperative scrotal skin length (Fig. 14.7). Knowing this, it is possible to examine a patient's scrotal skin length (preop) and conclude how long a skin tube will result [6].

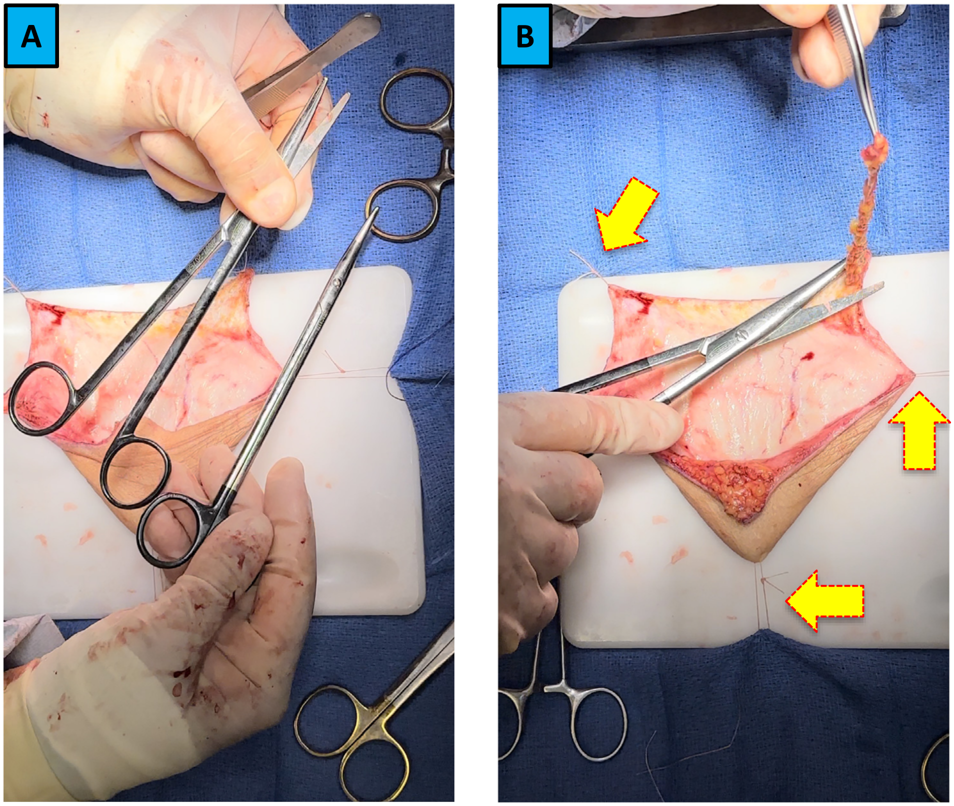

FIGURE 14.6 (a) Microserrated curved black-handle scissors (heavy and medium-weight) are our favored instrument to defat full-thickness grafts as they prevent tissue slippage during cutting, and cuts soft tissue more finely with less effort; (b) grafts can be defatted on a hard-plastic cutting board, using 2-0 Vicryl sutures (secured to the drape beneath the board; *yellow arrows*) to stretch the graft flat, to prevent full-thickness cuts ("button-holing") of the graft.

Scrotal skin length measured during pre-op clinic visit, and intra-op scrotal skin tube length

Pre-Op Midline Scrotal Skin Length & Intra-Op Tubularized Scrotal Skin Length (n = 46)			
Mean Pre-Op Scrotal Skin Length cm (SD)	Mean Intra-Op Scrotal Skin-Tube Length cm (SD)	Ratio of Intra-op Scrotal Skin Tube Length to Pre-Op Midline Scrotal Skin Length	Correlation Coefficient
21.6 cm (2.5)	12.7 cm (2.3)	0.59	0.41 (P = .005)

FIGURE 14.7 Measured preoperative AP skin length compared with final skin tube length showing ratio of skin length to tube length ($P = .005$).

The tubularized FTSG is then sutured (3-0 Vicryl suture, running–locking) to the inverted terminus of the penile skin tube over a dilator. Our practice is to spatulate each of the four quadrants. After suturing the penile skin tube to the FTSG over the dilator, the new penile + scrotal skin tube is inserted into the vaginal canal space. To create a window to expose the clitoris and urethra, midline skin (originally dorsal penile shaft skin) overlying the detubularized urethra is marked at midline and incised between the location of the clitoris (anteriorly) and the intact (i.e., still tubular) urethral opening (posteriorly), and each skin edge of the incision is sutured to the ipsilateral edge of the detubularized urethra using a running–locking 2-0 Vicryl suture. After this is completed, the new single skin tube is delivered into the vaginal canal space [6].

The vaginal canal is then packed with two vaginal tapes sutured together and coated in silver sulfadiazine cream (is rich in wound-healing vitamins and creamy texture facilitates packing insertion and removal). Next, we insert two 15-Fr round perforated closed-suction wound drains along the 3 and 9 o'clock locations along the vaginal canal. The drains are inserted through the perineum, and each is secured to the skin with a 2-0 Nylon drain suture. Undrained fluid beneath the FTSG is a significant risk factor for failure of graft "take." Therefore, the drains are left in place for 6 days, by which time drain output is invariably minimal to zero.

We do not suture or otherwise anchor the vaginal canal skin tube. Instead, we leave the packing in place for 6 days and then simply remove the packing. The packing is held tightly in place by 4-inch-wide foam tape strips, laid on each buttock, crossed over to the opposite side of the body at the perineum, and then secured to the contralateral anterior abdominal wall, below the level of the inframammary folds. The end result looks like a foam-tape "bikini-bottom." This dressing obviates the need for suturing the labia closed together to hold the packing in place. In 12 years of performing vaginoplasty, we have never experienced prolapse of an FTSG neovaginal canal by this method.

Instruments: We prefer to use microserrated curved black-handle scissors to defat grafts on a hard-plastic cutting board (Fig. 14.6).

Comparison of techniques: scrotal skin pedicle flap versus scrotal skin FTSG

We strongly favor use of scrotal skin FTSG over the scrotal skin pedicle flap we describe for several reasons: (1) the pedicle flap tends to be bulky, as its adipose tissue layer remains intact; (2) a pedicle flap does not appear to yield as long a graft as when the scrotal skin is defatted. Hence, in our view, an FTSG yields a larger graft length and area; (3) a pedicle flap is at greater risk of complete or even just partial prolapse, as the majority of its underside is adipose tissue lined.

One advantage of the scrotal skin pedicle flap is that it is likely better for use to line the vulva (when there is a significant paucity of penile skin to do so), as compared with FTSG. FTSG has relatively poorer "graft take" on the vulva as compared with within the vaginal canal space. The more robust and immediate blood supply of the pedicle flap may make it a better option to line the vulva [1,2,4,6].

Use of extragenital tissues, and management of loss of vaginal depth

Some surgeons advocate for using peritoneum, together with penile skin and scrotal skin, at primary vaginoplasty to line the vaginal canal [11,12]. We strongly disagree with this approach of routinely using peritoneum at first-stage surgery because, in our experience, scrotal skin, used as an FTSG, nearly always provides an excess of skin to line the vaginal canal [6,7]. We feel that, in addition to there being no obvious benefit to using peritoneum with primary vaginoplasty, it make much more sense to reserve the availability of the peritoneum for when it is absolutely necessary and useful: such as when patients lose a portion of their neovaginal depth after primary vaginoplasty [7,9]. Routine use of peritoneum with primary vaginoplasty precludes its use later to treat postvaginoplasty loss of vaginal depth with the latter occurs. Our approach to management of postoperative loss of vaginal depth is shown in Fig. 14.8.

Our review of the literature suggests that no series using peritoneum to augment vaginal canal depth has proven to yield long-term depth greater than what can be achieved by penile inversion vaginoplasty augmented with use of scrotal skin; both techniques yield a maximum long-term vaginal depth of 11–13 cm (Fig. 14.9). We hypothesize that this is likely because 12–13 cm is the distance from the vaginal introitus to the rectovaginal fold, and peritoneum or skin placed deeper into the vaginal canal than this depth will not be sufficiently well supported by tissue to allow for long-term survival. Given that scrotal skin grafts are typically

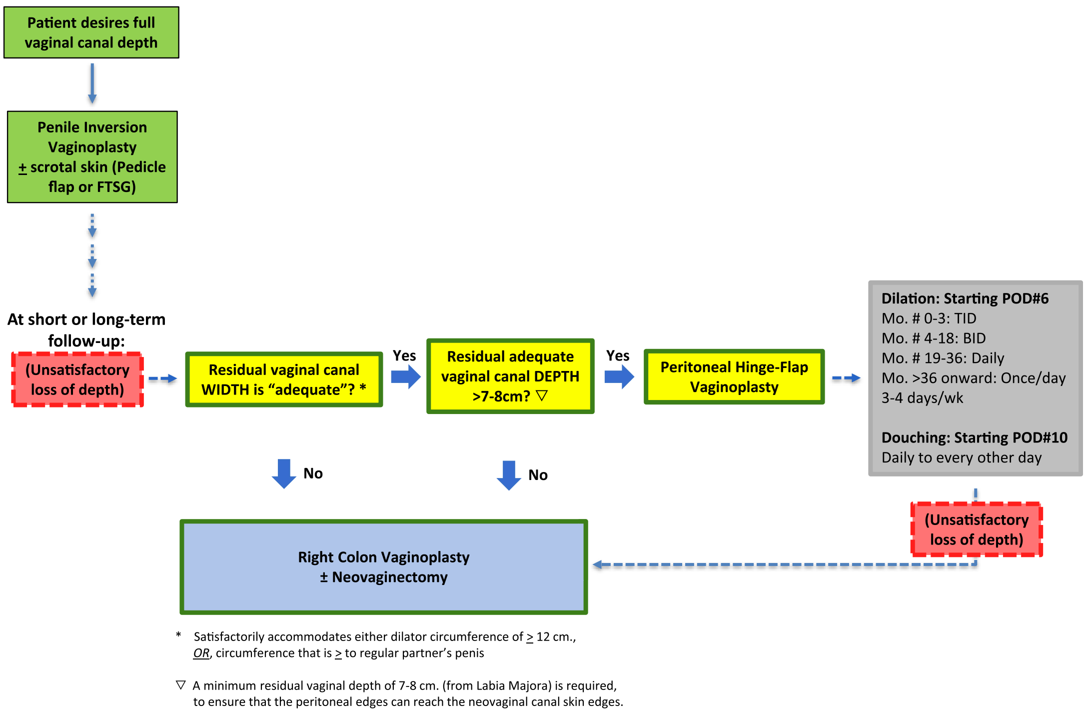

FIGURE 14.8 Loss of depth after full-depth vaginoplasty management algorithm.

Salvage Peritoneal Vaginoplasty				
	Depth Measurement Standardized?	Pre-Op Mean Depth, cm (SD)	Immediate Post-Op Mean Depth, cm (SD)	Long-Term Follow-Up Mean Depth, cm (SD) [days]
Modified Davydov Pull-Through				
Dy *et al*, 2021 (n=24)	No (Pt. self-reported)	*Not reported (“median range: 9.7–10.8”)*	*Not reported*	13.6 Range: 10.9– 14.5 [410]
Huang *et al*, 2023 (n=19)	Yes (Labia)	*Not reported*	13.1 (0.6)	11.0 (4.0) [210]
Urachus Flap				
Smith *et al, 2022* (n=14)	Yes (Labia)	9.2 (1.5)	15.1 (2.2)	12.5 (2.1) range: 10–16.5 [409]

FIGURE 14.9 Comparison of immediate postoperative and long-term vaginal depth outcomes among salvage peritoneal vaginoplasty series using the modified Davydov pull-through peritoneal vaginoplasty technique versus the urachus-based peritoneal hinge-flap technique—Note that with nearly identical duration of extended follow-up, with a similar neovaginal depth across all series, and ranges from 11 to 13.6 cm (4.33—5.35 inches).

sufficient to line in excess of 13 cm vaginal depth, and given the lack of published evidence that routine use of peritoneum at primary vaginoplasty yields any specific advantage, we conclude that there is no need to routinely utilize peritoneum (or other extragenital tissues) at time of primary vaginoplasty. Instead, these should be reserved for either the rare primary vaginoplasty where they are necessary, such as with extreme genital hypoplasia, or, for secondary (salvage) vaginoplasty.

Conclusions

The surgeon must consider the patient’s genital anatomy and available skin and skin reach when planning surgery to create a vaginal canal. It is useful to use, or create one’s own, decision-making algorithm for choosing the appropriate skin source and surgical approach. Scrotal skin is typically abundant and can be stretched as needed for use in reconstructive surgery. While a scrotal skin pedicle flap and scrotal skin FTSG are viable options, we favor use of the scrotal skin FTSG, as this option maximizes net graft coverage area and, when properly defatted and supported with judicious use of surgical drains, appears to have excellent outcomes. Because scrotal skin grafts typically yield sufficient skin to line the maximum achievable vaginal canal depth, extragenital tissues such as peritoneum should not be routinely used at time of primary vaginoplasty and should instead be reserved for use as salvage surgery if and when it is needed to treat postoperative loss of vaginal canal depth.

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CHAPTER

15

Shallow-depth vaginoplasty: Nomenclature, patient decision-making, and surgical technique

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Introduction

Gender-affirming vaginoplasty serves to eliminate the genital anatomy associated with an individual's sex assigned at birth, which is a key source of gender dysphoria for many patients. This complex surgery serves to create normal-appearing and functioning external female genital anatomy.

In previous work querying transgender women seeking genital gender-affirming surgery, our group found that, for patients, the three highest priorities related to the surgery, in ranked order of importance, were: (1) to eliminate any visible genital anatomy associated with their assigned birth-sex (which for most is a regular source of gender dysphoria); (2) to obtain normal externally visible female genital anatomy; and (3) to preserve erogenous genital sensation capable of providing orgasm. We found that the strongest predictor for whether or not a woman prioritized creation of a vaginal canal depended on whether her sexual interests included partners (male or female) with a penis [1].

Despite many patients having interest and preference for vaginoplasty without a full-depth vaginal canal, no publication to date has described a surgical technique specific to create female genital anatomy without a vaginal canal. In this chapter, we describe a novel surgical technique to simply and effectively create a natural-appearing recessed vulva with a vaginal dimple: we name it *shallow-depth vaginoplasty (SDV).*

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00015-7

Nomenclature for this surgery: What, why, and why is it important?

As a gender-affirming genital surgery, the term "vaginoplasty" has historically referred to a compilation of several surgeries performed at once, which eliminates a list of male anatomic structure and includes tissue rearrangement of the tissues preserved. The first descriptions of vaginoplasty included dissection of a vaginal canal space and creation of a vaginal canal. Over time, the term "vaginoplasty" has become synonymous with feminizing genital gender-affirming surgery. In this chapter, we refer to vaginoplasty as "full-depth vaginoplasty" (FDV), to differentiate it from SDV.

To our knowledge, aside from Stelmar et al.'s work from our group [1], no other publication has described a surgical technique specific for feminizing the genitalia, without a vaginal canal; and none has described a technique for creating a recessed vaginal introitus, without a full-depth canal, such as the hereby described SDV.

Vulvoplasty refers to a surgical procedure aimed at creating or reconstructing the external genitalia, and it involves the construction of a vulva, which includes the labia majora, labia minora, clitoral hood, and clitoris, without the creation of a vaginal canal.

Literature can also refer to this procedure as "zero-depth vaginoplasty," "minimal-depth vaginoplasty," and "shallow-depth vaginoplasty." However, these terms may not be accepted by some surgeons, as some may feel that female genital anatomy that lacks a vaginal canal should not be associated with the term "vaginoplasty". By contrast, it is our view that, regardless of the presence or absence of a vaginal canal over the several decades since surgery to eliminate male genital anatomy and replace it with female genital anatomy was first described, *patients* refer to the latter as "vaginoplasty". Furthermore, while *surgeons* reserve the term "vagina" to refer only to the vaginal canal space and its tissue lining, *patients* (and lay people) commonly use the term "vagina" to refer the visible portion of the female genitalia (i.e., the vulva). Given this, (some) patients may expect that the surgical term for their new genitalia (with or without a vaginal canal) to include the word "vagina", and so including the word vagina when referring to vaginoplasty without creation of a vaginal canal likely has a normalizing, "validating" effect. Accoridng to the Authors of this Chapter, the terminology we use with patients should serve patients first and foremost (Note of the Editors: according to the Editors of this book and to other experts, further discussion among stakeholders, such as healthcare providers and patients, is needed in order to reach a 'nomenclature consensus').

Are SDV and FDV "very" different?

The facts are that: (1) both of these surgical techniques include the same long list of procedures to remove male anatomic structures and creation of normal female genital anatomy; (2) there is no *visible* difference between either option (when a vaginal dimple is created in the absence of a canal); and (3) our technique yields a dimple (vaginal introitus) that can be digitally recessed by approximately 4–6 cm, which does result in very limited (but not zero) vaginal "depth." We argue that these procedures, SDV versus FDV, have many more commonalities, than differences. In fact, the only difference is that one has a full-depth vaginal canal (i.e., of sufficient depth for receptive vaginal intercourse) that has to be dilated and douched, while the other does not have a canal, and does not require dilation and douching.

What terminology do patients prefer, and why?

It is also very important to consider how patients wish to refer to these surgical procedures.

A study by Stelmar et al., from our group, queried patient preferences regarding terminology for what we choose to term “SDV” (Fig. 15.1) [1]. The term that the majority of patients selected as their “most preferred” was “shallow depth vaginoplasty.” We observed a trend where terminology that did not include a reference to the “standard” procedure, which they were choosing an alternative to vaginoplasty, was rated with the lowest favorability [1].

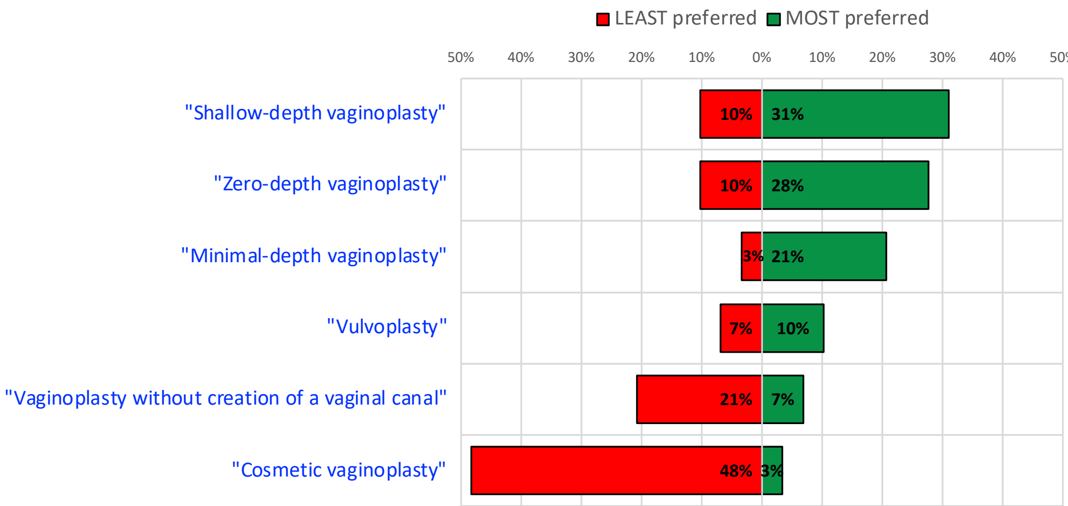

FIGURE 15.1 A total of 29 consecutive trans-women who presented to our practice to discuss undergoing vaginoplasty surgery were asked, via an online questionnaire hosted by an anonymous survey platform (Qualtrics, United States), to review the list of six different names for vaginoplasty surgery that does not include creation of a vaginal canal (These terms were gathered from the peer-reviewed literature and from scientific abstracts presented at gender-affirming surgery-related meetings.). Each of our patients was asked to identify which of the six names they *least preferred* (*red*), and which single name *most preferred* (*green*) for use by patients and doctors when referring to this surgery. “Shallow-depth vaginoplasty” was designated as “most preferred” most often (by 31% of subjects), while “cosmetic vaginoplasty” was both the least liked and most disliked. “Minimal-depth vaginoplasty” had the highest ratio of *most* divided by *least* liked. *Reproduced from J. Stelmar, S.M. Smith, G. Lee, M. Zaliznyak, M.M. Garcia. Shallow-depth vaginoplasty: preoperative goals, postoperative satisfaction, and why shallow-depth vaginoplasty should be offered as a standard feminizing genital gender-affirming surgery option. J. Sex. Med. 20 (11) (2023) 13331343.*

How should our field approach surgical terminology?

While it is ideal to have a single name for this and other new gender-affirming surgical procedures for consistency in the scientific literature and common reference, we suggest that the top priorities when selecting patient surgery terminology should be the following (in order of importance):

1. Acceptable to and without negative connotations for patients: The term should include some degree of patient-population preference.
2. Clear and descriptive: The term should accurately describe the procedure.
3. Gender-affirming: The term should reflect positive body image and affirm the patient's gender identity.
4. Understandable by patients: The term should avoid obscure scientific language that the average patient might not understand.

The process of naming many reconstructive surgeries is less often scientific, and more often discretionary (e.g., "metoidioplasty") or simply based on popularity. Consequently, our field has latitude to utilize terminology that prioritizes patient preferences. Prioritizing the patient is a foundation of "patient-centered care."

We cannot be sure that "shallow-depth vaginoplasty" is necessarily the *best* term for this surgery, but it has advantages: it is descriptive about its defining feature (shallow and not full vaginal depth), by virtue of including the term "vaginoplasty" it is not as "othering" as terminology that does not include "vaginoplasty," and it does the latter without terms that could potentially be construed as "negatives" by patients, such as *"zero depth," "vulva only," "cosmetic," etc.* Whatever terms we ultimately utilize for this and other new surgeries should reflect consideration of patient preference and acceptance.

Should both SDV and FDV be always offered?

It is important to emphasize that the choice of which surgery an individual undergoes is entirely their own. It is our practice to explicitly state this to patients—that we as providers cannot, and should not, direct or recommend one surgery over the other. Rather, our role as providers is to provide as much information as possible about any and all published surgical options, objectively and without bias. We also tell patients that we will discuss options we do not offer, and share why it is our practice to either not offer a given option, or, why we offer it in a different manner. The rationale for stating the latter explicitly is to affirm our commitment to transparency, objectivity, and patient-centered care.

Patient priorities will always vary across individual patients. This is because all patients are unique with respect to what benefits each prioritizes from their surgery, and their willingness to accept costs and risk.

In our practice, approximately 50% of patients who seek any type of feminizing genital gender-affirming surgery elect for a genital gender-affirming surgery without creation of a vaginal canal. When we queried the subset of transgender patients who sought genital gender-affirming surgery *without* creation of a (full) vaginal canal (such as SDV—as we name and describe it, or vulvoplasty—as named by other surgeons), we found that the fourth and fifth highest-ranked priorities on which they based their decision for surgery were #4: the ability to forego having to perform long-term vaginal dilation, and #5: the ability to forego having to perform long-term vaginal douching [1].

The creation of a full vaginal canal carries unique complication risks, each potentially requiring prolonged recovery and additional corrective surgeries that SDV does not entail. For example, having a vaginal canal requires a regular, lifelong commitment to vaginal dilation and douching [2–5]. Without dilation the tissues lining and/or surrounding the vaginal canal will contract and narrow the canal lumen, resulting in loss of depth and width, which impedes receptive vaginal intercourse. In addition, as the neovaginal canal is lined by skin, commonly penile and/or scrotal skin, this produces waste (i.e., sloughed skin cells, sweat, and oil), that, if not washed away with regular douching, accumulates and promotes bacterial growth, which produces a foul odor and often leads to infection, inflammation, foul discharge, and discomfort [1,3,6–9]. The risk of infection increases significantly when patients develop hair growth upon the skin, which lines the canal as hair follicles serve as a nidus for bacteria. Even vaginal canals lined by intestinal segments continually produce mucus, which if not evacuated with regular douching, we believe, causes "diversion colitis," a nonspecific inflammatory reaction associated with pain and intestinal segment bleeding, and can result in mucocele development [10].

A vaginal canal is also associated with unique complication risks, each of which requires prolonged recovery and additional corrective surgeries, that the alternative, genital gender-affirming surgery without a canal, or with a shallow-depth, does not have [1,11,12]. Examples include the risk of intraoperative rectal injury, risk of loss of depth and/or width, risk of vaginal introitus stenosis, risk of requiring a significantly greater number of required postoperative visits as compared with vaginoplasty without a canal, and risk of vaginal canal infections, foul odor, and discharge [5,10,13].

Indeed, genital gender-affirming surgery with and without creation of a vaginal canal has important commonalities as well, including benefits and common risks.

Creation of a neovaginal canal is an important decision that each patient must consider thoughtfully. It is simply not reasonable to assume that *all* transfeminine patients seeking vaginoplasty desire a vaginal canal *and* that they are willing and able to perform dilation and douching of a vaginal canal on a long-term basis [1,2,4,7,8,14]. There are many different possible reasons for why some patients may not want a vaginal canal. There is truth to the adage "we don't know what we don't know." As surgeons, we must accept that we often won't anticipate or know a patient's reasons for choosing one surgery over another. It is not realistic for a surgeon to expect to know what is best for a patient. Such expectations reflect a paternalistic, outdated approach to medicine that is not in step with modern, patient-centered, gender-affirming, respectful medical care [15]. Some patients may find discussing the basis for some of their decision making deeply personal, sensitive, or painful to share with a provider. Some patients seeking vaginoplasty may simply not plan to be sexually active, and feel sufficiently certain that their lack of desire to be sexually active will not change in the future that they might wish to forego the creation of a vaginal canal (Fig. 15.2). Other patients may plan to be sexually active, but not with partners that have a penis, or may perform sexual practices that do not require receptive vaginal intercourse for sexual fulfillment, or they may find the prospect of lifelong dilation and douching or risk of complications too unfavorable to proceed with canal creation [1,10,11,16,17].

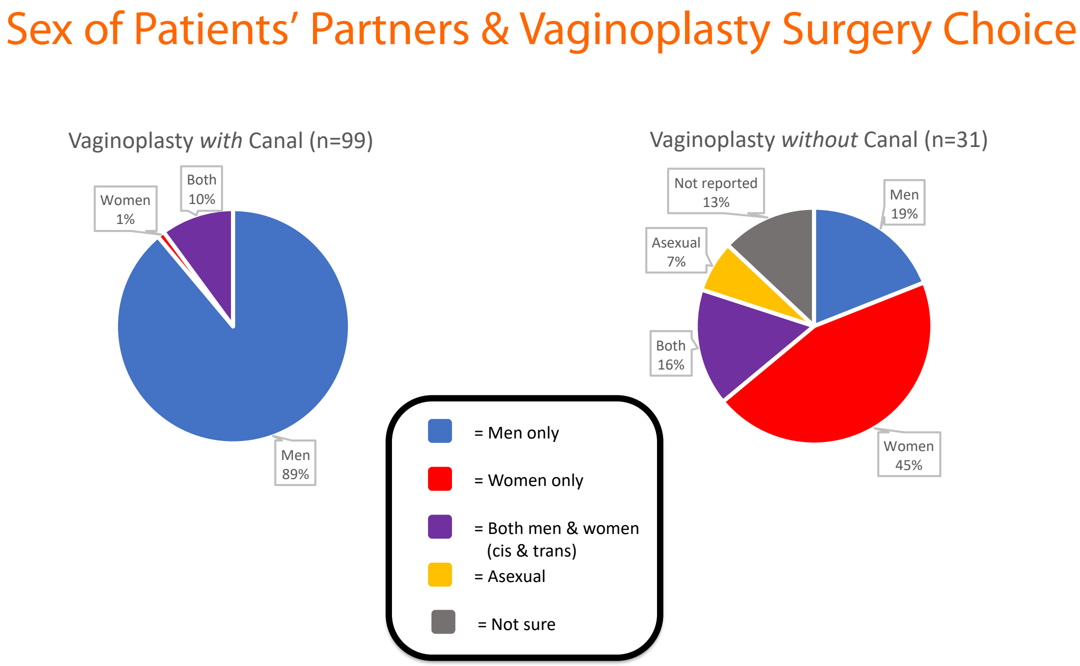

FIGURE 15.2 We queried the sex of patients' partners among a series of 130 consecutive patients seeking vaginoplasty from our program. Patients who elected vaginoplasty with vaginal canal creation were much more likely to be sexually active with only male partners (cis and trans men with a penis), while partners who elected vaginoplasty without a canal (i.e., "shallow-depth vaginoplasty", "vulvoplasty") were significantly more likely to have a diversity of sexual preferences: only women partners, partners of both sexes (this category included a subset whose partners were transwomen, with and without a penis), asexual, and people who were undecided regarding their sexual preference.

It is also just as important for surgeons to always consider that *patients*, too, are unaware of the available surgical options and expected outcomes related to the variety of what is seen as "normal" vulvar anatomy, as showcased by "The Great Wall of Vagina" (Fig. 15.3), and these options must be presented in a fair manner to support patients in considering the best option for themselves.

How to help patients with surgery-choice decision-making

It is useful to draw from clinical experiences to understand what patients do not understand, or what concerns they have, about what we offer them. For example, some patients have shared feeling that an SDV will be "obvious" to anyone looking at them, or, that an SDV is not a "real" vagina as it lacks a full vaginal canal. We have also encountered a small subset of patients that state the only reason they want a canal is to feel "whole"—that is, to have a vagina as similar as possible to a ciswoman.

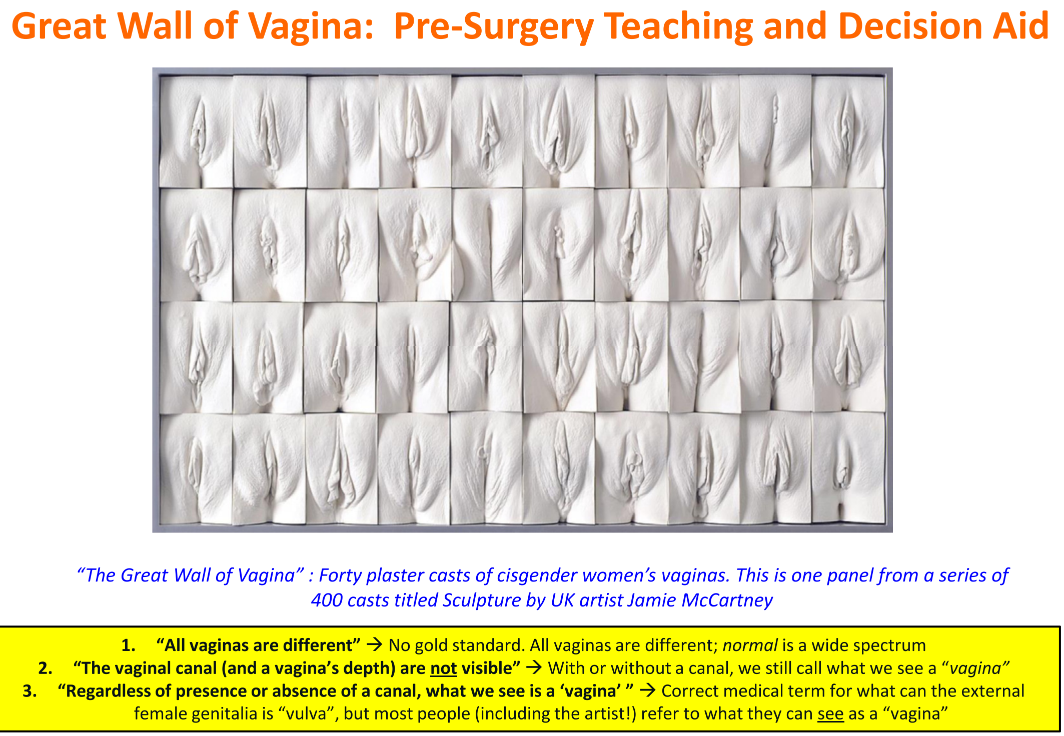

FIGURE 15.3 A patient teaching and surgery discussion aid that we show to all patients considering vaginoplasty. *Reproduced from M.M. Garcia. Sexual function after shallow and full-depth vaginoplasty: challenges, clinical findings, and treatment strategies- urologic perspectives, Clin. Plast. Surg. 45 (3) (2018) 437446.*

Our experience is that if these are the reasons for requesting FDV, then such a patient is at high risk of failing to dilate and douche in the future and experiencing the list of complications listed before.

To help frame the commonalities and differences between genital gender-affirming surgery with and without a canal, we created a patient decision-making aid tool that lists the common and differing features of both types of feminizing genital gender-affirming surgeries, citing risk data based on outcomes from our own surgeries to support patients in making their decision (Fig. 15.4).

During consultation, we share with our patients that the primary benefit of a canal is that it affords the ability to have vaginal-receptive intercourse, together with the intimacy and partner satisfaction, associated with it. We also clarify what a vaginal canal does not offer: a different appearance, or pleasure [1,12,18]. We explain that the canal in any woman (cis- or transgender) is internal and hidden from view. Only the dimple of the vaginal introitus is visible and is present in women who undergo SDV. We have found that a useful patient aid to convey this point is a panel of clay casts of vaginas (majority from cisgender women, but includes some neovaginas). We show patients the panel and text shown in Fig. 15.3 [11].

Comparison: Vaginoplasty WITH vs. WITHOUT Creation of a Vaginal Canal

The table below contains estimated outcomes for each surgery based on a review of actual clinical outcomes from the Cedars Sinai Transgender and Health Program.

Outcome Categories	Shallow Depth Vaginoplasty	Full Depth Vaginoplasty
Elimination of ALL male genital anatomy	Yes	Yes
Creation of normal-appearing female genital anatomy: a vagina with clitoris and hood, pink vulva, urethral opening, vaginal dimple (i.e. leads to non-visible vaginal canal, when present), inner labia, outer labia)	Yes	Yes
Clitoris with touch and pleasure sensation, capable of achieving orgasm	Yes	Yes
Urination from a normal appearing/located female urethral opening	Yes	Yes
Having to complete permanent hair removal from your penis shaft (usually requires 6-12 months of treatment) BEFORE your vaginoplasty surgery (unless you have already completed this)	Yes	Yes
Risk of requiring outpatient surgery to correct a "spraying" or deviated urinary stream	Yes (20% risk)	Yes (20% risk)
Risk of requiring an additional outpatient surgery to correct separation of the clitoris-hood	Yes (10% risk)	Yes (10% risk)
Having to complete permanent hair removal from your ENTIRE SCROTUM (usually requires 6-12 months of treatment) BEFORE your vaginoplasty surgery (unless you have already completed this)	None	Yes
Number of after-surgery clinic visits you must make in the first 3 months after your vaginoplasty surgery	~3 visits	~7 visits
Having to DILATE your vaginal canal for 20 minutes, starting 6 days after your surgery: 3X per day (months 0-3); 2X/day (months 4-18); 1X/day months 19-36; and 1X/ every other day for rest of life (month 37 onward)	No	Yes
Having to DOUCHE your vaginal canal once daily for the first 3 months after surgery, and then about every other day thereafter, for the rest of your life	No	Yes
Risk of requiring an additional outpatient surgery to correct narrowing/tightness from obstructive scar tissue at the vaginal canal opening	None	Yes (20% risk)
Risk of losing some vaginal canal depth (e.g., 1-2 inches) after surgery	None	Yes (5-10% risk)
Risk of losing all of your vaginal canal depth after surgery	None	Yes (3-5% risk)
Risk of experiencing narrowing of your vaginal canal that prevents intercourse and requires additional surgery	None	Yes (10% risk)

FIGURE 15.4 A patient surgery discussion and patient decision-making aid that we show to all patients considering vaginoplasty.

It is useful to explain clearly to patients not only what a canal offers, but also what it *does not* offer. For example, many patients falsely assume that the vaginal canal is where erogenous pleasure is experienced after vaginoplasty [11]. Regarding pleasure, we explain that the canal itself has no sensory nerve endings that transmit tactile or erogenous sensation. Any pleasure that patients might experience is actually from the introitus, vulva, and most of all, the clitoris and neurovascular bundles anterior to the clitoris, which a patient will experience regardless of the existence of a vaginal canal. We add that our studies have shown that patients who undergo shallow depth vaginoplasty, regardless of whether they undergo creation of a vaginal canal, appear to achieve orgasm as good as or of greater pleasure/quality as compared with before surgery—which most patients find reassuring [1,11]. Some patients ask about prostate stimulation via the canal. We explain that no studies have evaluated this, but that it is our opinion that it is unlikely as the prostate is often small for transgender women on gender-affirming hormone therapy, and given the prostate is located behind the pubic symphysis. It is unlikely to be stimulated with receptive penetration. Further research on erogenous stimulation and sensation in this area is needed.

Pedicled Inverted Penile Shaft Skin Flap for SDV

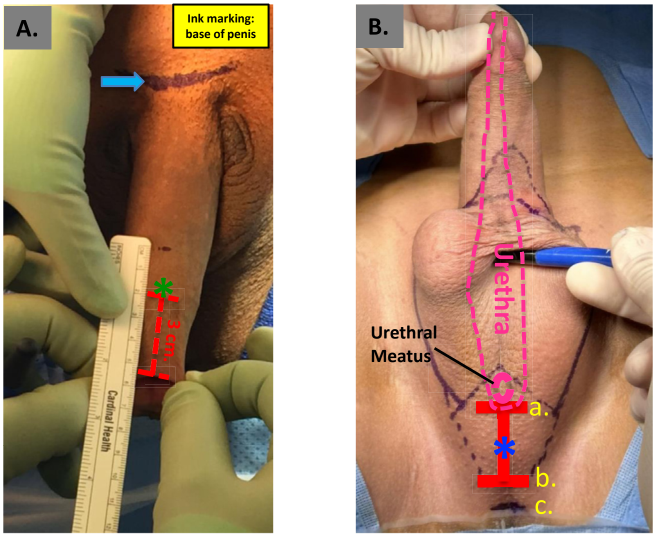

FIGURE 15.5 (a) The vaginal dimple can be made with penile shaft skin alone if the penile shaft skin is sufficiently long that a distal 2–3 cm segment of shaft skin (*green* asterisk) can reach the center of the neovagina introitus (*blue* asterisk shown in b). If so, the distal end of the penile shaft skin tube is oversewn and the entire shaft skin tube is inverted. (If the penile shaft skin length is longer than what is necessary for the distal 2–3 cm, to reach the vaginal introitus, excess shaft skin can be trimmed and discarded before oversewing the end of the shortened shaft skin tube.); (b) The anatomic location of the urethra (*pink* hatched lines), future urethral meatus (thick *pink* hatched line), and neovagina introitus (*) in a person whose sex assigned at birth is male is between the posterior edge of the urethral bulb (a) and approximately 2 cm anterior to (b) the anterior edge of the anus (c).

Surgical technique

In our view, the *simplest* technique to create a vaginal dimple is to utilize the already tube-shaped ~3 cm terminus of the penile shaft skin tube. The latter is oversewn with an absorbable suture and anchored at the location of the introitus. Its natural tube shape gives the appearance of a normal-appearing vaginal introitus.

Therefore, we begin by first confirming that this ~3 cm segment of distal shaft skin (Fig. 15.5a) will reach the location of the vaginal introitus, which is always located *between* the posterior edge of the urethral bulb and 2 cm anterior to the anterior edge of the anus (Fig. 15.5b).

By our technique, the penile skin tube is inverted, and its end is oversewn and anchored to the dense connective tissue of the perineal body, also referred to as the "central tendon" (located immediately posterior to the urethral bulb; Fig. 15.6a), *and* to the tendon of the bulbospongiosus muscle overlying the urethral bulb, where the latter becomes confluent with the central tendon (Fig. 15.6b). The dorsal skin of the penile tube is split to expose the urethra, pink backwall, and neoclitoris and incorporated into the clitoral hood as part of the final aesthetic appearance of the vulva.

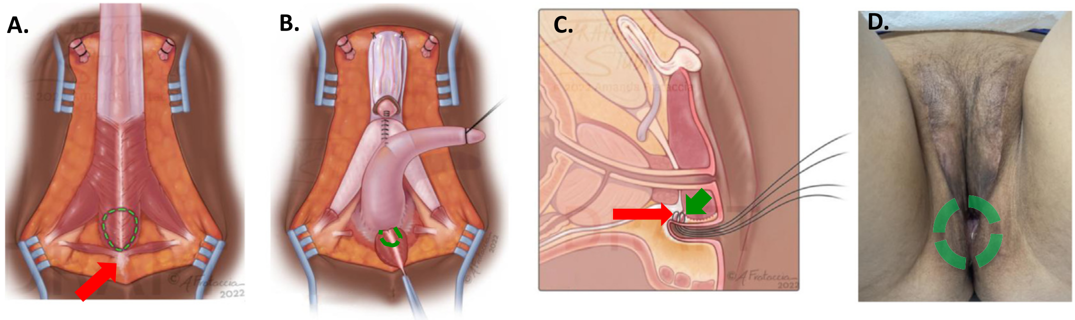

FIGURE 15.6 (a) The proximal portion of the tendon of the bulbospongiosus muscle (where it joins the perineal body [*red arrow*]) is mobilized. It is dissected posteriorly (b) to its confluence with the perineal body (*red arrow* in a and c) and preserved. Anchoring sutures (2–0 Vicryl) are placed through the distal penile shaft skin, which has been gathered with sutures to yield the appearance of a "dimple," and into the root of the bulbospongiosus muscle tendon and perineal body (c). These anchoring sutures yield the appearance of a recessed dimple at the location of the vaginal introitus (c and d).

If the penile skin tube is *longer* than what is needed to center ~3 cm of distal shaft skin at the center of the location of the vaginal introitus, then excess distal shaft skin can be trimmed and discarded, before oversewing its fresh-cut end.

If the penile skin tube is *shorter* than what is needed to center 2–3 cm of distal shaft skin at the center of the vaginal introitus location, then the penile skin tube must be augmented with scrotal skin. Because the penile skin tube serves to line the vulva area on either side of the clitoris to the new urethral meatus, it is necessary to divide the dorsal distal end of the penile skin tube at midline, as far cephalad as the location of the clitoris (Fig. 15.7a). This yields two narrow segments of penile shaft skin, each forming the vulva skin surface on either side of the clitoris, anteriorly, to the urethral meatus, posteriorly (Fig. 15.7b). Next, scrotal skin can be utilized, either as a full-thickness skin graft (FTSG) (Fig. 15.7c and d), or as a scrotal skin pedicle flap (SSPF) based on the posterior midline scrotum and perineum (Fig. 15.8), to line the remainder of the vulva area and to create the vaginal introitus "dimple." Patients who take puberty suppression hormone treatments and gender-affirming hormone therapy at an earlier age may present with limited penile shaft skin, which would warrant further use of a scrotal skin flap or graft. Given the rate of adolescent and teenage transgender individuals is increasing, we anticipate that the use of scrotal skin will need to be used more frequently. For such patients with especially limited penile shaft skin, where there is insufficient skin to even line the vulva (outside of the vagina), our pedicled scrotal flap technique (Fig. 15.8) has an added benefit: the length of the pedicled posterior scrotal flap can be increased to yield sufficient skin not only to create the dimpled vaginal introitus but also to line the *anterior* vulva.

With increased experience using the FTSG, we found that graft "take" was often incomplete. For this reason, we developed the pedicle flap technique described in Fig. 15.8 and found that the flap appears to survive reliably. Because patients undergoing shallow depth vaginoplasty will nearly always have excess scrotal skin (most of which goes unused), ensuring that there is *always* available skin for the SSPF. When preoperative measurements suggest that penile skin length will be insufficient, we request that patients undergo

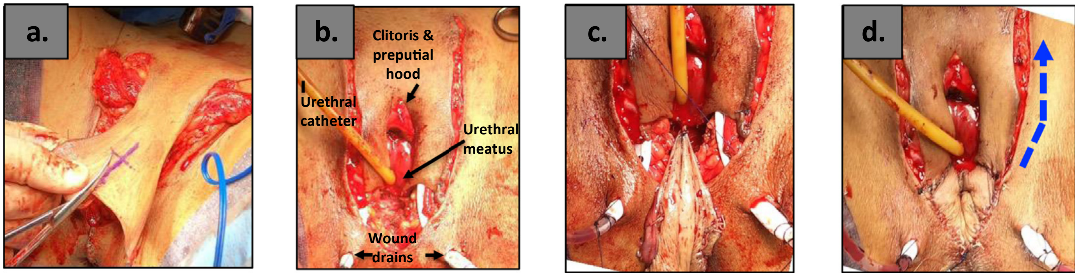

FIGURE 15.7 (a) When the penile shaft skin is not sufficiently long to reach the location of the vaginal introitus, as shown in Fig. 15.5, the penile skin tube is detubularized by incising it along its ventral length. Next, the location of the neoclitoris beneath the now flat sheet of skin is marked with ink (intersection of the midline ink cross, shown). The skin is divided cephalad along the midline, up to the location of the neoclitoris; (b) the left and right segments of divided penile shaft skin are laid on either side of the neoclitoris and urethra, as shown; (c) a full-thickness scrotal skin graft (FTSSG) is prepared from the discarded scrotum, and a large segment is placed over the location of vaginal introitus; (d) the FTSSG is sutured fist to the posterior edge of the urethra complex, and then to the caudal ends of the divided penile skin graft. The location of the dimple to be created in the center of the FTSSG is then marked with ink. A total of four to six anchoring sutures are placed through the perineal body and the root of the bulbospongiosus muscle tendon, and each is then passed through the center of the marked dimple area. After these four to six sutures are placed, all are tied down, to create and anchor the introitus dimple. The FTSSG is trimmed, and the remaining portion is sutured to the perineal skin edges. Lastly, the lateral edges of the penile shaft skin (vulva) are sutured to surrounding perineal skin (*blue* hatched *arrows*) in a cephalad direction.

FIGURE 15.8 The pedicle segment of posterior scrotal skin will be anastomosed to the intact penile shaft skin (tube). The scrotal segment will comprise the ventral aspect of the vaginal canal skin lining, in addition to a portion of the dorsal aspect of the canal. Note that the scrotal skin flap can be extended to include the proximal third of the ventral portion of the penile shaft, as, in our experience, the proximal third of ventral shaft skin is typically divided during inversion and does not contribute to vaginal canal depth. When there is insufficient penile skin to line the anterior vulva, this pedicled scrotal skin flap can be lengthened, to not only create the dimpled vaginal introitus but also to line the anterior vulva as well.

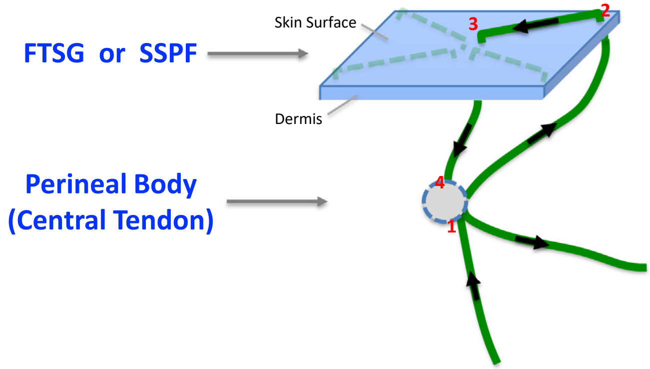

FIGURE 15.9 To anchor and gather the skin of the scrotal skin FTSG or SSPF into a "dimple" shape, the suture (2−0 Vicryl) is passed through the perineal body and the scrotal skin full-thickness skin graft (FTSG) or the scrotal skin pedicle flap (SSPF) in four passes: (1) through the perineal body; then through (2) outer quadrant of the FTSG or SSPF (in-to-out); then through (3) the center of the FTSG or SSPF (out-to-in); and lastly back through perineal body. A total of four sutures are passed in a similar fashion. All sutures are placed first, before any of them is tied down. A dimple shape results because all four sutures gather a relatively large area of FTSG or SSPF toward its center. *Reproduced from J. Stelmar, S.M. Smith, G. Lee, M. Zaliznyak, M.M. Garcia. Shallow-depth vaginoplasty: preoperative goals, postoperative satisfaction, and why shallow-depth vaginoplasty should be offered as a standard feminizing genital gender-affirming surgery option. J. Sex. Med. 20 (11) (2023) 13331343.*

permanent hair removal (always with laser instead of electrolysis, if their genital hair is darkly pigmented) of a ∼2-inch diameter circular area of their midline posterior scrotum [19].

How to create the dimple when an FTSG or SSPF is used?

When we use either a scrotal skin FTSG or SSPF (both of which are flat segments of skin), it is necessary to gather the skin toward its center, to create a natural "dimple." To do this, we first pass the suture (2−0 Vicryl) through the perineal body, then through a peripheral quadrant area of the FTSG or SSPF (in-to-out), and then through the center of the FTSG or SSPF (out-to-in), and, finally, back through the perineal body (Fig. 15.9). We pass a total of four sutures, first, before tying any of them down to create a dimpled vaginal introitus [1].

Postoperative satisfaction with SDV

In work published by Stelmar et al. from our group in 2023, we queried 35 consecutive patients who underwent SDV about their postoperative satisfaction across three domains: orgasmic sexual function, genital appearance, and pain control and time to recovery, with very high satisfaction rates across all three domains [1].

Conclusion

The option of SDV can be an excellent option for any patient who elects to forego creation of a vaginal canal, either because they do not anticipate depending on one for satisfactory intercourse, because they do not want to (or cannot commit to) adhering to a regular dilation and douching schedule, or for any other personal reason a patient may have. With thorough counseling about the costs and benefits and anticipated appearance of SDV, patients can decide for themselves which option (SDV or FDV) they are best served by. Either an FTSG or SSPF can be used to create the recessed blind-ending vaginal introitus, though we suggest outcomes are more optimal and reliable when SSPF is used.

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CHAPTER

16

Cosmetic aspects in gender-affirming vaginoplasty

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Introduction

The goal of gender-affirming vaginoplasty (GAV) is to enhance the benefits already achieved by psychotherapy, social transition, and hormone therapy to further alleviate the experience of gender dysphoria by ultimately aligning genital physical characteristics with the person's gender identity [1–4].

When aligning the genital physical characteristics, the constructed vulva (clitoris, labia majora and minora, and vagina) comprises functional and cosmetic outcomes. This chapter is focusing on the latter; more specifically, to achieve aesthetically pleasing results, it is important to know the desired outcome after surgery, which should resemble that of a genetic female. It is crucial to recognize that external genital appearance cannot be standardized, as every individual's body is unique, and there is no single "correct" or "perfect" representation of female genitalia.

Vulva introitus

The vulva introitus, which consists of the external female genitalia [5], extends from the mons pubis anteriorly to the labial commissure posteriorly. There exists a wide spectrum of vulva appearances [6], as exemplified by "The great wall of vagina," a sculpture created from casts of more than 500 women's genitals by an English sculptor. However, scientific data describing the ideal vulva are currently lacking, which makes vulva reconstruction a complex task due to the myriad structures and varying skin coverage associated with each component.

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00016-9

Vulva reconstruction aims to create structures such as the mons pubis, labia majora, labia minora, clitoris hood and column, clitoris, and vestibule of vagina. Achieving symmetry and fullness with minimal scarring are paramount for obtaining aesthetically pleasing results in GAV.

Mons pubis

The mons pubis encompasses the area over pubic symphysis, extending from the hair-bearing skin continuing from the abdominal region superiorly and to the labia majora inferiorly [7]. The presence of a fat pad between the skin and pubic bone enhances the prominence and attractiveness of the mons pubis. In GAV, the pedicle of glans penis preputial island flap can be tailored, either as a full length or partial length of tunica albuginea together with the flap. In case where the full length of tunica albuginea is used, the thicker pedicle may be positioned within the mons fat pad and fixed to the abdominal pubic fascia or periosteum to ensure proper clitoral placement. Achieving a smooth mons fat pad continuity involves dividing the abdominal fat midline, toward abdominal fascia, and dissecting the suprafascial plane to the left and right to match the pedicle's width. Subsequently, the pedicle is folded and secured to the fascia or periosteum at the midline between divided fat (Fig. 16.1). The final scars of vulva creation should be kept lower than mons area to maintain cosmesis.

FIGURE 16.1 **Pedicle of glans penis preputial island flap.** Set in midline between mons fat pad and fix with fascia or periosteum.

Labia majora

Labia majora are paired cutaneous fatty folds that extend from the mons pubis and converge posteriorly at the posterior fourchette, forming a ridge over the perineal body. The skin covering these structures is keratinized and stratified squamous containing eccrine glands, sebaceous glands, and hair follicles [5]. The labia majora serve as the lateral border of vulva, covering the labia minora, clitoris, urethra, and vaginal vestibule. In front view and closed-leg position, the labia majora nearly meet in the midline, which is called the anterior vulva commissure. In a slightly open-leg position, minimal labia minora protrusion is normally seen [7].

In GAV, the scrotal flap is drawn toward the midline and anchored to the base of the scrotal posterior flap. Redundant skin is excised through medial and lateral adjustment before cutting to ensure balance and symmetry of the labia majora [8,9]. The placement of the scars on the labia majora can be designed in the interlabial sulcus, midpart of labia majora, or laterally in the groin crease. Remaining spermatic cord fats are utilized to maintain the fullness of labia majora, as having fullness and smoothness are essential for achieving a youthful appearance. It is important to avoid excess skin and fat, as it can result in a scrotal-like appearance Fig. 16.2.

FIGURE 16.2 **Labia majora.** Scrotal-like labia majora.

Clitoris

From a cosmetic perspective, the clitoris should exhibit a round or oval shape with proper size and projection, mirroring the glans penis. In prepubertal girls 0–10 years old, study [10] suggests that the width of the glans clitoris is 4.624+(0.135 × years age), with a length of 7.710 mm + (1.087 × years of age). For adult women, the mean transverse diameter of the glans is 3.4 ± 1.0 mm, the longitudinal diameter of the glans is 5.1 ± 1.4 mm, and the total clitoral length including glans and body is 16 ± 4.3 mm [11].

The clitoris is typically located 3–4 cm anterior to the urethral opening or the lower part of the pubic bone at the level of the adductor longus muscles. In supine position with legs fully opened, the upper part of clitoris should be covered by clitoral hood, with the clitoral partially exposed in the lower one-third or lower half. However, it should be fully covered in a closed-leg position.

The goal of clitoris creation in GAV is to achieve a cosmetically pleasing appearance while improving sexual function. Various techniques can be employed, such as glans pedicle flaps, as proposed by Hinderer for intersex anomalies [12,13] and by Brown for transsexualism [14,15], utilize dorsal neurovascular pedicles to preserve sensation. However, this approach often leads to an oversized clitoris. To balance the size and sensation preservation, many surgeons reduce the glans. Some techniques, such as those advocated by Watanyusakul [16], divide the glans into three parts, with the middle part used for clitoris reconstruction and two lateral parts sutured together to create a secondary sensate organ. Eldh et al. employ dorsal skin connected to the glans [17], while Watanyusakul proposes glans penis preputial island flap (Chonburi flap) using a dorsal neurovascular pedicle to preserve sensation to the clitoris and the labia minora [18]. This flap, consisting of circumferential prepuce connected to the glans, serves to reconstruct the clitoris, hooding frenulum, and inner surface of labia minora.

Presently, the use of a dorsal glans with preserved neurovascular bundle [19] has become a common practice. The dorsal neurovascular bundle, comprising the dorsal arteries, vein, and nerves, requires delicate dissection to ensure proper clitoris supply. This technique maintains good rate of sensitivity, and sexual satisfaction with orgasm can achieve as high as 100% [20,21]. Some surgeons dissect the pedicle, including the dorsal tunica albuginea, to protect pedicle, instead of dissecting just above the carvernosum. The tunica albuginea provides volume augmentation at mons pubis [3,4] and can be used to fix the pedicle to pubic fascia or periosteum to provide support to the clitoris [22].

Various techniques for glans penis reduction can be designed to achieve the desired appearance. For instance, the dorsal midline tissue of glans may be utilized to create a clitoris with a "U" Fig. 16.3 or "W" shape, with size of approximately 0.5 cm and some projection. The lateral part and ventral portions of the glans can be repurposed as clitoral crus, perineal body, or secondary sensate organ.

Clitoral hood, column and frenulum

Regarding clitoral hood reconstruction, its outer surface is composed of keratinized skin, while the inner surface comprises nonkeratinized skin. The inner surface is formed by connecting the prepuce to the glans penis as a glans penis preputial island flap by circumferential incision on prepuce around 2–4 cm from the neck of the glans [9,16]. After glans penis preputial island flap is created, the prepuce is then divided in midline (Fig. 16.4) and pulling downward to be the left and the right clitoral hood and inner surface of labia minora. The outer surface is constructed from a penile skin flap.

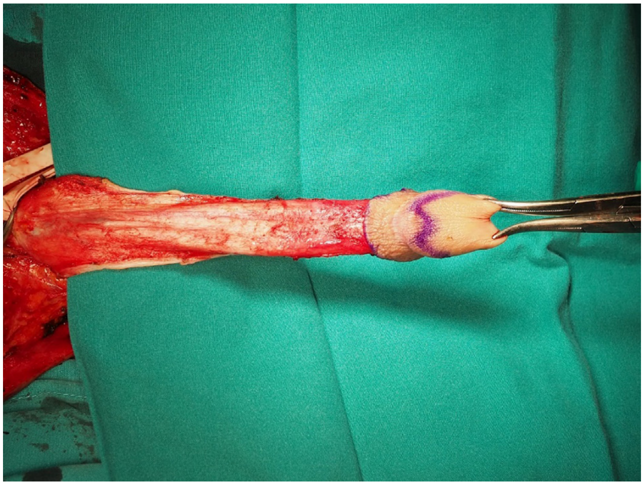

FIGURE 16.3 **Clitoris.** Designed in U shape.

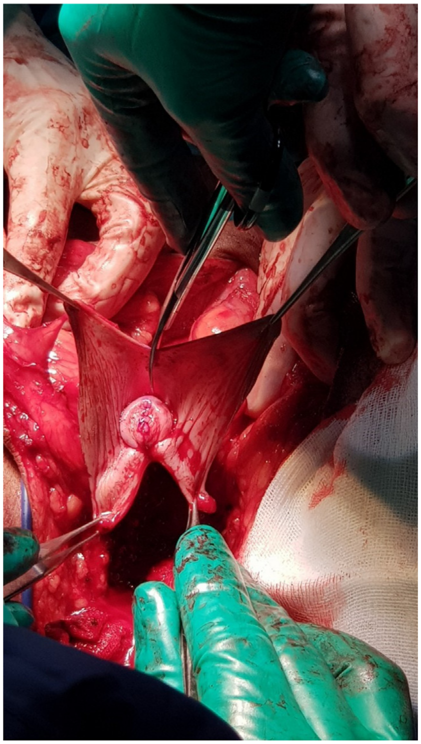

FIGURE 16.4 **Clitoral hood.** Divide prepuce in midline.

The clitoral column can be created using suturing techniques, tagging the skin to the deep fascia. In case of wide-based penile skin flap, a triangular skin excision at the base of the flap can be made. The lowest edge of the clitoral hood should cover the upper half to the upper two-thirds of clitoris, with the lateral part continuing backward to form the labia fourchette.

The frenulum of the clitoris is a fold of tissue that connects from midline underneath the clitoris to the inner surface of labia minora bilaterally. It can be created by incising the inner surface of labia minora horizontally at the level of clitoral base and suturing to the defect between clitoris and second sensate organ [16] (Figs. 16.5–16.13).

Labia minora

Labia minora are of paired mucocutaneous skin folds with highly vascular and abundance neural elements [23]. The upper part of the labia minora expands to form the clitoral hood and frenulum, while the lower part meets at the fourchette. The skin of the labia minora is keratinized squamous cells with sebaceous glands but lacking sweat glands, hair follicles, and subcutaneous fat. The inner third of labia minora, toward the vestibule, consists of nonkeratinized mucosal tissue [5]. The size and shape of the labia minora can vary [24], but they should be either concealed within or slightly protruding from the labia majora, with a minimum size of 1 cm.

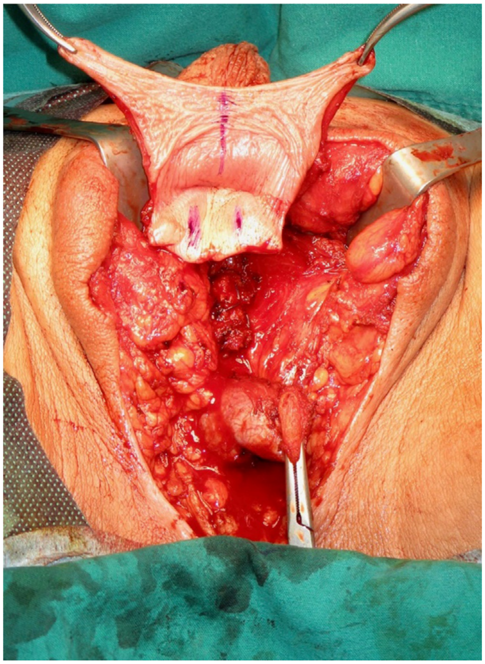

FIGURE 16.5 **Clitoris creation.** Divide prepuce in midline while glans divided into three parts. *Courtesy of Dr.Suporn Watanyusakul.*

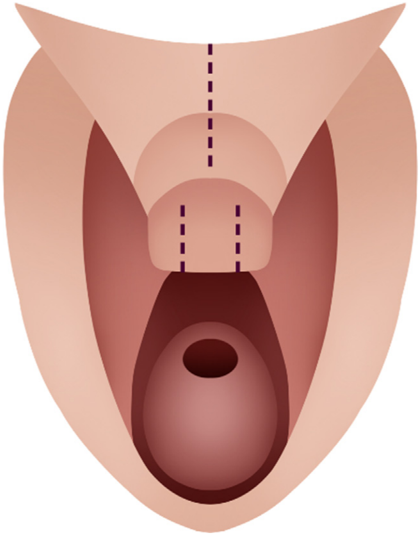

FIGURE 16.6 **Clitoris creation.** Divide prepuce in midline while glans divided into three parts. *Courtesy of Dr.Suporn Watanyusakul.*

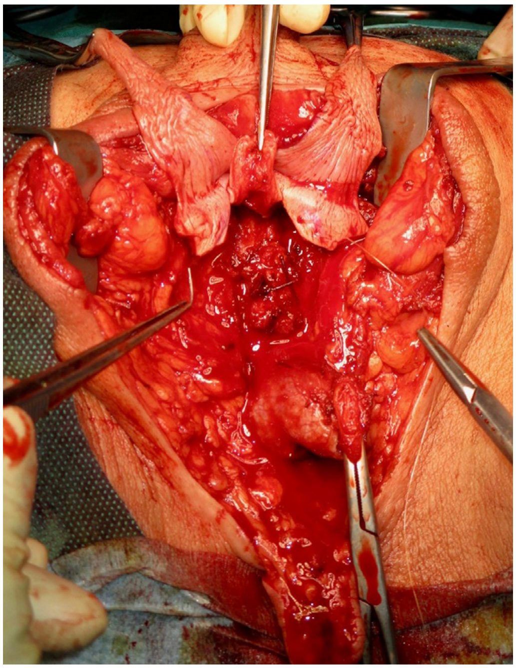

FIGURE 16.7 **Second sensate organ.** Lateral parts of glans were sutured together to be second sensate organ while middle part creates clitoris as in U shape technique.

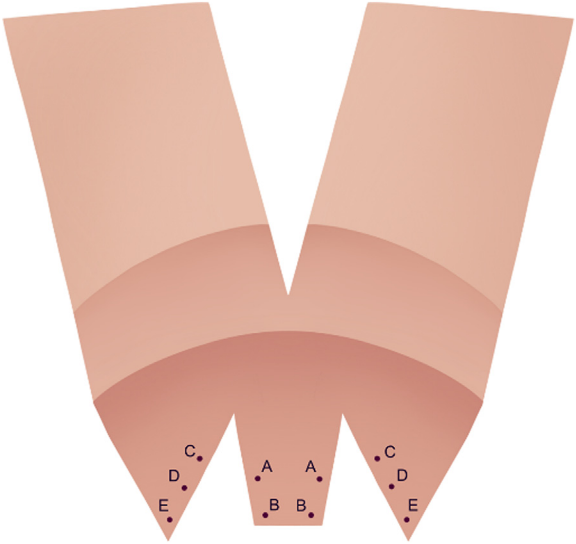

FIGURE 16.8 **Second sensate organ.** Lateral parts of glans were sutured together to be second sensate organ, while middle part creates clitoris as in U shape technique. *Courtesy of Dr.Suporn Watanyusakul.*

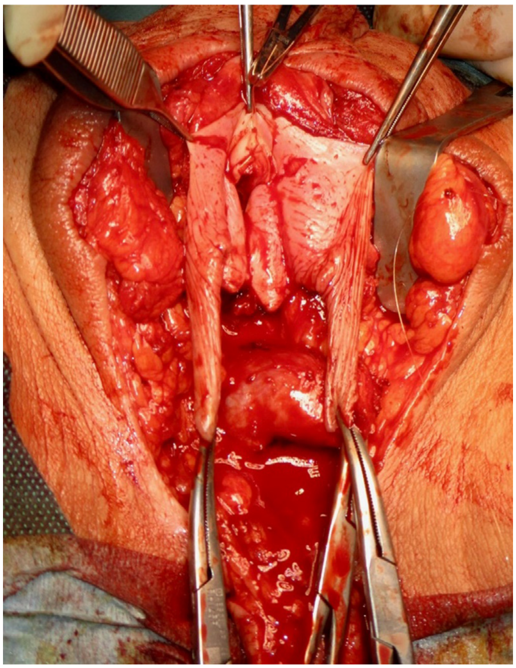

FIGURE 16.9 **Frenulum.** Inner surface of labia minora and defect between clitoris and second sensate organ were sutured to create frenulum. *Courtesy of Dr.Suporn Watanyusakul.*

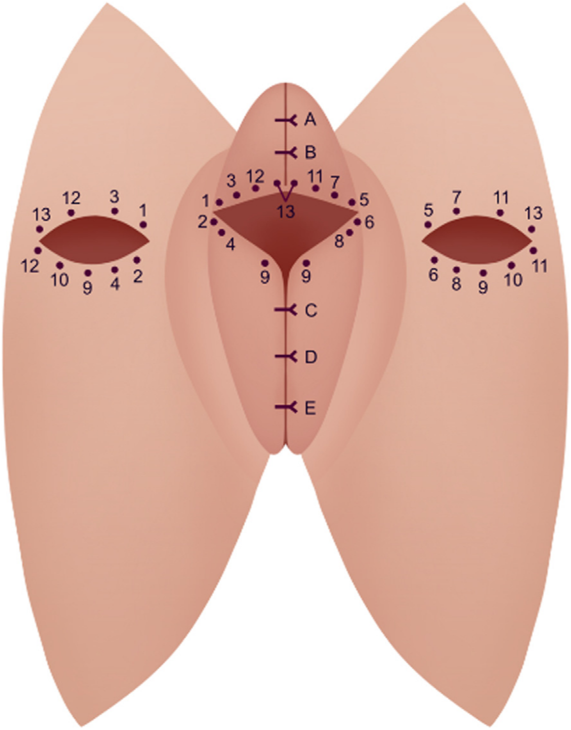

FIGURE 16.10 **Frenulum.** Inner surface of labia minora and defect between clitoris and second sensate organ were sutured to create frenulum. *Courtesy of Dr.Suporn Watanyusakul.*

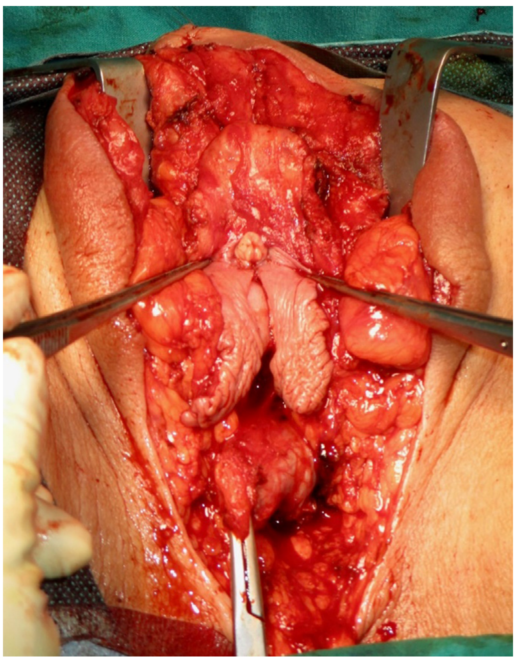

FIGURE 16.11 **Frenulum.** Frenulum created. *Courtesy of Dr.Suporn Watanyusakul.*

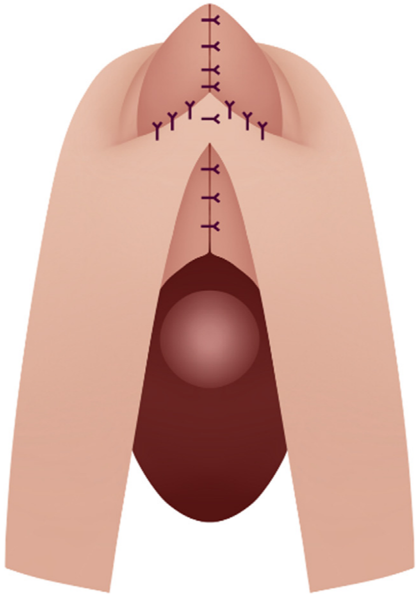

FIGURE 16.12 **Frenulum.** Frenulum created. *Courtesy of Dr.Suporn Watanyusakul.*

FIGURE 16.13 **Final outcome.** Clitoral hood, column, and frenulum. *Courtesy of Dr.Suporn Watanyusakul.*

To achieve the desired cosmetic appearance, reconstruction of all structures, including the prepuce or clitoral hood, frenulum, mucosal-like inner skin fold, and well-formed elliptical fourchette, is necessary. The outer surface of labia minora is created from penile skin, while the inner surface is formed from the prepuce, defined as type A (Fig. 16.14). In cases of prior circumcision [16], where the prepuce has been removed, the inner surface of labia minora can be fashioned from penile skin, and the outer surface can be created from medial part of scrotal skin, although this may compromise cosmesis, defined as type B procedures (Fig. 16.15).

The separation of the labia minora from the labia majora occurs at interlabial sulcus. Suturing the lateral edge of the penile skin flap and medial edge of the scrotal skin flap to the deep fascia and stump of the corpora creates the sulcus (Fig. 16.16). In the upper part of the labia minora, if need, a shallow incision may be made in the penile skin flap, and stitches can be used to anchor the dermis down to the deep fascia.

FIGURE 16.14 **Type A procedure.** Prepuce can be used for inner while penile skin for outer labia minora. *Courtesy of Dr.Suporn Watanyusakul.*

Posterior fourchette

The posterior fourchette should exhibit an elliptical appearance with a slight raised edge, and ideally, minimal to no vaginal mucosa should be visible. In GAV, the scrotal skin flap is designed in an inverted-U or inverted-V fashion to serve as the posterior lining of vaginal canal. The flap consists of both skin and adipose tissue and is created with a length ranging from 4 to 7 cm and a width of approximately 2–3 cm [9]. It is positioned 4 cm above the anus [19] and prevents stenosis of the introitus. Some experienced surgeons develop smaller

FIGURE 16.15 **Type B procedure.** After circumcision, penile skin used for inner while scrotal skin for outer labia minora. *Courtesy of Dr.Suporn Watanyusakul.*

FIGURE 16.16 **Interlabial sulcus creation.** Lateral edge of labia minora and medial edge of labia majora were sutured to deep fascia.

flap to narrow the posterior fourchette (Figs 16.17 and 16.18), while others may apply technique such as partial deepithelized and suturing labia minora on the flap can be applied, though this can compromise vascular supply.

FIGURE 16.17 **Narrow base flap.** For narrow posterior fourchette.

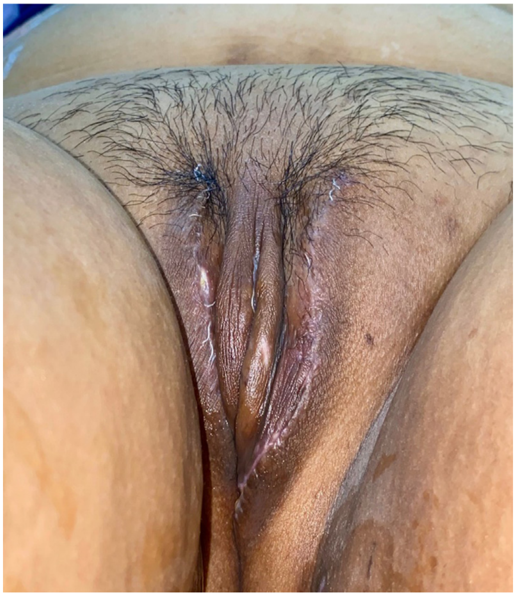

FIGURE 16.18 Narrow base flap. Makes more natural posterior fourchette.

Conclusion

To date, there is no unique standard cosmetic result that can be achieved following GAV. The variation of the results, which reflects different refinements from different authors, also reflects the variation of the anatomy of the female external genitalia. Although surgeons are taking into considerations individual patient expectations in merit to the desired cosmetic outcomes, the final outcome also depends by the material provided by the same patient; thus a specific outcome cannot be promised. Indeed, showing pictures preoperatively results a good method for communicating to patients, and possibly, it can make their expectations more realistic. Defining patient-reported outcome measurements specific on the cosmetic outcome, which is currently not available, could allow to relate a specific cosmetic outcome to the final patient satisfaction.

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CHAPTER

17

The use of bowel in gender-affirming vaginoplasty

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Introduction

History

Despite significant modifications in techniques for feminizing genital gender affirmation surgery in recent decades, the fundamental surgical techniques were developed over a half century ago. The techniques for the creation of the vaginal canal first developed for the treatment of congenital vaginal agenesis have since played an important role in the treatment of Cis gender patients with Mayer—Rokitansky—Kuster—Hauser (MRKH) syndrome. For patients with MRKH, nonoperative techniques, such as serial dilation, typically offer inadequate depth results. However, use of the bowel for the neovagina in this cis-gender population has allowed a near normal appearance with excellent depth and a good blood supply [1].

The use of the bowel for vaginoplasties originated earlier than the peritoneal flap and penile inversion techniques (see Table 17.1). The first peritoneal flap in cisgender women was first done in 1912 by Dmitry Oskarovich Ott, though Davydov became the namesake of the present-day procedure [2]. Approximately 40 years later in 1952, Harold Delf Gillies first described the penile inversion vaginoplasty for transgender patients [3]. The bowel vaginoplasty originated earlier in 1892, when the Russian surgeon Sneguireff used the rectum for a neovaginal reconstruction in the treatment of vaginal agenesis [4]. Then, in 1904, Baldwin

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https://doi.org/10.1016/B978-0-443-21776-0.00017-0

TABLE 17.1 History of bowel vaginoplasty.

Date	Surgeon	Type of vaginoplasty	Cis/Transgender women
1892	Sneguireff	Rectum	Cisgender
1904	Baldwin	Ileum (cisgender women)	Cisgender
1911	Wallace	Sigmoid	Cisgender
1912	Oskarovich	Peritoneal flap	Cisgender
1952	Delf Gillies	Penile inversion	Cisgender
1974	Markland and Hastings	Cecum and sigmoid	Transgender

From Icahn School of Medicine at Mount Sinai.

used an isolated loop of the ileum in the treatment of congenital vaginal absence but also suggested that the sigmoid could be used. It then took only 7 years for Wallace to report the successful use of sigmoid colon in vaginal construction in 1911 [1]. These techniques have now been translated to genital surgery for the transgender population. The first mention of the creation of the neovagina with bowel segment in transwomen is in 1974 b y Markland and Hastings who used the cecum and a part of the sigmoid in a neovaginal reconstruction [5]. Recently, the use of bowel segments has become increasingly important for the transgender population.

In addition to the type of bowel used, a variety of approaches have been described to harvest the bowel segment, including open as well as minimally invasive laparoscopic and robotic techniques.

Potential benefits of bowel in the gender-affirming vaginoplasty

Theoretically, the neovagina should be supple, carry low surgical risk, use easily available tissue, self-lubricate with sexual arousal, maintain adequate depth for sexual intercourse without the need for dilation, and carry minimal long-term risks [6].

No feminizing vaginoplasty fulfills all of these criteria, and patients must decide in consultation with their surgeon what option suits their needs best. Alternatives to bowel vaginoplasty include minimal depth vaginoplasty, or vulvoplasty, penile inversion vaginoplasty with free graft, and peritoneal flap vaginoplasty. There are several drawbacks to a penile inversion: risk of recurrent vaginal infections, lack of lubrication necessitating use of exogenous lubrication with dilations or penetrative vaginal intercourse, development of granulation tissue within the canal, and the need for lifetime maintenance dilations. In patients with genital hypoplasia, tissue may be inadequate for penile inversion vaginoplasty to achieve adequate depth. Although peritoneal flap vaginoplasty may be useful in a subset of these patients, there may still not be adequate tissue for all patients. Intestinal vaginoplasty techniques can result in the greatest depth of the vaginal canal for these patients.

Table 17.2 shows the mean vaginal canal depths for three vaginoplasty techniques. Meta-analysis from Bustos et al. reported the mean vaginal depth for standard penile inversion vaginoplasty as 9.4 cm (7.9–10.9 cm), and all types of intestinal vaginoplasties 15.3 cm

TABLE 17.2 Mean vaginal canal depth for three techniques.

Technique	Mean vaginal depth
Penile inversion vaginoplasty [7]	9.4 cm (7.9−10.9 cm)
Bowel vaginoplasty [7]	15.3 cm (13.8−16.7 cm)
Robotic-assisted peritoneal flap vaginoplasty [8]	13.9 cm (13.6−14.1 cm)

From Icahn School of Medicine at Mount Sinai.

(13.8−16.7 cm) [7]. Mean depth for robotic-assisted peritoneal flap vaginoplasty in Dy et al. was 13.9 cm (13.6−14.1 cm) [8].

Bowel vaginoplasty offers abundant native tissue allowing for the attainment of adequate depth and width regardless of the amount of scrotal skin and can provide a more natural vagina-like mucosa with enough self-lubrication to preclude the need for exogenous lubricants.

When executed correctly, bowel vaginoplasty maintains its vascularity, theoretically reducing the risk of vaginal stenosis and potentially also permitting larger vaginal depths to be created. Accordingly, in a study of 12 patients undergoing sigmoid vaginoplasty, the average depth of the newly created vagina was approximately 13.9 ± 2.0 cm with 67% having no complications, and all of these patients retained tissue suitable for engaging in sexual activity [9]. Thus, bowel vaginoplasties are suitable when there is not enough skin for a graft to create a vagina with sufficient depth and width, especially if patients have genital hypoplasia from prepubertal androgen suppression [4].

Anecdotally in our practice, we have found that patients undergoing revision or primary sigmoid vaginoplasty can dilate as needed after the first 6−12 months postsurgery, whereas patients undergoing penile inversion vaginoplasty necessitate lifelong dilation.

The common risks in the use of the colon for the vaginal lining include unwanted mucus production, odor, introital stenosis, and diversion neovaginitis [6]. Additionally, chronic inflammation of the neovaginal segment could theoretically pose a long-term risk of cancer; however, there are only isolated case reports on this topic. Thus, long-term follow-up is necessary for risk stratification. Patients should be counseled on these risks when considering intestinal vaginoplasty for secondary operations following primary procedures or as a primary operation. Many believe that sigmoid vaginoplasties come with many gastrointestinal complications, but these complications occur less than previously thought, despite the more invasive nature of the procedure [9]. This could be attributed to the fact that only a 12−15 cm segment of the large intestine is typically harvested.

Contraindications

Extensive medical history must be obtained prior to surgery. There are several contraindications to intestinal vaginoplasty. Patients with inflammatory bowel diseases, hereditary colon cancer syndromes, extensive history of intraabdominal surgery or trauma, or history of pelvic radiation are not candidates for intestinal vaginoplasty. Patients with short gut syndrome or a history of small bowel resection should not be offered ileal vaginoplasty as this can exacerbate nutritional and metabolic abnormalities.

Preoperative preparations

The first preoperative consideration is obtaining medical and psychiatric clearance as per WPATH guidelines.

Then, in the setting of revision surgery, a vaginoscopy is recommended to evaluate the extent of vaginal stenosis and assess for any possible fistulae.

In addition, a colonoscopy is recommended for all bowel vaginoplasty candidates over the age of 50 as part of standard recommended cancer screening guidelines prior to surgery date. Abnormal findings may preclude the use of a bowel segment for vaginoplasty.

Mechanical bowel preparation the day before surgery is encouraged and can vary depending on surgeon preference. The use of mechanical bowel preparation is not mandatory for small bowel diversions; however, it may aid in the dissection of the vaginal canal. At our institution, we instruct patients to obtain an 8.3 oz bottle of polyethylene glycol, to be mixed with a 64 oz sports drink such as Gatorade, and begin drinking 8 oz every 15–30 min, starting 16 h before scheduled surgery time. Oral antibiotics are typically not given as part of the bowel preparation.

Perioperative considerations

Our preference has been the sigmoid colon harvested robotically for the creation of the neovaginal canal. At the time of induction, patients are given 5000U of subcutaneous heparin as prophylaxis given the high risk nature of a long surgery with the patient in a steep Trendelenburg dorsal lithotomy position.

When performing any type of colorectal surgery, antibiotic prophylaxis should include coverage of enteric gram-negative bacilli, enterococci, anaerobes, and *Staphylococcus aureus* and should be administered 30 min prior to incision. At our institution, we administer IV cefazolin and metronidazole, unless contraindicated.

Surgical technique

Primary versus secondary bowel vaginoplasty

Bowel for creation of the vaginal canal in transgender patients has been used as a revision procedure for vaginal or introital stenosis as well as a primary vaginoplasty surgery. In primary vaginoplasty cases, penile disassembly with penectomy, orchiectomy, urethroplasty, and creation of the vulva is performed in the standard penile inversion vaginoplasty technique prior to proceeding with intestinal harvest and creation of the vaginal canal. The inverted phallic skin flap is sutured to the bowel segment either with robot assistance or, if accessible, externally through the perineal incisions.

In revision cases, external genital incisions are generally not necessary unless the patient is undergoing concomitant aesthetic revisions. When performed as a revision or secondary surgery, remnants of the scarred and fibrotic neovagina should be excised circumferentially to ensure optimal wound edges are prepared prior to anastomosis of the pedicled intestinal flap.

Ileum

[10] reported that the average depth of the ileal neovagina was 13 cm (range 12.5–14 cm) at the first postoperative visit [10]. However, the use of the ileum for neovaginal canal creation has not been widely adopted for vaginoplasty in gender-affirming surgery. In addition to an absence of significant data on its use, the small intestine may generate a larger amount of mucus production and carry a higher risk of injury with dilations and intercourse (due to the lack of structural resilience compared with the large bowel), and patients may be susceptible to resorptive or metabolic disorders. Historically, this procedure may have been used if the patient had insufficient genital tissue for the creation of vaginal canal lining from penile and scrotal skin alone. However, its use has been described mostly in the revision vaginoplasty setting after loss of vaginal canal depth. For most patients, better options exist with fewer physiological and metabolic complications than the use of the ileum. These alternative options also still offer adequate tissue for depth, and therefore, we generally do not recommend the use of the ileum for the creation of the vaginal canal.

Ileal vaginoplasty: Surgical technique

A combined perineal and laparoscopic or robotic approach is recommended for both primary and secondary/revision cases to maximize exposure and minimize perforations [11]. The patient should always be positioned in dorsal lithotomy to allow access for both teams to work concomitantly.

In primary cases, the procedure begins with standard penile inversion vaginoplasty techniques, and the intestinal harvest will occur second. In revision cases, vaginal remnant and scar tissue should be excised by the perineal approach first.

When ileal harvesting is performed as open surgery, a Pfannenstiel or median laparotomy incision can be used. If the procedure is performed laparoscopically or robotically, peritoneal access is obtained by insertion of the umbilical trocar and pneumoperitoneum is applied. Subsequently, a right lateral trocar is inserted at the midclavicular line at the level of the umbilicus. The third trocar is placed in the right lower quadrant, lateral to the epigastric vessels.

Once peritoneal access is obtained, the ileal flap is harvested. 20 cm distal to the ileocecal valve, an ileal segment measuring approximately 15–20 cm is chosen for harvest. Vascular integrity of the ileal loop is maintained by using the standard transillumination technique. The segment is then isolated using a linear bowel stapler. Then, bowel continuity is restored in an end-to-end or side-to-side fashion using an intracorporeal approach, manual suturing, or a linear stapler.

The distal portion of the ileal segment is transferred to the neovaginal cavity. The harvested ileal segment can be kept as a single lumen to line the vaginal cavity, or it can be opened on its antimesenteric border and reconfigured into a “U” or “J” shape, then retubularized, if further maximization of the neovaginal lumen is necessary. Once complete, the ileal segment is brought to the perineum or the phallic skin flap, and the ileocutaneous anastomosis is performed in a tension-free manner [12].

Use of the colon segments

Indications

Colon segments may be considered when penile inversion vaginoplasty or peritoneal flap vaginoplasty is not an option for transwomen with penoscrotal hypoplasia (penile length <8 cm and insufficient scrotal skin for lining the neovagina), or those who have undergone prior penile inversion vaginoplasty or peritoneal flap vaginoplasty, but failed to achieve adequate neovaginal depth. In addition, it may be considered as a primary technique based on patient preferences after discussing the unique risks of this technique. Techniques using both sigmoid and right colon have been described in the literature, and segments harvested range from 12 to 18 cm, depending on the needed depth. Colovaginoplasty, whether using the right colon or sigmoid colon, offers several advantages compared with other techniques.

1. The texture and appearance of the colon resemble a natural vagina.
2. Bowel lumen and natural lubrication provide copious vaginal depth and moisture, which reduces risk of future vaginal stenosis [5].
3. Lifelong vaginal dilation is not necessary, and introital dilation can be replaced with penetrative intercourse.
4. Penetrative intercourse may be aided without external lubrication by the colon's ability to produce mucus.

Right colon

The right colon technique has only been described in the literature in the setting of revision/salvage vaginoplasty cases once the peritoneal flap has been exhausted or is not technically feasible.

Several advantages have been proposed in favor of right colon over sigmoid by Garcia et al. 2020 and can be summarized as follows:

1. When compared with the sigmoid colon (and its varying blood supply from inferior mesenteric artery and sigmoidal arteries), the vasculature of the right colon is more anatomically consistent, with less known variations [6]. The ileocolic artery is the most inferior branch of the SMA (superior mesenteric artery) and is the primary pedicle for the ascending colon. It is known for being a long artery, and its anatomic variation is mostly limited to traveling either anterior or posterior to the superior mesenteric vein [13]. Because of this limited variation, identification and preservation of the pedicle is facilitated. The generous length of the ileocolic artery also allows for easier tension-free translocation of the harvested segment from the right upper quadrant down to the vaginal introitus.
2. Moreover, the use of the right colon may result in a lower risk of anastomotic leak: ileocolic anastomosis (1%–2% leak rate) versus a colorectal anastomosis (5%–7% leak rate).
3. Finally, the location of the ileocolic anastomosis remains in the right upper quadrant versus the colorectal anastomosis being directly proximal and posterior to the neovagina in the left lower quadrant [13–15].

Garcia et al. 2020 described their laparoscopic right colon vaginoplasty technique for revision vaginoplasty on 22 patients. Of these 22 patients, 20 were revision cases after a failed penile inversion vaginoplasty and 2 had prior minimal depth vaginoplasty. In this technique, they utilize four laparoscopic ports, three 5-mm ports, and one 12-mm assistant port.

The procedure begins in the pelvis, where the vaginal remnant and scar tissue are identified and excised circumferentially entirely to prepare for anastomosis. The pelvic surgeon can help with identification of the vagina by placing a dilator into the vaginal canal.

Then, the ascending colon is mobilized by complete lateral dissection along the white line of Toldt up to the hepatic flexure. Proximal to the middle colic artery, the transverse colon is mobilized off the stomach, duodenum, gallbladder, and liver with sharp and blunt dissection as well as ligature. To minimize bulk, the omentum is dissected off the proximal half of the transverse colon. Inferior to the ileocolic vessels, the mesentery to the terminal ileum is divided cautiously so as to not compromise the ileocolic vascular pedicle to the neovagina (the ileocolic artery is preserved, but the right colic artery and the right branch of the middle colic artery must be divided). An appendectomy is also performed at this time. Next, the mesentery of the transverse colon and the left middle colic artery are ligated proximal to the middle colic arterial trunk. The terminal ileum and proximal transverse colon are divided after confirming the harvested segment reaches vaginal introitus without tension (the length of the colonic segment harvested is not specified in the literature and should be tailored to the patient's anatomy). Then, the terminal ileum and distal transverse colon are anastomosed to one another. After harvesting the right colon segment, it is rotated clockwise 180 degrees and the stapled end of the transverse colon is pulled to the vaginal introitus, where a Babcock passed into the vaginal canal will hold it in place. Per Garcia et al. clockwise rotation of the harvested segment allows less kinking and tension of the pedicle [6]. The colon segment is then gently oriented with tinea at 12 o'clock for proper orientation. During this maneuver, care should be taken to avoid excess traction on the pedicle to prevent an avulsion injury (see Fig. 17.1).

Left colon (sigmoid)

The sigmoid is likely the most commonly used intestinal segment in gender-affirming vaginoplasty today. Harvesting of the sigmoid segment can be performed in an open manner or done laparoscopically or with robotic assistance depending on surgeon experience. The proximity of the sigmoid colon to the perineum minimizes the distance needed for mobilization of the intestinal flap into the vaginal canal. Moreover, the diameter of the sigmoid lumen allows for maximal width of the vagina. Its proximity to the perineum allows for excellent vaginal depth regardless of technique. With the laparoscopic technique, [9] reported an average neovagina depth of 13.9 $+/-$ 2.0 cm in 12 patients [9]. In another study, [11] achieved an average neovaginal depth of 14.5 cm (range 12–20 cm) in 14 patients [16]. Accordingly, there is a decreased need for lifelong dilation and vaginal molding.

Compared with the small intestine and skin grafts, the thickness of the sigmoid colon wall seems to withstand trauma more effectively [17]. This thickness can lead to a decreased risk of bleeding and vaginal injury after sexual intercourse [5].

Overall, laparoscopy procedures in this area have shown excellent visibility, fast recovery, favorable cosmetic results, minimal scarring, and reduced hospitalization duration [17]. In

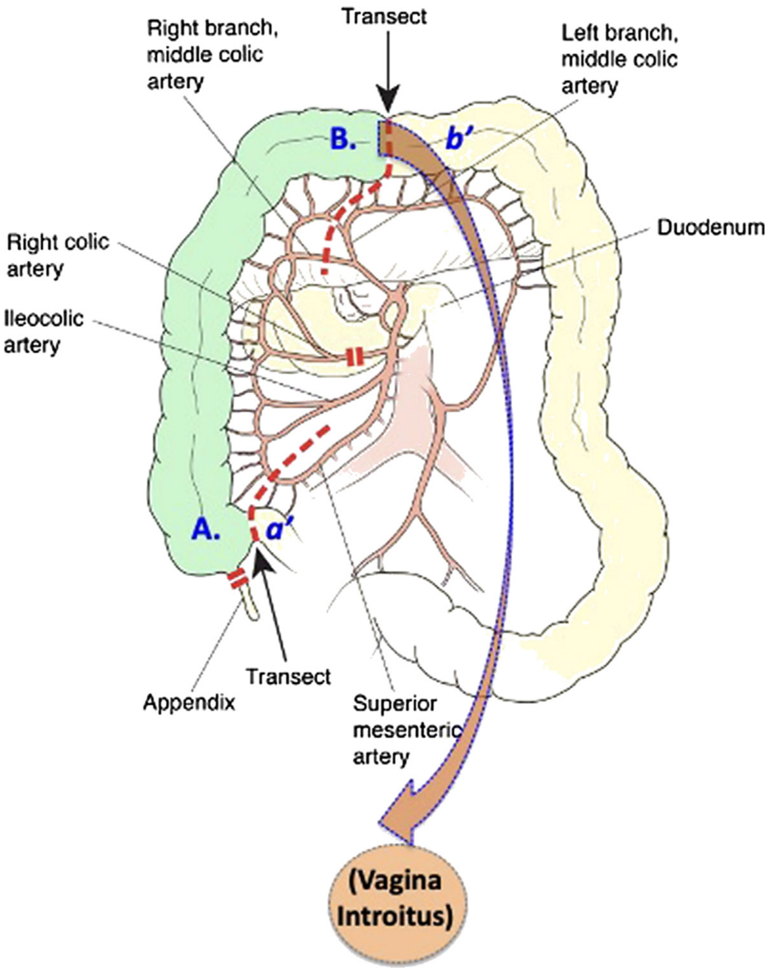

FIGURE 17.1 **Vascularity and mobilization of the right colon for vaginoplasty.** *Courtesy of Maurice Garcia.*

one study, [18] used an open technique using the sigmoid, with which a satisfactory aesthetic result was achieved in 77 out of 86 patients (89%) [18].

Our institution is the first to describe the robotic-assisted sigmoid vaginoplasty (RSV) technique in both primary and in revision cases of vaginoplasty.

Robotic Sigmoid Vaginoplasty: Surgical technique

Fig. 17.2 provides an overview of the steps of the procedure. Patients are positioned in dorsal lithotomy with their arms tucked, which will allow for two teams to work simultaneously, a robotic team and a pelvic reconstructive team.

When performing primary sigmoid vaginoplasty, perineal dissection and penile inversion vaginoplasty are performed by the reconstructive team. After the phallic skin flap has been mobilized, the vaginal canal is dissected, and once Denonvilliers' fascia has been incised

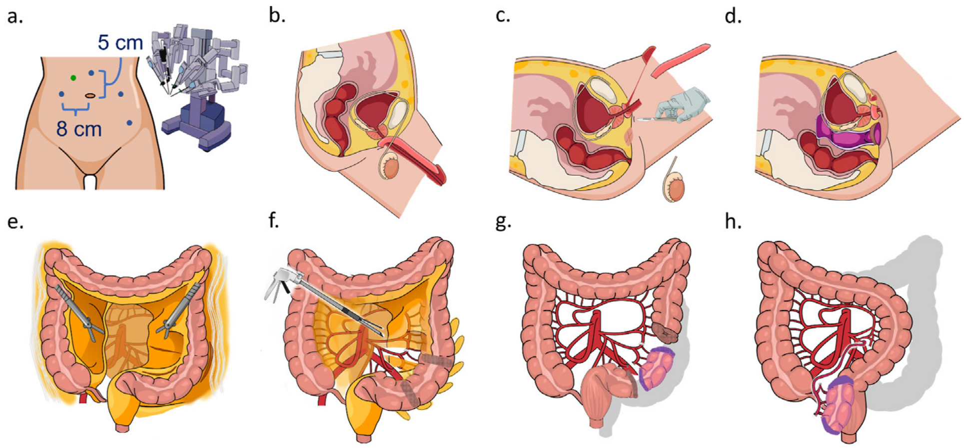

FIGURE 17.2 **Overview of robotic sigmoid vaginoplasty steps.** (a) Trocar placement. Four robotic 8-mm ports (*blue*); the robotic 8-mm camera port is placed 5 cm supraumbilical; 2 8-mm robotic ports should be placed 8 cm lateral to the umbilicus and immediately superior to the anterior superior iliac spine crest. The 12-mm assistant port (*green*) is placed between the camera port and right lateral robotic ports. (b−d) The reconstructive surgeon performs the penile inversion vaginoplasty portion of the procedure with orchiectomy, clitoroplasty, urethroplasty, and vulvoplasty in primary cases; and in revision cases, excises all remnant vaginal scar tissue. (e−h) Robotic sigmoid harvesting is performed by dissecting the mesentery to the root of the IMA, creating a medial pedicle, and bringing the tension-free sigmoid donor segment into the vaginal canal.

from the perineum, then the robotic team begins the bowel harvest. In secondary or revision cases, the reconstructive surgeon begins by excising any scar tissue in the vaginal canal.

The robotic portion of the procedure begins by gaining intraperitoneal access using the Veress needle technique, and an 8-mm robotic camera port is placed 5 cm supraumbilical. The remainder of the ports should be placed under direct camera vision (Fig. 17.3).

Once the robot has been docked, the first step of the procedure is to locate the vaginal remnant or the remnant of the previously dissected canal. This is done by incising the peritoneum in the pouch of Douglas and dissecting distally, just posterior to the seminal vesicles and the prostate until reaching Denonvilliers' fascia. This plane is followed down toward the apex of the prostate. In revision cases, the remnant of the vaginal canal is opened with a vaginal dilator inserted to help with localization of the correct space. The sigmoid is harvested. Dissection begins lateral to medial along the white line of Toldt to mobilize the sigmoid colon all the way to the splenic flexure. The sigmoid must be released from its lateral adhesions and retroperitoneal attachments with careful blunt dissection down to the level of the IMA and medialized. A 60-mm linear bowel stapler is used to transect the distal sigmoid just proximal to the rectum at the area where the mesentery is longest (Fig. 17.4). The mesosigmoid is then opened and transected until it reaches the base of the sigmoid artery. A 15-cm segment of sigmoid for the neovagina is measured, and the proximal segment is stapled with another 60-mm linear bowel stapler. Of note, the sigmoid arteries are more easily identified by a medial approach. Close inspection of the surrounding vasculature is necessary since the sigmoid artery serves as the vascular pedicle for the sigmoid flap. The sigmoid

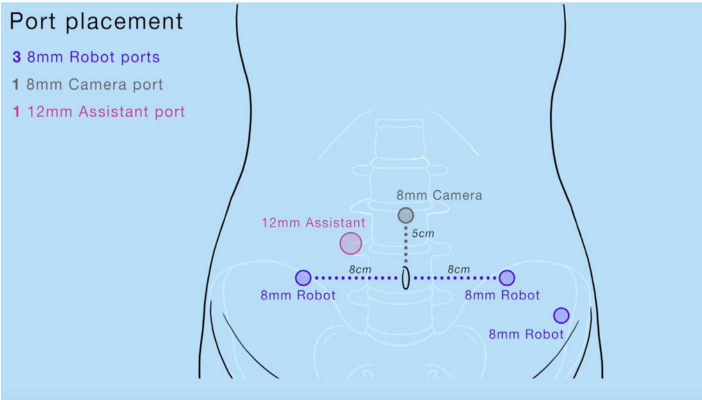

FIGURE 17.3 **Port placement for robotic sigmoid vaginoplasty.** *Courtesy of Dr. Rajveer Purohit.*

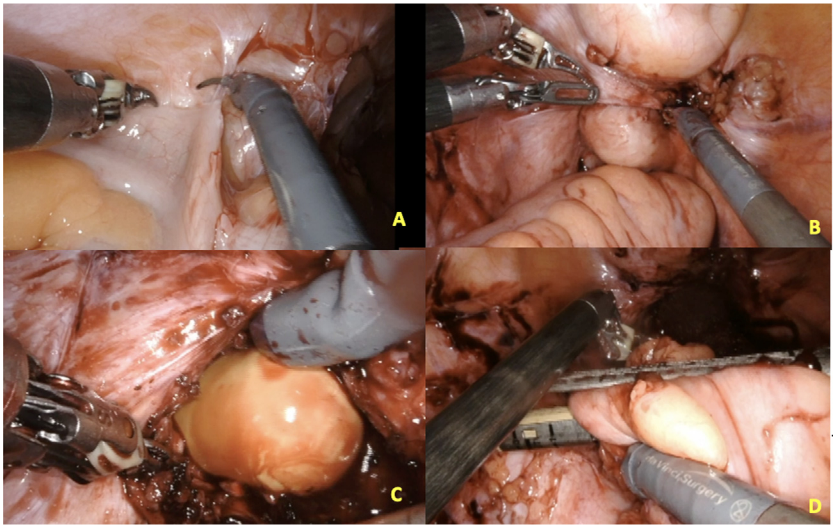

FIGURE 17.4 **Robotic sigmoid vaginoplasty.** Incision at the line of Toldt (a) to mobilize the colon. Indentation seen between instruments (b) that dilator is pushed through (c). Once vaginal space is created, EndoGIA stapler is used to harvest the sigmoid segment (d).

artery often derives from the IMA, but it can also stem from the left colic artery. Care must be taken not to injure the superior rectal artery.

Bowel continuity is then restored using a 28-mm EEA circular stapler brought in from the rectum. Continuity is achieved by first excising the staple line from the proximal sigmoid, and placing the anvil inside to proceed with suturing. We use 4–0 PDS to close the sigmoid around the anvil. The proximal and distal colonic limbs are then easy to bring together and staple. Care must be taken to avoid any crossing of staples with the new staple line form the prior stapling as this can cause faulty anastomosis (Fig. 17.5). After stapling, the presence of

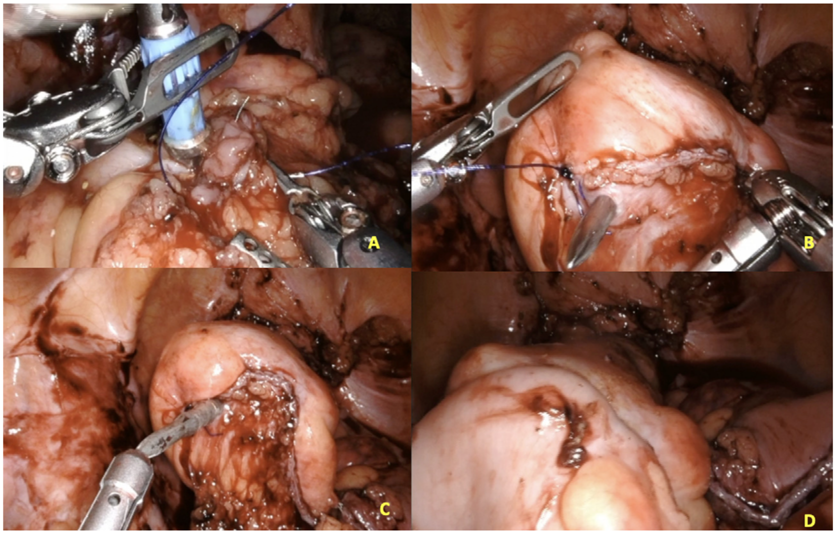

FIGURE 17.5 **Robotic sigmoid vaginoplasty.** Bowel continuity is reestablished by suturing the anvil in place proximally (a) and placing EEA trocar through the rectum until trocar fully pierces distal end (b). Anvil and Trocar are connected (c) and bowel continuity is reestablished (d).

two staple donuts should be confirmed. Once continuity is restored, the harvested sigmoid segment is freed/mobilized and pulled toward the inverted penile skin. If the segment is on tension, the distal sigmoid artery branches can be ligated/sacrificed to allow for more length and mobility of the conduit (Figs. 17.6 and 17.7). Tension-free translocation of the segment into the vaginal canal is crucial, and Indocynanine Green (ICG, firefly mode) can be used to facilitate identification of the preserved vasculature at this time.

Anastomosis between previously dissected fasciocutaneous flaps of penile skin and the harvested sigmoid segment is performed with the robot and done in an interrupted fashion using 4−0 PDS. The neovagina is fixed to the sacrum, preventing postoperative prolapse. The depth and width of the vagina is checked by vaginal dilators. The distal sigmoid staple line is then opened and anastomosed to the vaginal canal remnant or penile skin to create the vaginal canal (Fig. 17.8).

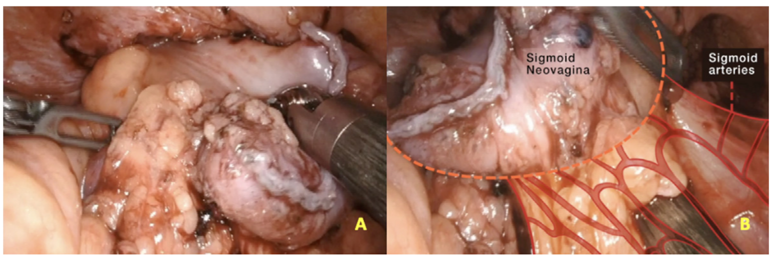

FIGURE 17.6 **Robotic sigmoid vaginoplasty.** Sigmoid segment is positioned through the neovaginal space (a) with location of vascularity (b) shown.

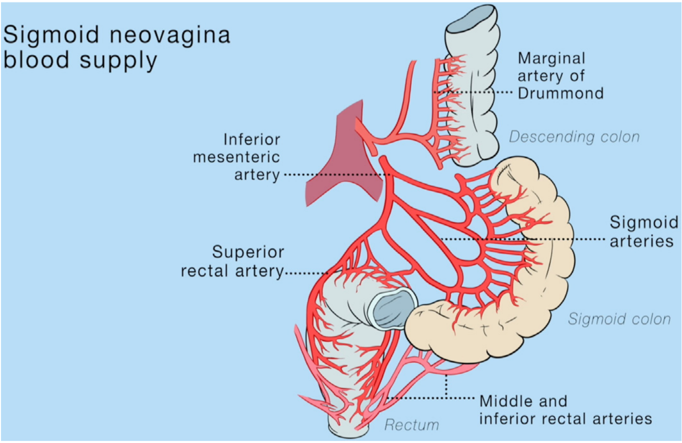

FIGURE 17.7 **Vascular supply to the sigmoid segment.** *Courtesy of Dr. Rajveer Purohit.*

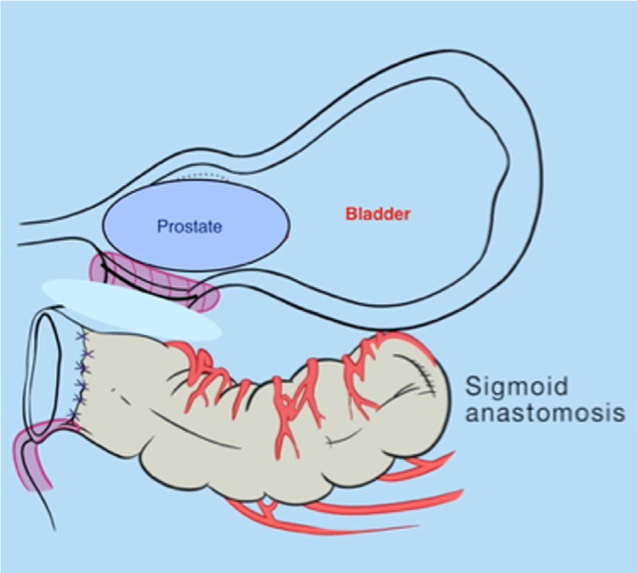

FIGURE 17.8 **Sigmoid anastomosis.** Once sigmoid is harvested, care must be taken to ensure penile skin is then anastomosed to the sigmoid deep to the introitus to maintain optimal cosmesis.

The neovagina can be fixed to the sacral promontory to prevent postoperative neovaginal prolapse if there is concern for this. The integrity of the anastomosis and depth and width of the vagina is confirmed by using vaginal dilators. Once complete, the neovagina is lightly packed with metrogel-soaked vaginal packing just beyond the site of anastomosis to prevent stenosis while healing. For aesthetic reasons, in both revision sigmoid vaginoplasty (Fig. 17.9) and primary sigmoid vaginoplasty (Fig. 17.10) cases, we try to keep the skin anastomosis as deep as possible to minimize the external visibility of colonic mucosa and the appearance of a stoma.

FIGURE 17.9 **Final appearance of revision sigmoid vaginoplasty.** *Courtesy of Dr. Rajveer Purohit.*

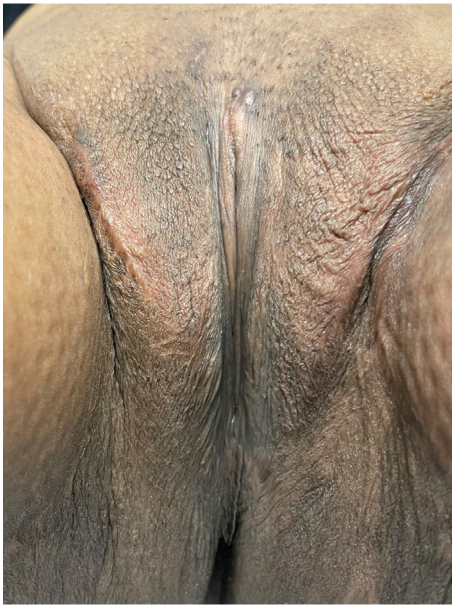

FIGURE 17.10 **Final external appearance of the primary sigmoid vaginoplasty.** *Courtesy of Dr. Rajveer Purohit.*

Limitations and complications

Surgical procedures involving the intestines and bowel anastomosis carry potential for complications, and intestinal vaginoplasty does have limitations. Complications may include vaginal and introital stenosis, diversion colitis, fistula, excessive mucus production with odor, and rarely cancer affecting the specific portion of the intestine [19].

Ileum

It was found that the small intestine lacks the necessary width to achieve adequate depth when creating a neovagina (average ileum-derived neovagina depth is 13 cm (range 12.5–14 cm), as mentioned previously—the lower end of the range for intestinal vaginoplasty). Moreover, the process of positioning the small intestine within the pelvic cavity is challenging due to the short length of the mesentery and the considerable distance that needs to be covered. The walls of the small intestine are also relatively fragile, and its delicate mucosal lining is susceptible to damage, which can result in subsequent bleeding [19].

[12] evaluated 32 patients (27 transgender and 5 nontransgender patients) with an ileal vaginoplasty as a primary procedure in 3 patients and a secondary procedure in the remaining 29. In this study, the main complication of ileum-derived vaginoplasty was introital stenosis. Out of the 32 patients, introital stenosis occurred in 4 patients (12.5%) [12]. Additionally, a rectoneovaginal fistula occurred in one patient and required surgical intervention. They reported that revision vaginoplasty procedures may cause increased risks of iatrogenic injuries and subsequent risks of rectoneovaginal fistula formation [12]. An anastomosis leakage or anastomotic stricture are two additional complications that may occur; [12] reported one case of anastomosis leakage and one case of intestinal anastomotic stricture [12].

There is concern around the occurrence of prolapse and diversion colitis when using the ileum [2]. However, no prolapse or diversion colitis was reported by [12]. Additionally, in four studies with a total of 169 patients, both transgender and cisgender patients, [20] reported no prolapse, diversion colitis, or cancer [20].

The vaginal-like mucosa that occurs, however, causes excessive discharge with no malodor Bouman et al. [20]. The ileum's mucosal secretions are more prevalent yet also less lubricating than the sigmoid segment [5]. In a study with 80 transgender and cisgender patients, on average, the patients used about 10–15 sanitary pads every day for the first month Wu et al. [19]. However, this temporary high level of discharge gradually reduced to a manageable level within a period of 2–6 months, without causing significant clinical morbidity [20]. Liguori et al. 2005 closely studied five transgender patients with an ileum-derived neovagina and reported that none reported significant dyspareunia [10].

Right colon

One study has reported outcomes using the right colon for the vaginal canal in transgender patients. In Garcia et al. 2020, 22 transgender women underwent revision vaginoplasty with the right colon. Two intraoperative complications were reported: one bowel ischemia and one bladder injury [6]. The most common short-term complication (<30 days) was ileus/small bowel obstruction, which occurred in 3/22 patients (13.6%). No patient experienced an anastomotic leak. 6/22 (27.3%) patients had long-term complications (>30 days): 1 developed Crohn's (not involving neovagina); 1 experienced late small bowel obstruction; 5 had issues with neovagina prolapse (22.7%); 4 developed stenosis (18.2%); 2 faced external obstruction at the recto-vaginal junction; and 3 were diagnosed withdiversion neovaginitis (13.6%). [6] A total of 6 of 22 individual patients (27.3%) required postoperative surgery. Diversion neovaginitis was clinically suspected in three patients with mild bleeding/discharge symptoms (mucus production/amount of vaginal discharge was not quantified or assessed) and confirmed on endoscopic biopsy. Diversion neovaginitis was successfully treated with mesalamine enema in all patients [6].

Sigmoid

In Bouman et al. [15], 42 transgender patients underwent primary laparoscopic sigmoid vaginoplasty. Only one intraoperative complication occurred, a rectal injury that was primarily repaired [15]. Immediate postoperative complications requiring reoperation occurred in 3/42 patients (6.8%), one of which had an anastomotic leak. Introital stenosis required surgical revision in 6/41 patients (14.6%). One patient had mucosal prolapse [15].

In [11], at the long-term follow-up (median was 23.8 years), after a secondary sigmoid vaginoplasty, one of the most common complications was neovaginal fistula. Three patients developed a neovaginal fistula (13%), requiring secondary surgery [16].

In [20] and [21], the most common complication of sigmoid-derived vaginoplasty was stenosis (8.6% and 8.3%, respectively) [19,21]. Further, in [20], out of 686 sigmoid vaginoplasties in a systematic review of both cisgender and transgender individuals, 27 cases (4.1%) of introital stenosis needed surgical intervention, and dilation solved 30 cases (4.5%) [20]. This stenosis often occurred during the first postoperative year. Prolapse also occurred in 7.7% of sigmoid-derived vaginoplasties, occurring more often than with ileum grafts (7.7% vs. 0%, respectively). Among the cases, 27 instances (6.5%) involved a minor mucosal prolapse, which could be addressed with a straightforward local incision Bouman et al. [20]. In two cases (0.48%), a subsequent neovaginopexy procedure was conducted. In follow-ups ranging from 15.6 months to 12 years, no diversion colitis or cancer was reported [19].

In a study with solely transgender patients, [15] experienced similar long-term postoperative complications requiring surgical correction after 3.2 ± 2.1 years: introital stenosis (n = 6, 14.6%) and minimal mucosal prolapse (n = 1, 2.4%) [15].

Neovaginal discharge can be the sole indicator or clinical presentation for various different complications including fistulae, granulation tissue, infections, or malignancy as described in [11,22]. Most individuals' high levels of discharge decreased to an acceptable level within 2–6 months, similarly to the ileum-derived vaginoplasty [20]. However, according to [11], a few patients had excessive neovaginal discharge due to mild diversion neovaginitis (n = 2, 4.8%-)—both were treated with short-chain fatty acid enemas [15].

Kwun Kim et al. [23] reported whether patients experienced any malodor 1 year after their surgery and found that only 3/28 transgender patients (10.7%) complained of malodor [23].

Additionally, [11] examined the long-term risk of diversion neovaginitis. They reported that the most significant endoscopic features were a diminished vascular pattern, edema, granularity, friability, decreased resilience, and erythema [24]. The endoscopic findings of the neovaginal segment were consistent with inflammatory changes analogous to diversion colitis patients. Excess discharge is vaguely defined in the literature by whether a patient deems it as problematic. Excessive discharge has several possible causes, such as diversion neovaginitis, infection, and fistulas, and so there is a need for a standardized diagnostic and treatment algorithm to best approach analyzing discharge levels [22].

Postoperative care and follow-up

Vaginal packing and the 16 Fr foley catheter remain in place for 1 week postoperatively until the first follow-up visit. Patients are on bedrest for postoperative day (POD) 0 and then placed on standard ERAS protocol starting POD 1. Our patients are admitted to the hospital for 3–4 days depending on the return of bowel function. In the literature, the average hospital stay for sigmoid vaginoplasty was longer (12.5 ± 9.5 days) than for an ileum graft (7.1, range 6–12 days) [9,10].

Vaginal packing and urethral foley are removed 1 week postoperatively at first office visit. Dilation education is performed at this first visit. Patients are instructed to begin vaginal dilations three times daily using just the patient's finger to keep the junction between the skin and the intestinal section open. They are provided with a set of vaginal dilators and instructed to begin with the smallest dilator in the set. Patients were discouraged from penetrative sexual activity before the 6 months postoperative time point. Copious water-based lubrication is encouraged on an as-needed basis for easier dilation. Patients with pain on dilation are referred to pelvic floor physical therapy.

Vaginal douche to evacuate the mucus is recommended for a period of 1 month postsurgery if necessary [25].

Sexual satisfaction

Ileum

In terms of sexual activity and sexual satisfaction with **ileum** grafts, patients were able to resume sexual activity 1–2 months after surgery. For ileal vaginoplasty, all patients were sexually active after 6 months Trombetta et al. [26]. Additionally, overall sexual satisfaction is very high in ileum-derived vaginoplasty due to the natural vaginal-like mucosa—100% overall sexual satisfaction was reported by Liguori et al. [10].

Right colon

All (100%) patients reported satisfaction with right colon-derived neovagina function and appearance (mean satisfaction with colon neovagina function was 4.4/5 (SD 0.5), and 4.1/5 (SD 0.87) for appearance of the introitus (5 means very satisfied and 1 means very dissatisfied) [6].

Sigmoid

Satisfactory sexual activity is a common reason to perform intestinal vaginoplasties, and data suggests sigmoid vaginoplasties offer high sexual satisfaction rates. After a year, [23] reported that 22 transgender patients (78.5%) were sexually active with 19 (86.3%) of those patients experiencing orgasm [23]. The other patients were not having sexual intercourse due to lack of partners. Only one patient experienced pain during intercourse (3.5%), and two patients experienced vaginal bleeding during intercourse (7.1%) [23]. In Wright et al. [21], out of 19 sexually active patients with sigmoid vaginoplasty available for a long-term follow-up, no individuals reported any dyspareunia [21]. However, in a larger systematic review including both transgender and cisgender individuals, dyspareunia affected 24.7% of 271 patients with sigmoid vaginoplasties in a total of seven studies [20] and can often be a result of neovaginal colitis [19].

Overall sexual satisfaction is very high (>80%) in all types of gender-affirming vaginoplasty [25]. Sexual satisfaction assessments varied due to lack of standardized questionnaires in the transgender population, and therefore, FSFI (female sexual functioning index) was often used. However, standardized questionnaires were rarely used, enforcing the need for a standardized approach when evaluating sexual satisfaction.

Conclusion

The use of bowel segments for gender-affirming revision and primary vaginoplasty carry unique advantages and risks. Extensive patient counseling and shared-decision making should help guide treatment decisions regarding use of bowel for gender-affirming vaginoplasty. Average procedure-related complication rates for ileum and sigmoid were 8.3% and 6.6%, respectively [20].

Overall, all types of intestinal vaginoplasty offer abundant native tissue allowing for the attainment of adequate depth and width regardless of amount of scrotal skin and can provide enough lubrication to preclude the need for exogenous lubricants. When executed correctly, bowel vaginoplasty maintains its vascularity, theoretically reducing the risk of vaginal stenosis and potentially also permitting larger vaginal depths to be created.

The final choice of which surgical procedure to use depends on the specific patient and their individual anatomy and the surgeon's expertise and preferences. For a variety of reasons described, we have avoided use of small bowel and prefer the sigmoid for neovaginal wall creation. Sigmoid vaginoplasty has been particularly useful in situations where a patient does not have adequate skin to use for a penile inversion due to a stoppage in puberty.

Overall, level 1 evidence is lacking, but data suggests that the utilization of bowel segments in vaginoplasty is a safe and effective procedure that offers satisfactory outcomes with potential benefits such as a natural and self-lubricating neovagina of sufficient width and depth, eliminating the need for long-term dilation and achieving enhanced cosmesis.

A review of the significant published literature on the use of bowel segments for a vaginoplasty is seen in Table 17.3.

TABLE 17.3 A review of the significant published literature on the use of bowel segments for vaginoplasty.

Reference	Year	# of patients	Technique	Mean follow up	Outcomes measured (OR time, LOS, vaginal depth, sexual satisfaction, overall satisfaction, complication rate)	Complications
Bouman et al. [20]	2014	686 sigmoid 169 ileum (both cisgender and transgender patients)	Sigmoid, ileum (open, laparoscopic, and robotic)	Sigmoid: 18 months to 12 years (19.7 months) Ileum: 14 −34.6 months (49.9 months)	DOP: 204 min sigmoid, 269 min ileum LOS: 8.9 days sigmoid, 13.4 days ileum VD: 11.5–13 cm sigmoid, 10.5–18 cm ileum Diameter: 3.7–4 cm sigmoid, 2.5–4.5 ileum SA: 74.2% sigmoid, 56%, 88%, 100% in 3 different studies ileum SS: 85.7% sigmoid, 100% ileum	Sigmoid: Stenosis Discharge Malodor Prolapse Necrotizing fasciitis intraluminal abscess dyspareunia Ileum: Discharge Malodor Stenosis Dyspareunia
Djordjevic et al. [18]	2011	27	Secondary sigmoid (open)	47 months	LOS: 7–9 days VD: 12 cm VW: 3.4 cm FSFI: 11.5–35.7 (mean 28.9) SS: 79% (women asked to define SS)	Mucus discharge Persistent introital stenosis Dyspareunia
Kim et al. [17]	2021	15	Sigmoid (laparoscopic)	24.8 months	DOP: 529 ± 128 min, mean VD: 15.2 ± 1.3 cm LOS: 8.7 ± 1.7 days SS: 50% of de novo surgery	Stenosis Postoperative anastomotic leakage Rectovaginal fistula formation Colon flap necrosis Necrotizing cellulitis Anastomotic leakage
Salgado et al. [9]	2018	12	Sigmoid (laparoscopic)	6 months	VD: 13.9 ± 2.0 cm LOS: 9 ± 2.1 days SA: 42% SS: 100%	Introital stenosis Bladder injury Deep venous thrombosis Death from pulmonary embolism Infection
Meece et al. [27]	2023	2	Sigmoid	19–20 days then 1 year; 1 month		Abscess formation leading to necrosis Stenosis leading to sigmoid conduit Ischemia

Zolper et al. [28]	2020	69	Sigmoid (78.3%); transverse (21.7%)	49.8 months	LOS: 8.5 days VD: 15.3 cm, n = 54 OS: 77.6% SA: 51.2% AO: 84.0%	Introitus stricture
Kwun Kim et al. [23]	2003	28	Sigmoid	1, 2, 6, and 12 months and then once a year until 10 years	LOS: 8−10 days VD: 12 cm VW: 3.9 cm SA: 100% AO: 88.9%	Excessive discharge Malodor Intermittent abdominal pain Pain during intercourse Bleeding during intercourse Vaginal orifice constriction Problem with urination Rectovaginal fistula Excessive rectosigmoid vaginal protrusion
R C Franz [29]	1996	2	Sigmoid	1 year	PI: 0%	Mild stenosis
Zhao et al. [30]	2011	19	Ileum (laparoscopic)	Mean follow-up 34.6 months	DOP: 215 min LOS: 12.5 days VW: 3.2 cm VD: 15 cm TOS: 7.5 months	Rectum and/or bladder injury during operation Acute renal failure Delayed healing of ileocutaneous anastomosis Introital stenosis Intestinal obstruction Neovaginal discharge (8−12 sanitary pads)
Garcia et al. [6]	2021	22	Right colon (laparoscopic)	30 days, 5 months, 9.5 months (median 4 months)	DOP: 210 min for primary RBF: 2.7 days OS: 4.4/5 SD 0.5 SS: 4.1/5 SD 0.87 *1 means very dissatisfied, 5 means very satisfied	Injury of ileocolic pedicle Minor bladder injury Small bowel obstruction Intraabdominal hemorrhage Neovagina prolapse Stenosis Extrinsic obstruction at the rectovaginal junction Diversion neovaginitis

AO, Achieve orgasm; *DOP*, Duration of procedure; *LOS*, Length of hospital stay; *OS*, Overall satisfaction; *PI*, Pain during intercourse; *RBF*, Return of bowel function; *SA*, Sexual activity; *SS*, Sexual satisfaction; *TOS*, Mean time between operation and sexual intercourse; *VD*, Vaginal depth; *VW*, Vaginal width

From Icahn School of Medicine at Mount Sinai.

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CHAPTER

18

Peritoneal flap gender-affirming vaginoplasty

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Introduction

Gender-affirming vaginoplasty is a procedure with many different paths to a shared destination of reconstructed anatomy. This destination is guided by surgeon experience and patient expectations. Many patients highly value vaginal dimensions in their overall satisfaction. Vaginal depth and width can allow for pain-free participation in desired sexual practices and can relieve gender incongruence even for those who do not engage in receptive intercourse—as a result, depth can be culturally very significant, leading to psychosocial consequences for patients if adequate depth is not achieved or maintained [1]. When patients were surveyed on directions for future research, they prioritized investment in techniques and management affecting vaginal canal dimensions [2].

The tissue used to create the vaginal canal distinguishes surgical techniques and influences vaginal dimensions. The existence of many techniques reflects the lack of a perfect option for patients, as each presents their own benefits and complications. Patients undergoing penile inversion vaginoplasty (PIV) who have limited genital tissue may have smaller vaginal dimensions unless an additional donor site is used; bowel vaginoplasty can circumvent this drawback, but risks introducing intraabdominal complications.

Compared with PIV, peritoneal flaps provide vascularized tissue to constitute the vaginal canal without requiring an additional skin donor site or compromising the bowel through resection and anastomosis, thereby reducing risks of bowel perforation or injury, skin infection, postoperative pain, and donor site scarring. Although it also requires entering the peritoneum, it is less invasive than bowel vaginoplasty. In addition to the safety benefits, the

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https://doi.org/10.1016/B978-0-443-21776-0.00018-2

peritoneum possesses many ideal qualities for a substitute of natal vaginal lining: it is nonhair bearing, moist, and lined by squamous-like mesothelial cells [3–5].

The benefit of peritoneal flaps can be maximized through a novel robotic approach drawing from a rich history of vaginal reconstruction and modern techniques in urogynecology. This chapter will serve as a detailed review of the surgical technique, patient management, and unique considerations involved in robotic peritoneal flap gender-affirming vaginoplasty (RPGAV).

Brief history

The origins of peritoneal flap vaginoplasty trace back to German gynecologist Walter Stoeckel in 1919 and Russian gynecologist M. I. Ksido in 1933 [6,7], with recognition building after the technique was implemented by Davydov and Zhvitiashvili to treat vaginal agenesis in 1969 [7–9]. Whether peritoneal flap vaginoplasty was performed in a transgender patient during this period is not known, as prior to recognition of their identity, it is well known that transgender people would obtain surgery through clinics for intersex care, thereby obscuring reports of a gender-affirming vaginoplasty [10]. Of the available documentation, the use of peritoneum in gender-affirming surgery is relatively new compared with other techniques, with the first reports of split-thickness skin graft gender-affirming vaginoplasty in 1931, bowel in 1942, and penile inversion in 1952.

Concurrent to the evolution of vaginoplasty techniques, technological advancements in surgical instruments led to the use of the PROBOT—a robotic surgical assistant designed specifically to aid urologists in transurethral surgery—in 1988 [11]. The Da Vinci robotic system from Intuitive Surgical (Sunnyvale, CA) led to adoption of robotic-assisted laparoscopy techniques in prostate, kidney, bladder, and pelvic reconstructive surgery, with strides especially made in robotic prostatectomy [11]. In 2017, the senior authors drew on this surgical innovation to perform the first documented cases of a peritoneal flap gender-affirming vaginoplasty using a robotic modification of the Davydov technique [12]. Laparoscopic means of integrating peritoneum into gender-affirming vaginoplasty have also since emerged [13,14].

Preoperative Considerations

Surgical success has two major components: the operation and the patient. Meticulous surgical technique can still result in failure if the patient is unsatisfied with the final outcome. The preoperative period provides a window to optimize patient factors conducive to fulfilling these components. Both medical and psychosocial factors are important, as evidenced by research linking patient education to higher surgical satisfaction [15]. A patient who understands the medical risks and benefits of their procedure is well met by a surgeon who understands the psychosocial needs of their patient.

In addition to the involvement of mental health providers, preoperative multidisciplinary care should include a pelvic floor physical therapist. Dilation is time-consuming, painful, and consequently a potential cause of postoperative complications; pelvic floor physiotherapy helps patients prepare for the difficult regimen. Many members of the transgender community have a problematic history with navigating the healthcare system [16], and having a trusted physiotherapist to refer to will increase patient adherence. This is especially key for peritoneal flap vaginoplasty, as the intraabdominal aspect of the procedure has been associated with the formation of pelvic abscesses when patients do not dilate, although this is exceedingly rare [17].

As with any surgery, medical comorbidities must be addressed. Due to the microvascular consequences of smoking and diabetes, adequate glycemic control must be achieved, and patients should be advised to stop smoking at least 6 weeks prior to surgery. Gastrointestinal diseases, such as Crohn's Disease or ulcerative colitis, are not strict contraindications to surgery but may pose a higher rate of complications and need for additional surgeries, so these patients must be thoroughly consulted on this risk before proceeding. Prior abdominal surgery is particularly relevant to intraabdominal approaches to peritoneal flap vaginoplasty, as it increases risks of adhesions, fistula formation, or atypical pelvic anatomy; however, they do not preclude candidacy for RPGAV. We consider a previous prostatectomy to be a contraindication to RPGAV because it poses a higher risk of incontinence due to the dissection around the external urinary sphincter.

The use of exogenous estrogen perioperatively lacks consensus in the literature, but the best evidence points to its continuation in patients undergoing vaginoplasty [18], as is the practice of the senior authors. Patients should still be educated on the hypothetical risks of venous thromboembolism (VTE) during initial consultation while acknowledging that withholding hormones can cause patients psychological and physiological distress, especially after a gonadectomy [19].

Although one of the benefits of peritoneal flap vaginoplasty is a reduced need for donor site skin, hair removal is paramount as parts of penile and scrotal skin are still used to line the vaginal canal. A template should be provided to patients to share with hair removal technicians, as seen in Fig. 18.1. Laser and electrolysis are both valid means of hair removal with specific considerations tailored toward a patient's complexion, hair pigmentation, and hair composition.

It is the preference of the senior authors that patients have a BMI <35; however, this is not a strict cutoff. A higher BMI complicates surgery, as it can be more technically challenging for the surgeons, surgical equipment may falter with patients at a high enough BMI, and visceral fat distribution can impede intraabdominal access, in addition to issues with wound healing and cardiovascular issues in obese patients [20,21]. However, the risks of an elevated BMI in surgical patients should be weighed against the risks of withholding a potentially lifesaving treatment. Patients with severe gender incongruence have higher rates of suicidal ideation and attempts than the general population, and gender-affirming surgery has been proven to reduce these sequelae [16,22,23]. Shared decision-making and informed consent should therefore be pursued with these patients and are important in ensuring equitable care [20].

Surgical Technique

This chapter focuses primarily on RPGAV, but a brief review of laparoscopic techniques is warranted. Laparoscopy-assisted peritoneal flap gender-affirming vaginoplasty (LPGAV) is a new approach that has been reported in case reports and small cohorts. These alternate techniques described include laparoscopic dissection of the posterior bladder wall and

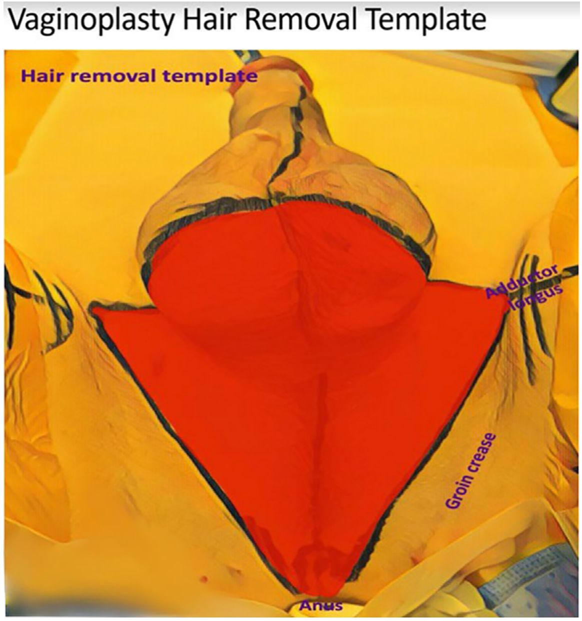

FIGURE 18.1 Preoperative hair removal template provided to patients to guide either electrolysis or laser hair removal.

rectosigmoid colon in full layers with "pull-through" of the peritoneal flap, which has been significantly undermined to provide lining to nearly the entire canal, and then sutured to a penile skin flap at the introitus; and pedicled peritoneal flap dissections with extracorporeal suturing and tubularization of the flaps via a groin incision [13,14,24]. Some have also used laparoscopic approaches when harvesting peritoneal flaps for revision vaginoplasty [25]. Compared with the use of a surgical robot, LPGAV confers many physical restrictions on the surgeon due to limitations in angles, range of motion, and positioning. This can decrease precision in many facets, including suturing and manipulation of the intraabdominal contents, which may explain why some laparoscopic techniques thus far have involved hand-sewing the canal outside the abdominal cavity. The use of a groin incision with externalization of the peritoneal flaps poses an additional infection risk. Therefore, the robot remains the senior authors' recommended tool for peritoneal flap vaginoplasty.

Robotic Assisted Peritoneal Flap Gender Affirming Vaginoplasty

Since 2017, more gender-affirming surgeons have begun performing RPGAV, with personalized modifications in approach. This chapter describes only the technique of the senior authors to avoid misrepresenting any other performing teams. The Da Vinci Xi Robotic system was initially used for RPGAV; however, the switch was made to the single-port robot system once it was available, and our data reflects a decrease in operative time, improved surgeon visualization, and improved mobility within the pelvis. The use of a single robot arm also decreases the imposition on the perineal surgeon and requires fewer incisions.

Position and Preparation

In the senior authors' practice, RPGAV is performed with two surgeons, a reconstructive urologist (LCV) and a plastic surgeon (RBL). All patients receive intraoperative antibiotics and chemical and mechanical VTE prophylaxis. The case begins in the lithotomy position. While in this position, the major perineal landmarks are marked: the adductor tendons, inner groin creases, the ischial tuberosities, and the perineal–scrotal junction (Fig. 18.2). The last two structures serve as the parameters for the planned rhomboid flap and site of the future vaginal introitus. All patients then have a Foley catheter placed.

Perineal Dissection

Scrotal Dissection and Graft Harvest

The use of peritoneal flaps in the eventual canal permits a unique distribution of genital tissue during external reconstruction, and the perineal and intraabdominal dissections proceed concurrently. A 2 cm long × 1 cm wide rhomboid flap is designed in the perineum and elevated with skin and underlying fat. An ellipse of scrotal skin is excised and passed off for thinning. Although preoperative hair removal has been done, remaining hair follicles are removed during thinning of the graft. The lateral aspect of the scrotal and perineal skin is preserved for labia majora reconstruction. Bilateral orchiectomy begins with dissection of the tunica vaginalis and tunica adventitia to release the testes and skeletonize the spermatic cord to the level of the external inguinal ring. A 0-silk suture is used to ligate the spermatic cord; retraction of the residual cord into the inguinal canal is ensured to prevent later bulging in the vulva. Of note, orchiectomy before vaginoplasty does not result in meaningful contracture of the scrotal skin or scar tissue and does not compromise the ultimate result. If a patient would like to consider orchiectomy prior to vaginoplasty, we recommend using a midline scrotal incision as this scar would be excised at time of future vaginoplasty.

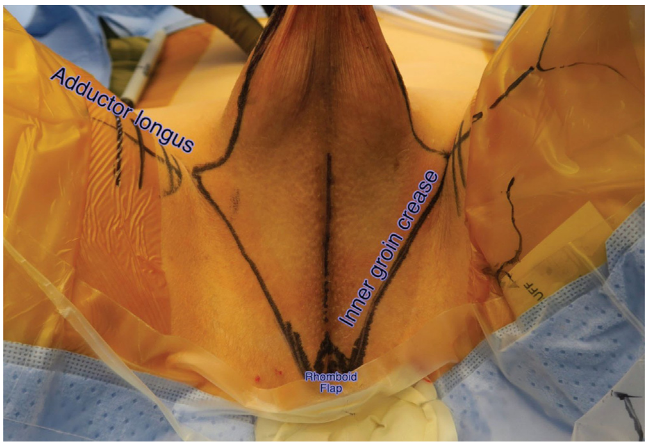

FIGURE 18.2 Marking of the perineal dissection landmarks and rhomboid flap boundaries.

Penile Degloving

A circumferential incision is made in the penile skin approximately 2 cm below the coronal ridge. The proximal penile urethra is freed by degloving in the loose areolar plane above Buck's fascia, and the penile skin is then inverted.

Urethrectomy and Corporotomy

The urethra is dissected free from the corpora cavernosa and amputated at the level of the adductor tendon. Removal of the spongy corporal tissue begins with incising the bilateral corpora cavernosa ventrally and preserving the dorsal tunica, which carries the dorsal pudendal neurovascular bundle. The corporotomy then continues distally along the ventral penis to the level of the ischium at the base of the corpora, and the spongy tissue is elevated with the edges of the tunica albuginea under tension. The septum and spongy erectile tissue are then removed. The right and left corporotomies are closed in a running fashion using 3−0 polydioxanone (PDS; Ethicon, Inc., Somerville, N.J.).

Perineal Exposure

The perineum is dissected through Colles' fascia to the level of the bulbospongiosus muscles. The muscle is dissected free from the underlying bulbar urethra and then left attached as a flap until the canal dissection is complete and the integrity of the rectal wall is confirmed. The perineal dissection proceeds proximally toward the robotic surgeon in the plane between the muscle and the urethra. Lidocaine with epinephrine is used as tumescent. The central tendon is sharply taken down with scissors, and the connection to the intraabdominal canal is made at the level of the prostate.

Intraabdominal Dissection

With the patient in steep Trendelenburg, the intraabdominal dissection and perineal reconstruction occur simultaneously. For SP access, a supraumbilical incision is made in the skin followed by a 2.7-cm fasciotomy and sharp peritoneal dissection [26]. After entering the peritoneum, the SP trocar is inserted with a preferred abdominal insufflation of 8 mmHg. An 8-mm assistant port is placed approximately two fingerbreadths above the anterior superior iliac spine.

While there are many robotic instruments available, the time and cost of the operation can be reduced by minimizing the instruments used to bipolar Maryland forceps, monopolar scissors, and needle driver. The rectovesical space is exposed with careful sigmoid adhesiolysis, followed by a wide incision overlying the seminal vesicles and beneath the vas deferens laterally. The vas deferens demarcates the anterior and posterior peritoneal flaps. The medial umbilical ligaments serve as the lateral borders of the anterior flap, whereas the posterior flap is marked laterally by the ureters and superiorly by the sacral prominence (Fig. 18.3). Denonvilliers' fascia is opened to create a safe operating plane between the prostate and rectum. If bleeding does occur from the pedicles, hemostasis is usually achieved with suture ligation to reduce the risk of cautery injury to the rectum. Dissection of the vaginal canal then proceeds antegrade to the level of the prostatic apex, and connection is made with the perineal dissection by the perineal surgeon. A 38-mm, Orange Soul Source vaginal dilator (North

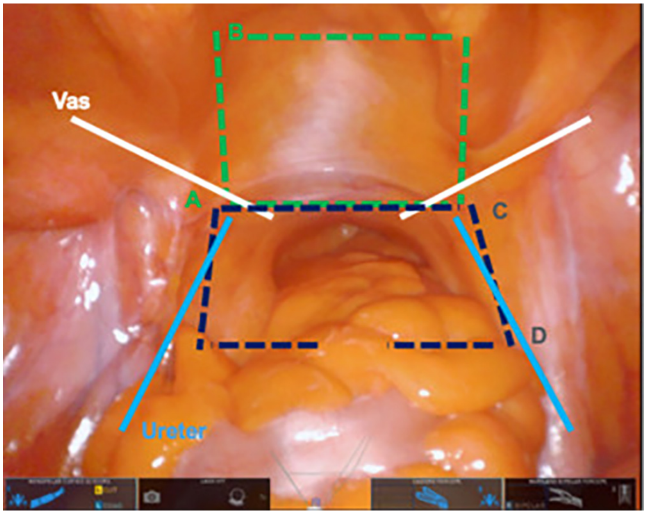

FIGURE 18.3 Labeled robotic view of the boundaries of the flap dissection for both the anterior (*green*) and posterior (*blue*) flap with accompanying landmarks.

Hollywood, CA, United States) is then inserted into the canal to confirm it is of adequate size. Depending on each patient's unique anatomy, the levator ani and pelvic wall musculature may have to be partially divided laterally to fully accommodate this dilator.

Creation of the Vaginal Lining

The anterior peritoneal flap is raised from the posterior bladder, and the posterior flap is raised adjacent to the rectum, both measuring approximately 12 cm by 12 cm in size, although flap size may vary according to patient anatomy and amount of tissue needed.

During the concurrent perineal and peritoneal dissection, an assistant thins the harvested scrotal skin graft and tubularizes the skin around an orange dilator. The tubularized skin graft is then sutured to the penile skin tube. Once the peritoneal flaps have been elevated, the skin tube, which will line the distal canal, is inverted and passed to the waiting robotic surgeon.

The robotic surgeon then sutures the posterior peritoneal flap to the inferior ventral penoscrotal skin and the anterior peritoneal flap to the dorsal aspect of the skin graft. A barbed, 3–0 absorbable suture is best fit for this technique as it minimizes tension on the anastomoses.

The previously raised rhomboid flap is inset to the penile scrotal skin tube on the posterior floor of the canal with an interrupted 3–0 Vicryl (Ethicon, Inc., Somerville, N.J.) suture.

The vagina is then packed with rolled gauze that has been soaked in mupirocin, bacitracin, and lubricant. After the robotic surgeon confirms that the packing extends to the end of the vaginal canal, the apex is finalized with another 3–0 absorbable barbed suture, starting with a three-point stitch midline, and then extending laterally, which separates the vagina and the abdominal cavity. Ensuring the vagina is secured to the peritoneal lining greatly decreases the risk of neovaginal prolapse. The final anatomy of the vaginal canal is displayed in Fig. 18.4.

Closure then ensues with a 0-Vicryl for the fascia, 3–0 Vicryl to approximate subcutaneous tissue, and a 4–0 Monocryl (Ethicon, Inc., Somerville, N.J.) for subcuticular closure.

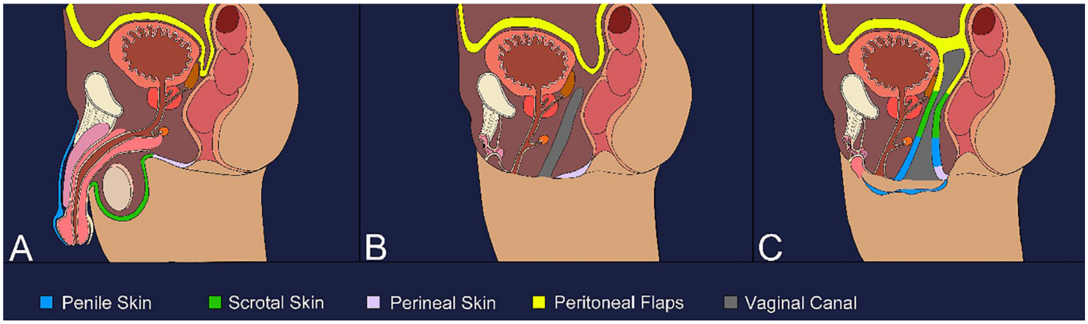

FIGURE 18.4 (a) Preoperative anatomy. (b) After penectomy and orchiectomy, when peritoneal flaps (*yellow*) are raised from the bladder and rectum. (c) Neovaginal canal (*gray*) is formed at the apex by peritoneal flaps, scrotal skin (*green*), and penile skin (*blue*), which also form the labia minora. Posterior aspect of the neovagina is adjacent to perineal skin (*purple*).

External Reconstruction

The external reconstruction occurs simultaneously, working in tandem with the creation of the vaginal canal. There are core axioms that guide this phase of the operation. First, like tissue should be replaced with like tissue. Most components of the external genitalia are composed of the same structures that differentiate upon the introduction of sex hormones; the labia majora shares its source with the scrotal skin, the labia minora with the penile raphe, and the clitoris with the glans [27] (Fig. 18.5). Second, the vulva should be conceptualized as discrete subunits with their own contours and landmarks that are approached granularly, with the understanding that the creation of each subunit will affect the appearance of all others [28]. Third, distortion of anatomy from scarring can be mitigated by placing incisions and suture lines along the natural topography of the aforementioned subunits; this creates shadows and adds dimension to the reconstructed unit similar to the composition of a natal vulva [28]. Finally, the penoscrotal flap should not be pulled laterally, as this causes effacement of the labia minora. It should instead be pulled inferiorly.

Clitoroplasty

While the peritoneal flaps are being raised, the perineal surgeon continues with the vulvar reconstruction. Clitoroplasty is based on the neurovascular pedicle associated with the glans and preputial skin. The central portion of the glans that contains the urethra is removed. The inferolateral aspect of the glans is then deepithelialized, leaving a 2×1 cm area of skin, and the remaining epithelium is sutured into a cone to form the exposed portion of the clitoris. The neurovascular bundle that runs along the tunica is folded back on itself and tacked to the mons pubis with a single absorbable stitch. The clitoris is then set at the level of the adductor tendon and sutured to the urethral mucosa. The remaining urethra is divided ventrally to the level of the decussation of the corpora cavernosa and used to line the vestibule. The lateral edge of the urethral mucosa is sutured to the medial edge of the distal penile/preputial skin attached to the clitoris. This forms the medial aspect of the labia minora.

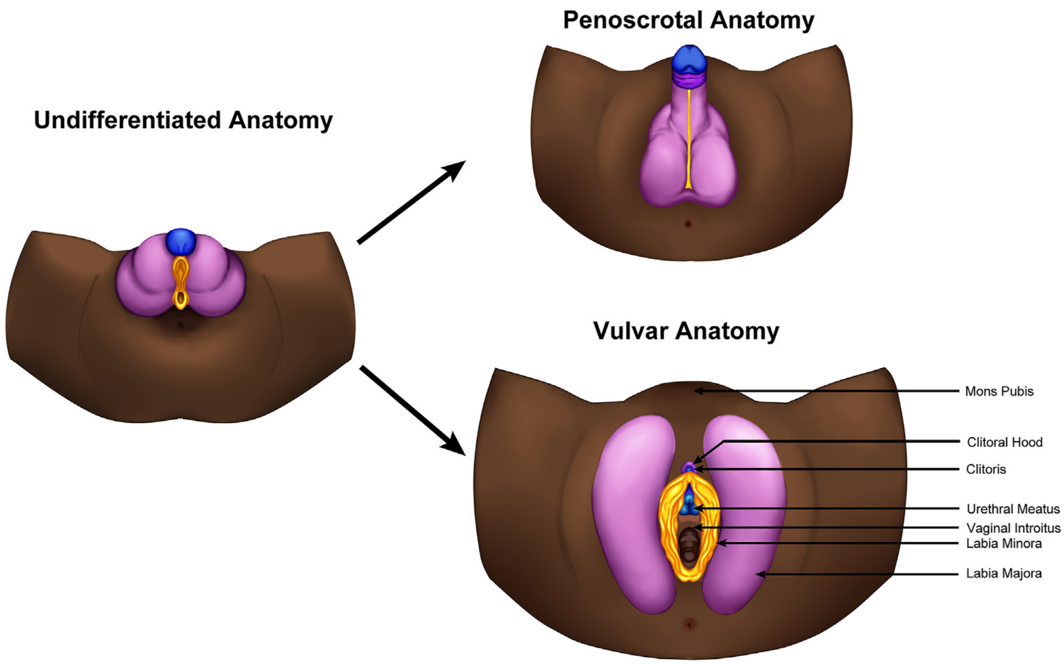

FIGURE 18.5 Diagram depiction of the embryonic undifferentiated genitalia that can be driven toward penoscrotal or vulvar anatomical subunits depending on early hormonal exposure. Using homologous structures and adhering the labeled vulvar anatomic subunits is the foundation for our aesthetic vulvar reconstruction. *Illustrations by © Zackary Herbst.*

The bulbar urethra is reduced using electrocautery; this is paramount, as excess bulbar urethra can engorge with arousal and obstruct the vaginal canal. The new meatus is formed by posterior eversion of the urethral mucosa.

Labiaplasty

The penile skin, which has been pulled inferiorly toward the vaginal introitus, is then split in the midline, exposing the clitoris and urethra. The penile skin is sutured to the preputial or distal shaft skin, forming the labia minora. Horizontal mattress 3–0 Vicryl quilting sutures are placed to define the labia minora and create a sulcus between the minora and majora.

The labia majora are formed from the remaining scrotal skin, which should be pulled down to the perineum inferiorly. Dog ears can be chased and excised medially. Ideally, the incisions land 1 mm medial to the groin crease and the lateral incision does not extend beyond the level of the adductor.

Closure

After all stages of reconstruction are completed, a negative-pressure, vacuum-assisted closure device is placed over the vulva and covered with gauze and abdominal pads. Finally, these dressings are held in place by gauze and compressive elastic tape.

Revision RPGAV

Any patient seeking depth revision RPGAV, regardless of their primary technique, should have all barriers to dilation appropriately addressed before considering revision surgery. Pelvic floor physical therapy and daily dilation with estrogen cream for 3 months are required prior to considering revision surgery. Other barriers to dilation, such as a history of sexual trauma, are also thoroughly explored. For those whose depth does not improve even after conservative treatment, the RPGAV can be a safe and effective technique for patients who have lost vaginal canal depth after their primary operation. In patients with some remaining depth, the peritoneal flaps are sutured to the canal remnant. In those who have lost all depth and cannot achieve a sufficient vaginal depth with peritoneal flaps alone, AlloDerm (LifeCell Corp, Branchburg, NJ), an acellular dermal matrix, has been used in the place of donor skin grafts. The AlloDerm is tubularized around the orange Soul Source dilator, similarly to how the penile–scrotal skin tube is in primary vaginoplasty. The tubularized AlloDerm is sutured into the introitus or the remaining vaginal cuff and then to the peritoneal flaps, as seen in Fig. 18.6. The remainder of the operation proceeds as described before.

Postoperative Care

Patients remain in the hospital for 5 days, during which antibiotics and VTE prophylaxis are continued. Patients get out of bed on postoperative day (POD) 1, and mobilization is steadily increased over the following days. The external dressing and wound VAC are removed on POD 4, at which point patients can shower. The Foley catheter is removed the

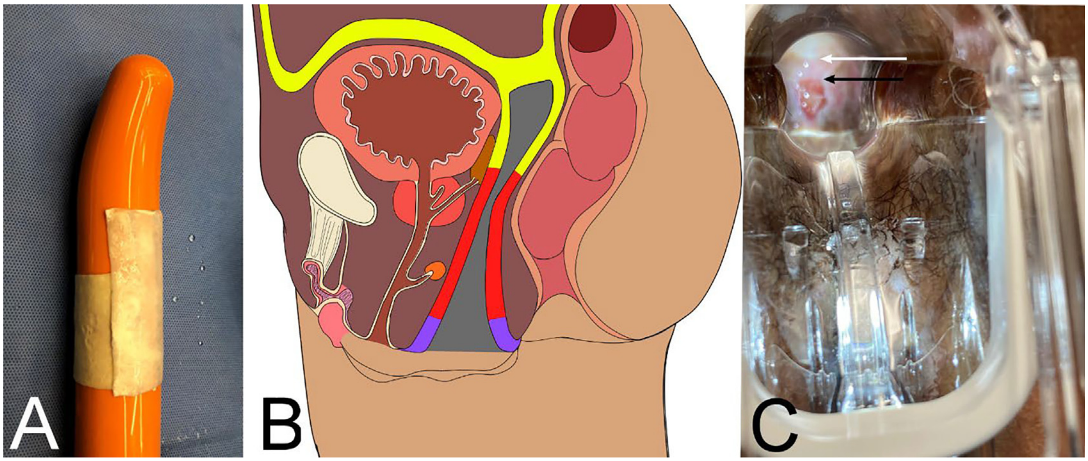

FIGURE 18.6 (a) AlloDerm, thin implantable, 4 cm width × 7 cm length and a thickness of 0.55 mm. The graft is tubularized around the 3.8 cm diameter Soul Source vaginal dilator. (b) Graphic representation of the different components of the revision vaginal with AlloDerm. *Purple*: The remnant vaginal canal. *Red*: The AlloDerm component of the vaginal canal. *Yellow*: The flaps that are mobilized from the peritoneum for the apex of the vaginal canal. (c) Image taken in-office displaying the healed lining of AlloDerm-augmented vaginal canal revision on postoperative day 90.

night of POD 4. The vaginal packing is removed on the morning of POD 5, and the patient is taught to dilate and douche. Once they exhibit capacity to dilate independently, they are ready to be discharged to home.

Postoperative evaluations should be frequent, starting at 2, 3, 4, 6, and 12 weeks, then moving to 6 months and then finally annually. The initial dilation regimen consists of 4, 15-minute sessions daily, with gradual increases in the size of the dilator until the orange dilator (from Soul Source) is used consistently. Dilation with the orange dilator ideally occurs within 6 weeks. All patients, regardless of ease of dilating, are recommended to attend pelvic floor physical therapy. Patients are cleared for receptive vaginal intercourse at 3 months.

Postoperative Outcomes

Patient Reported Measures

Patient-reported outcome measures (PROMs) should spearhead any determinant of surgical success. Our practice and many others use a patient's report of which dilator they are using at each office visit to assess their current vaginal dimensions. Depth is also confirmed with measurements taken during a lighted speculum exam. For vaginal depth, the largest study on RPGAV has a median depth of 13.6 cm with range from 9.7−14.5 cm [29]. These results are consistent even for patients with minimal genital tissue before primary vaginoplasty (median 14.5 cm with interquartile range 13.3−14.5) [30] and for those undergoing revision RPGAV, regardless of whether skin grafts (mean 13.6 cm with range 10.9−14.5) or AlloDerm (median 12.1 cm, range 9.7−13.3) were employed [31,32]. Dilation is required to maintain depth in RPGAV; regular receptive vaginal intercourse is not a sufficient substitute.

Rates of erogenous sensation after RPGAV are high, ranging from 86% to 100%; however, erogenous sensation has been shown to not correlate with how patients experience sex after vaginoplasty, so this metric should always be investigated alongside PROMs [33]. Orgasm capacity is a more reliable marker of sexual function, and it is often preserved in those undergoing RPGAV, with rates between 86% and 90% in both primary and revision cases; this is compared to anorgasmia rates upward of 40% in cisgender women [32,34−36]. Our practice queries the ability to orgasm, erogenous sensation, sexual activity, and libido at every visit.

Self-lubrication can be desirable for those engaging in receptive vaginal intercourse or who may find it gender-affirming; however, the natural moisture of the vaginal lining must be distinguished from tissues that can produce fluid. Peritoneal flaps may produce some moisture, but this occurs in the deepest portion of the vagina instead of the introitus and does not lubricate in response to sexual arousal. Bowel-based vaginoplasty does secrete fluid, but not exclusively during sexual arousal and can be malodorous [37]. Despite the in situ secretory capacity of the peritoneum, the flaps undergo epithelialization after transformation into the vaginal canal and function similar to the squamous epithelium of the skin [38]. Therefore, patients should be instructed to use additional lubrication during dilation and sexual intercourse.

Surgical Complications

RPGAV is a safe and effective procedure with low complication rates. The most common complications are neovaginal stenosis, typically associated with difficulty dilating, acute urinary retention, and granulation tissue. All patients who present with vaginal stenosis are instructed to attend pelvic floor physical therapy, and many improve with this treatment. Persistent granulation tissue can be addressed in the office with serial curettage followed by a course of intravaginal steroids. Patients with acute urinary retention are discharged with a urinary catheter for 1 week, with subsequent resolution of symptoms.

In the largest published cohort of patients who underwent RPGAV, there were no bladder or urethral injuries [29,39]. There was one rectovaginal fistula in a patient with Crohn's disease. Approximately 13% of patients returned to the operating room to address nonemergent, patient-requested revisions [29]. Intraabdominal complications account for 2.2% of cases requiring return to the operating room and have consisted of hematoma evacuation, abscess drainage, rectovaginal fistula repair, and small bowel obstruction with incarcerated bowel [17,40]. These were managed without recurrence or permanent disability to the patient. The successful treatment of these complications is only possible with close, routine follow-up and prompt intervention. RPGAV has had no instances of vaginal prolapse, vaginal protrusion, or death and intrinsically avoids intestinal complications associated with bowel vaginoplasty such as intestinal flap necrosis, anastomotic bowel leak, and diversion colitis [41].

There is less data for revision RPGAV, but the existing literature reinforces the safety of this procedure. The few reported complications pertained to granulation tissue, dilation, and urinary function [31]. These were managed conservatively and resolved within 3–6 months, aside from one instance of de novo urinary retention ultimately requiring placement of a sacral neuromodulator for reduced detrusor contractility [31].

Conclusions

Gender-affirming vaginoplasty has a rich history spanning decades. Various techniques have been described and applied. The use of peritoneal flaps in GAV is the most recent adaptation and is best performed with robotic assistance. Robotically assisted, peritoneal flap gender-affirming vaginoplasty provides significant vaginal depth, and the reduced dependency on a patient's preoperative anatomy allows for more genital tissue to be available during external reconstruction to achieve excellent cosmesis with preservation of orgasmic capacity. It has a low rate of complications and reoperation, and is effective in patients undergoing revision surgery. Patient selection is paramount to surgical outcomes and requires a multidisciplinary team, including mental health professionals and trained physical therapists. Complex decisions, like the continuation of exogenous estrogen and BMI limitations, should only be made with active involvement of the patient. No patient has a higher likelihood of satisfaction than one who is well educated in the preoperative period.

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CHAPTER

19

Complications following genital gender-affirming surgery in AMAB: Review of the literature

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Introduction

In the modern era, gender-affirming vaginoplasty was first described in Germany in the 1930s [1]. Among the notable figures in this narrative stands Lili Elbe, a Danish transgender woman whose journey is one of the first documented cases of gender affirmation surgery (GAS). In Dresden, Germany, she underwent pioneering procedures, tragically succumbing to complications following her final surgery. Her story, along with others such as Christine Jorgensen, brought international attention to the transformative possibilities of GAS and the inherent risks.

In the late 1950s, the innovative techniques of Dr. Georges Burou in France heralded a new era in GAS. His seminal work on penile inversion vaginoplasty laid the foundation for modern surgical approaches. Starting in the mid-1960s–1970s, many academic centers in the United States, including Johns Hopkins Medical Center and Stanford University, embraced the challenge of providing comprehensive care to transgender individuals, marking pivotal milestones in surgical accessibility and expertise. At the same time, there was a growing resistance to providing GAS care. For example, Dr. McHugh the Chair of Psychiatry at Johns Hopkins directly opposed GAS. He published several studies that concluded that GAS offered "no objective benefit" to transgender patients [2]. Similar efforts around the country led to rapid closure of many gender-affirming clinics.

The field of GAS continues to evolve, with a return of care to academic medical centers and a refocus on pooling data and highlighting evidence-based care. In 2015, the US Transgender

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00019-4

Survey found that 54% of transgender women were interested in feminizing genital GAS (fgGAS) [3]. With increasing numbers of surgeons performing surgery and improved access to care, data suggest that up to 80% of transgender women will undergo surgery [4]. As more procedures are performed, the number of reported and recognized complications will rise. Tracking and standardizing outcome measures is important in advancing the field[5].

In appropriately identified individuals, gender-affirming surgery is recognised as safe, effective, and medically necessary [6]. However, like other complex genitourinary reconstructive surgeries, it carries potential complications. This chapter provides an overview of complications related to gender-affirming vulvoplasty and vaginoplasty as well as recommendations for management.

Disclaimer on outcome reporting

A recent comprehensive, systematic review of all peer-reviewed literature related to gender affirming genital reconstruction found little concordance between study methods; nearly 90% of patient-focused outcome metrics appeared once or twice in over 1800 articles and only 1% of articles used metrics validated in the transgender population [7]. Another systematic review on genital reconstructive surgery by Dunford et al. found that composite outcome measures were weak and the level of evidence for these outcomes was low as defined by the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) system for evaluating evidence [7,8]. At the time of publication, there was a single-validated patient-centered outcome measure known as AFFIRM [9] and one in creation (GENDER-Q) [10].

To further standardize reporting, internationally accepted core and patient-reported outcome measures are under development.

Complication classification

Complication classification is key to the comparison of outcomes. The Clavien-Dindo scale is a classification system used to grade the severity of surgical complications based on the clinical impact and the interventions required to manage them. A Clavien-Dindo grade of 0 is the absence of any adverse events. Grade 1 encompasses deviations from the normal postoperative course that do not necessitate pharmacologic treatment or surgical, endoscopic, or radiologic intervention. Grade 2 involves pharmacologic treatments beyond those permitted for grade 1, such as blood transfusions or total parenteral nutrition. Grades 3 to 4 encompass surgical interventions or life-threatening complications necessitating intensive care unit management. A Clavien-Dindo grade of five is assigned to any complication resulting in death [11].

In gender-affirming surgery, the Clavien-Dindo scale can serve as a standardized tool for assessing and reporting complications associated with procedures such as vaginoplasty. By categorizing complications according to the Clavien-Dindo scale, healthcare professionals can effectively communicate the severity of adverse events, facilitate comparisons between different surgical techniques and patient populations, and inform quality improvement initiatives aimed at enhancing patient safety and optimizing surgical outcomes in gender-affirming surgery. In a recent study on vaginoplasty outcomes, utilizing the American College of Surgeons National Surgical Quality Improvement Program, results were divided into Clavien-Dindo grades 0–2 and 3–5. They found the rate of Clavien-Dindo grade 3–4 to be 5.5% with most complications involving wound healing problems. The rate of grade 5 complications was 0 [12].

The Clavien-Dindo scale provides classifications of complications, which require immediate recognition and management in the postoperative period. Complications should be distinguished from surgical sequelae, which are the long-term consequences or outcomes that result from a previous surgical complication or underlying condition. They may develop weeks, months, or even years after the surgical procedure and are often a result of the body's response to the initial complication or intervention.

This chapter will highlight the most common surgical complications associated with gender-affirming vaginoplasty and offer insights into potential sequelae. Each complication will be categorized based on Clavien-Dindo grades, where grades 0−2 denote minor complications and grades 3−5 signify major ones. The grade assigned will reflect the most prevalent outcome based on existing data, although individual patient circumstances may vary. Similarly, proposed sequelae listed are subject to potential variations based on individual patient experiences and clinical context.

Vulvoplasty

Vulvoplasty is often referred to as "zero-depth vaginoplasty" or "no-depth vaginoplasty" meaning the vaginal canal is not simultaneously created. The decision to proceed with a no-depth versus full-depth surgery is based on patient preference, but also surgeon recommendations related to specific patient characteristics and medical risk factors (e.g., history of prostatectomy, pelvic radiation, inability to dilate neuromuscular condition)[13,14]. The risks and complications of vulvoplasty are also inherent to vaginoplasty ("full-depth" procedures). Although subtleties exist in techniques related to vulvoplasty, the overarching technique involves the use of embryologically homologous structures to create the clitorovulvar anatomy. The most reported complications include intraoperative bleeding, hematoma, wound dehiscence, wound infection, tissue necrosis, clitoral necrosis and/or sensation issues, and granulation tissue. Functional complications include urinary tract issues (infections, deviated stream, incomplete bladder emptying, and insensate bladder), generalized numbness, and clitoral numbness/anorgasmia [14]. A summary of the complications unique to construction of the vulva can be found in Table 19.1.

Wound disruption, wound infections, and tissue necrosis

Wound healing issues are the most commonly reported complications ranging from 3.3% to 33% [12,15,17,21,27]. Most wound issues resolve without surgical intervention [28] and readily respond to good hygiene and topical antimicrobials. Overall return to OR after fgGAS is low (approximately 5%) and of those cases that return to the OR, up to one-third are a result of "wound problems" [12]. The vulva is at risk for wound disruption due to convergent suture lines with risk further exacerbated by tension on the suture lines, presence of hematomas or seromas, or postoperative neovaginal dilation.

In the subacute postoperative phase, wound or graft edges can form granulation tissue. Massie et al. report granulation tissue as the most common wound complication (26% of

TABLE 19.1 Vulvoplasty Complications: Complication severity based on Clavien-Dindo scale 0–2 = minor, score 3–5 = major.

Complication	Severity	Incidence (%)	Onset	Management	Possible sequelae	References
Granulation tissue	Minor	26	Early–late recovery	Topical silver nitrate	Aesthetic, pain	[15,16]
Wound infection	Minor	1.8–27	Early–late recovery	Antibiotics, surgical debridement (rarely, required)	Aesthetic, pain	[16–20]
Wound dehiscence/ tissue necrosis	Minor	0.6–24.6	Early–late recovery	Local wound care, tissue resurfacing (rarely required)	Aesthetic	[18,20–24]
Clitoral necrosis	Minor	2	Immediate postOp–early recovery	Local wound care	Diminished sexual stimulation (2.7%)	[25,26]

patients) [15,16] and risk factors included hypertension, diabetes mellitus, and elevated BMI [16]. Chemical cautery with silver nitrate can be used to treat this friable tissue [16,29–31]. Multiple applications may be required. Granulation tissue may be a sign of infection or increase the risk of infection; therefore, it is reasonable to consider antibiotics as well [22].

Postoperative wound infection rates have been reported in up to 27% [16–19,32]; a recent NSQIP database study found a rate of 1.8% [12]. Most superficial wound infections will respond to oral antibiotics, and surgical intervention is rarely required with reports less than 1% [18,20].

Tissue necrosis is often a precursor to wound disruption. The reported incidence of tissue necrosis ranges from 0.6% to 24.6% [22,18,20,23]. Of note, the wide range includes studies, which just reported necrosis that required return to OR, whereas others report both minor and major cases. Most reports of tissue necrosis range from 1% to 4% [21,24]. Like wound disruption, tissue necrosis can most often be treated with local wound care, and in early cases, application of nitro paste can be considered [22,24].

Clitoral complications

The incidence of clitoral complications is low. Goddard et al. published clitoral outcomes on 222 patients. They found loss of sensation of 2.7% of cases, whereas clitoral hypersensitivity was more common at 14% [25]. Similarly, Rossi Neto et al. published outcomes of 332 cases and found rates of partial clitoral necrosis of 2% and clitoral pain reported in 1% of cases [26]. Postvaginoplasty orgasm rates of up to 86% have been reported [33].

Vaginoplasty complications

The neovaginal canal creation is considered the most technically challenging part of fgGAS due to the proximity of the urethra and rectum making injuries to these structures possible. The aforementioned complications apply to vulvoplasty and vaginoplasty, whereas those that follow are mostly unique to full depth vaginoplasty. A summary of the general complications for vaginoplasty can be found in Table 19.2. Complications unique to vaginoplasty type are summarized in Table 19.3.

Bleeding and hematoma

Bleeding requiring transfusion occurs in less than 1% of cases, even when a vaginal canal is concurrently created [23]. Most commonly, bleeding arises from the remaining corpus spongiosum surrounding the urethra [21,27], from dissection into or through the tunica albuginea during elevation of the dorsal neurovascular bundle, and from creation of the neovaginal canal after disruption of branches of the inferior gluteal, inferior vesical, and pudendal vascular supply of levator ani [46,38]. Corpus spongiosum bleeding can be addressed with pressure and hemostatic agents. For bleeding from the tunica albuginea, once the neurovascular bundle is sufficiently elevated and the urethra is separated, the bilateral corpora cavernosa can be cross-clamped just below the junction of the two corporal bodies and the excess tissue discarded, allowing for achievement of hemostasis. Hemostasis during canal creation can be achieved with selective electrocautery (taking care not to injure the urethra, bladder, and rectum), suture ligation, and tranexamic acid [46]. Interventional embolization of vessels should be avoided to prevent necrosis of the flaps and/or graft [38].

Postoperative bleeding has been reported in 3.2%–12% of patients following vaginoplasty [21,22,47] and is the most common reason for returning to the operating room [12]. Thus, meticulous efforts to maintain hemostasis are needed to prevent postoperative hematoma, which has been reported in 1.6%–21% of cases [21,31]. Hematoma formation can precipitate tissue necrosis, graft loss, fistula formation, and infection [21]. Other prevention strategies include postoperative compression with an external bolster, a pressure dressing, and use of a perineal drain. Avoidance of nonsteroidal antiinflammatory medications for the first 24–48 hours after surgery may also be prudent [21]. Currently, there is limited data regarding postoperative bleeding and hematoma in the setting of venous thromboembolism (VTE) chemoprophylaxis, and use of agents to prevent VTE intraoperatively remains an important consideration in patients undergoing vaginoplasty.

Meatal stenosis, urethral injuries, and urethroneovaginal fistula

Meatal stenosis can occur in up to 14% of patients and lead to obstructive voiding [21,24] with more recent studies citing a rate of 6.9% [37]. For those in urinary retention, a Foley catheter is placed either transurethrally or suprapubically. Utilizing a suprapubic catheter will allow for stricture visualization with a voiding cystourethrogram or a retrograde urethrogram [22]. Initial management of distal stenosis with dilation is feasible. Persistent meatal stenosis will require a meatoplasty with recurrence occurring in approximately 16% [21].

TABLE 19.2 General vaginoplasty complications.

Complication	Severity	Incidence (%)	Onset	Management	Possible sequelae	References
Excessive bleeding	Minor–major	3.2–12	Immediate post-op	Blood transfusion (1.8%), pressure dressing, operative exploration (<1%)	None apparent	[12,34,35]
Hematoma	Minor–major	1–21	Immediate post-op	Pressure dressing, operative exploration	Wound healing	[12,21,31]
Urethral injury	Major	0–1.1	Intra-op	Immediate multi-layer, tension-free closure, prolonged Foley drainage	Urethroneovaginal fistula	[12,16,18,31,36]
Meatal stenosis	Major	6.9–14	Variable	Foley catheter placement (transurethral/suprapubic), imaging or exam under anesthesia, meatoplasty	Decreased urinary stream, obstructed urination	[21,22,24,37]
Urethral stricture	Major	0–18.3	Early–late recovery	If obstructed, Foley catheter placement, imaging or surgical exploration, urethroplasty	Persistent stricture, decreased urinary stream, obstruction	[37]
Urethroneovaginal fistula	Major	0–4	Early–late recovery	Delayed repair utilizing standard fistula closure techniques, prolonged Foley drainage	Recurrent fistula	[15,17,18,26,38,39]
Urinary tract infection	Minor	0–15	Variable	Antibiotics	Recurrent urinary tract infections	[12,37]
Rectal injury	Major	0.7–6.7	Intra-op	Immediate multilayer, tension-free closure	Rectoneovaginal fistula (20% of rectal injuries)	[17,26,32,40–42]
Rectoneovaginal fistula	Major	0–2	Early–late recovery	Delayed repair utilizing standard fistula closure techniques	Recurrent fistula	[23,40,42]

(*Continued*)

TABLE 19.2 General vaginoplasty complications.—cont'd

Complication	Severity	Incidence (%)	Onset	Management	Possible sequelae	References
Introital stenosis	Minor–major	2.5–15	Variable	Dilation, surgical revision	Persistent stenosis	[16–18,21]
Vaginal stenosis	Minor–major	1.2–14	Variable	Dilation, surgical revision	Persistent stenosis	[4,17,21]

TABLE 19.3 Vaginoplasty type-specific complications.

Complication	Vaginoplasty type	References
Intraneovaginal hair growth	PIV w/skin grafts	[25,34]
Intraabdominal abscess	Peritoneal, intestinal	[43,44]
Bowel obstruction	Peritoneal, intestinal	[43,44]
Internal hernia	Peritoneal	[43]
Bowel segment necrosis	Intestinal	[44,45]
Anastomotic leak	Intestinal	[44,45]
Diversion neovaginitis	Intestinal	[44,45]
Neovaginal irritable bowel disease	Intestinal	[44]

The rate of urethral injury has been reported in 1% or less of cases [16,31,18,36]. Recognized and unrecognized urethral injuries may result in urethroneovaginal fistula with published rates ranging from 0% to 4% [15,17,18,26,39]. Recognition of urethral injury prompts direct surgical repair in a multilayer fashion. If a urethroneovaginal fistula develops from a recognized or unrecognized urethra injury or because of meatal stenosis [40], a delayed repair with principles relevant to fistula surgery is performed—tension-free primary closure, multilayer coverage, nonoverlapping suture lines, and consideration of tissue interposition. Tissue interposition is highly recommended in repair of neovaginal fistula given poor peripheral tissue vascularization [31]. Both urethral injuries and urethroneovaginal fistula repairs require prolonged transurethral catheter use with the duration determined by size and location of injury.

Rectal injuries and rectoneovaginal fistula

Rectal injuries and rectoneovaginal fistula (RnVF) are challenging problems. Direct rectal injury is the most common etiology of RnVF and typically occurs during dissection of the vaginal canal. The dissection may be similar to a perineal prostatectomy and may be aided by a digital rectal exam [48]. Despite caution, rectal injuries have been reported in 0.68%–6.7% of vaginoplasty cases [26,40,41,42]. When rectal injury is identified during the primary surgery, multilayer closure with nonoverlapping suture lines is recommended [15,25,36,39,49]. Colonic diversion may be utilized at time of repair, but this depends upon the clinical circumstances. Approximately 20% of patients with recognized intraoperative rectal injuries will subsequently develop RnVF [40].

RnVF occurs in the postoperative period with a reported incidence ranging from 1% to 17% [21,23]. Etiologies include rectal injury, abscess, flap infection, hematoma, seroma, dilation injury, and rarely malignancy of either graft origin or rectal origin [31,22,36,40]. Small fistula may be managed conservatively with a low-residue diet, whereas complicated fistula will require surgical repair [40].

A study by Pansritum et al. reported on a cohort of 2059 patients who underwent vaginoplasty. Their results demonstrated a 0.68% rectal injury rate and 0.24% RnVF rate. In this series, the mean location of the rectal injury was 5.2 cm cephalad to the vaginal introitus; similarly the rectal vaginal fistula was at 5.4 cm. Mean size of a rectal injury was noted to be 2.5 and 2.3 cm for a rectovaginal fistula. Average time to development of fistula was 22.4 days (range 8–55 days). In their cohort, the fistulous tracts were closed with a rectoprostatic fascia reinforcement flap and concomitant placement of a new neovaginal cavity (skin grafts were used in 67% of neovaginal reconstruction and 33% were sigmoid colon). They reported no recurrence of fistula [42].

van der Sluis et al. report RnVF rate of approximately 1.2% in a cohort of 1082 patients. They found the RnVF rate to be 0.8% in penile inversion vaginoplasty (8/997), 0% in primary bowel vaginoplasty (0/40), and 6.3% in revision vaginoplasty (5/80). Most fistula repairs in this series included fistulectomy combined with local transposition flaps. When local flaps could not be used due to size, location, impact on neovaginal girth, cosmesis, or depth—a pedicle flap was used. They note several significant differences between RnVF compared with those that develop in native vaginal canals—namely postvaginoplasty the local tissue may be scarred with limited underlying vascular supply and regenerative capacity causing this tissue to behave more like postablative/radiated native tissue [40].

Bandi et al. provide an overview of repair options for complicated RnVF [48]. This case series describes techniques used to repair recurrent complicated RnVF with patients having previously had two to four failed RnVF repairs. Techniques utilized by this group include Turnbull-Cutait colonic pull-through procedure, gracilis muscle transposition, hyperbaric oxygen therapy, and buccal mucosal grafts. They advocate for preoperative strategies to improve local tissue conditions including nutritional optimization, hyperbaric oxygen therapy, fecal diversion, and adequate delay between procedures. They note in their experience rectal advancement flaps for complex RnVF repair are inadequate. Their team advocates for interposition of healthy tissue either transabdominally or transperineally.

RnVF following vaginoplasty are considered complex fistulas and requires a multidisciplinary team approach to repair. This team includes gender-affirming surgeons and other experts in the areas of colorectal surgery, urogynecology and pelvic reconstructive surgery, urology, and plastic surgery [22,40,48,50].

Penile inversion (perineal) vaginoplasty—Scrotal/skin grafts

Penile inversion vaginoplasty has been the primary approach for decades and, thus, has the most published outcomes. One benefit of this approach is there is no entry into the peritoneal cavity, which avoids intraabdominal complications. Adverse events after penile inversion vaginoplasty range from 20%–30% [15,21,51,52]. In a recent claims database study, Mishra and Ferrando demonstrated the incidence of major adverse events (Clavien-Dindo grade 3–4) within 30 days of PIV was low at 5.5% with most involving wound problems, return to the operating room, or readmission [12]. Higher BMI, higher ASA class, and low preoperative hematocrit were correlated with complications. Most patients experienced minor complications or no complications at all.

van der Sluis et al. reviewed retrospective studies on PIV that included at least 100 patients—10 studies total. They found the most common intraoperative complications reported were rectal injuries (0.4%–4.6%), urethral injuries (1 study, 1.1%), and bleeding that required transfusion (4.8%). Of note, not all studies report intraoperative complications. Postoperative complications reported included hemorrhage (1.9%–10.7%), wound infection (1%–18%), meatal stenosis (6%–39.8%), neovaginal stenosis (1.2%–14%), introital stenosis (2.5%–14.5%), prolapse (0.3%–2.4%), urethroneovaginal fistula (0.8%–3.9%), rectoneovaginal fistula (0.6%–2%), urinary retention (9%–13.9%), and urinary tract infection (UTI) (4.4%–7%). The average revision rate was found to be 2%–3% [4].

Urinary issues after PIV are common in the immediate postoperative period, but typically resolve without intervention. A review by Ding et al. included PIV studies that described postoperative urinary tract symptoms. Twenty-seven articles were reviewed and included 3388 patients in total. The most common reported urologic complication included splayed stream (11.7%), meatal stenosis (6.9%), and irritative symptoms such as frequency and urgency (11.5%). Other complications included urinary retention (5.1%), incontinence (8.7%), urethral stricture (4.6), and UTI (5.6%) [37].

Bustos et al. performed a review and metaanalysis of PIV (3930 cases) and intestinal vaginoplasty (726 bowel pedicles) techniques and found the overall rate of fistula was 1%, 11% for stenosis and/or stricture, 4% for tissue necrosis, and 3% for prolapse [53]. In their analysis, regret was low at 2%. The neovaginal canal depth was on average 9.4 cm for PIV and 15.3 cm for intestinal vaginoplasty. Orgasm rate was 76% overall, 73% for PIV, and 95% for intestinal vaginoplasty.

Studies that have investigated quality of life and sexual health after PIV demonstrate patients are satisfied with their results and quality of life is improved [21,18,34,35,54]. Mean vaginal depth has been reported of 10–13.5 cm across 12 series [21] and up to 13.6 cm from a single-site case series from a high-volume center [55].

Intraneovaginal hair growth can be of concern for patients and lead to infections, hairballs, and contribute to concretions of secretions and lubricants [34]. In a study by Goddard et al., approximately 30% of patients reported long-term issue with intracanal hair growth and in that cohort one patient required removal of a hairball [25]. Preoperative hair removal is helpful in reducing this risk. A study by Yuan et al. compared the treatment outcomes of electrolysis versus laser hair removal in patients who underwent PIV and vulvoplasty procedures. They found laser hair removal to provide greater treatment efficiency, less pain, and lower cost for patients with dark pigmented genital hair [56].

Peritoneal vaginoplasty

There has been growing interest in the peritoneal vaginoplasty technique, and it has been emerged as an option for both primary and revision vaginoplasty cases. This technique is similar to the Davydov procedure in which the neovaginal canal is lined with mobilized flaps of peritoneal tissue. It is important to acknowledge the distinction between peritoneal grafts that are harvested and transected from their native blood supply, requiring neovascularization, versus peritoneal flaps that maintain native blood supply. Outcomes reported here pertain to peritoneal flap vaginoplasty, which is the technique that is most common in vaginoplasty.

The peritoneal vaginoplasty technique can be performed using minimally invasive abdominal approaches including laparoscopic and robotic. In this technique, the canal is dissected from a top-down fashion—from peritoneum to the perineum—which is opposite of the typical approach of the PIV perineal bottom-up dissection. Factors that may favor peritoneal vaginoplasty include limited penoscrotal tissue [57]. Relative contraindications include elevated BMI, inflammatory bowel disease, and previous abdominal or pelvic surgery [58].

There is a proposed benefit of self-lubrication with this technique; however, there is evidence that the mesothelium of the peritoneum undergoes metaplastic changes and becomes similar to squamous epithelium in the neovagina, which limits its potential secretory function [58,59]. As a result, exogenous lubrication is still needed for dilation and sexual activity. Another considered benefit is greater vaginal canal depth. As aforementioned, PIV mean depth has been reported of 10−13.6 cm [21,55], the largest series of robotic peritoneal vaginoplasty included 145 patients mean vaginal depth ranged from 9.7 to 14.5 cm [60]. Lastly, the robotic approach employed by this technique can be used to provide apical suspension of the neovaginal canal and reduce the risk of prolapse [61].

Similar to other approaches of vaginoplasty, complications associated with peritoneal vaginoplasty are low and include wound healing issues, vaginal stenosis, and fistula [61,62]. Unique complications given the intraabdominal approach include intraabdominal abscess, small bowel obstruction, and hernia. The largest study to report on postoperative outcomes related to peritoneal vaginoplasty, included 274 patients and a complication rate of 2.2%—one intraabdominal hematoma, two intraabdominal abscesses, one recurrent small bowel obstruction (SBO), and two incarcerated internal hernias [43]. One of these patients developed a secondary SBO due to an incarcerated hernia a year after the index surgery [43]. Acar et al. reported on a series of 22 patients who underwent robotic-assisted peritoneal vaginoplasty and found a higher-than-average reported rate of lower urinary tract injuries including two bladder injuries and two urethral injuries which they postulate was due to the extensive bladder dissection required for this approach [63].

Peritoneal vaginoplasty can also be performed via a single-port robotic approach. Dy et al. describe their technique and outcomes of both multiport (Xi) robotic surgery and single-port (SP) platforms. In this study, they included 100 patients (47 Xi, 53 SP). The average procedure times were 4.2 h for the Xi and 3.7 h for the SP. The mean vaginal depth for the Xi cases was 13.6 cm and width of 3.7 cm and the SP mean depth was 14.1 cm and width of 3.7 cm. They reported no intraoperative complications, 6% rate of postoperative transfusion, and 13% return to OR rate. The rate of postoperative vaginal stenosis and transfusion rate was higher in the Xi group than the SP group. There was no statistically significant difference in return to OR rates between the cohorts with one returning for stenosis, two for hematoma, two for granulation, three for cosmetic revisions, two for cyst/abscess, two for urethral stenosis, one for rectovaginal fistula, one for bowel obstruction, and one for hernia [60].

Familiarity with deep pelvic and prostatic dissection, an experienced robotic or laparoscopic surgical team, and a dual surgeon approach—one performing perineal dissection and the other performing mobilization of peritoneal flaps help facilitate the peritoneal vaginoplasty.

Intestinal/sigmoid vaginoplasty

Intestinal vaginoplasty can be performed for primary cases, although it is typically reserved for revision cases or those people with insufficient penoscrotal skin [64]. Most techniques utilize the sigmoid colon for neovaginal construction. The perceived advantage of this method lies in the mucosal lining's ability to potentially self-lubricate by generating mucus through goblet cell activity. There is a common misconception that those who have intestinal vaginoplasty will not require the same dilatation schedule as those who undergo PIV [65]. However, introital stricture is common, and introital dilation is required [65]. In this patient population, self-lubrication has been associated with higher Female Sexual Function Index scores [66].

Risks of intestinal vaginoplasty include the inherent risk of bowel surgery such as bowel segment necrosis, anastomotic leak, ileus/bowel obstruction—overall risk of these complications is low (<1%), but if they occur, they can lead to significant morbidity or mortality. Some may find the secretions from the intestinal mucosa to be malodorous and/or copious. A recent systematic review by Robinson et al. included 10 intestinal vaginoplasty studies with 654 cases. The overall complication rate was 32.9% with the most common complications being: return to the OR (18%), vaginal stenosis (11%), mucorrhea (7%), and neovaginal prolapse (6%) [44].

Long-term considerations for those with intestinal neovaginas are diversion neovaginitis, neovaginal inflammatory bowel disease, and neovaginal malignancies [45]. Diversion neovaginitis is a condition that has been reported in 4.4% of patients and results from alterations in the cells lining the canal known as sigmoidal colonocysts [44]. These cells typically receive nutrients from the fecal stream rather than blood supply; thus, atrophy occurs after diversion nutrients are depleted [45]. This process can lead to inflammation and symptoms including pain, bleeding, and malodor [67]. There have been reports of successful treatment with topical short-chain fatty acids, coconut oil, and/or 5-aminosalicylic acid [45]; severe forms may require neovaginectomy [67,68].

It is prudent to pursue colorectal cancer screening in this patient population due to persistent inflammation. These chronic conditions may occur remotely from surgery with some complications reported greater than 20 years after the index surgery [44].

Venous thromboembolism

Historically, the risk of VTE was thought to be quite high among transgender women due to use of prothrombotic exogenous estrogen. Early studies reported a 20−45-fold increased risk of VTE and/or pulmonary embolism compared with the general population [69,70]. Noteworthy, in these early studies, exogenous estrogen was high dose, specifically ethinylestradiol. Newer formulations, 17-beta estradiol, and transcutaneous administration have lowered the VTE risk. In a study of over 2800 transgender women matched 10-fold to cisgender male and female controls, the increased risk was twofold with the overall rate being low [71].

In a large insurance claims database study of patients who underwent vaginoplasty, the rate of postoperative VTE within 90 days of surgery was 1.1% overall. Those that experienced postoperative VTE were more likely to have had a previous VTE (47.1%), be from a rural community, older age, with increased medical comorbidities [72]. In this study, it is unknown if patients stopped exogenous hormones before surgery or what VTE prophylaxis they received in the perioperative period.

A retrospective study conducted by Kozato et al. examined the rates of VTE following vaginoplasty among individuals who either maintained or suspended estrogen intake 1 week before surgery. Over 400 patients were included in this trial and approximately half had stopped estrogen preoperatively. In this cohort, only one patient developed a postoperative VTE, and that person had stopped hormones 1 week before surgery. There were no VTEs in the group that continued estrogen [73].

Nolan et al, performed a prospective cohort comparing 90-day post-operative VTE rates between those that stopped exogenous hormones perioperatively versus those that continued exogenous hormones. They did not find a difference in VTE rates between the two cohorts [74]. A metaanalysis, which included two studies and over 1000 patients, did not find a statistically significant difference in VTE rates in those that stopped hormones versus those that continued in the perioperative period [75]. Despite this evidence, no consensus exists on continuation or cessation of exogenous estrogen in the perioperative period and care pathways remain based on surgeon and care team preferences.

Pelvic floor disorders and lower urinary tract symptoms

Considering vulvoplasty and vaginoplasty procedures include disassembly of the lower urinary tract, significant reduction in urethral length, spatulation of the distal urethra, and possible partial transection of levator ani muscles, pelvic floor disorders (PFDs), and lower urinary tract symptoms are common. Early postoperative and short-term complications include acute urinary retention, UTI, and split/spray urinary stream [21,76]. A recent meta-analysis by Ding et al. of lower urinary tract symptoms (LUTS) after PIV found overall rate of urinary complications to range from 5% to 11.9%; specifically UTI rates of 0%–15% (10 studies, outlier rate of 30%, median 4.4%, pooled average 5.6%), urethral stricture rates of 0%–18.3% (11 studies, median 7.1%, pooled average 4.6%), meatal stenosis rates of 1.1%–14.8% (17 studies, outlier rate of 40%, median 4.4%, pooled average 6.9%), urinary retention rates requiring prolonged catheterization of 0%–13.9% (5 studies, median 6.8%, pooled average 5.1%), urinary incontinence rate of 1.1%–27.3% (8 studies, median 9.1%, pooled average 8.7%), split or spray stream rate of 1.8%–22.5% (10 studies, outlier rate of 33.2%, median 10.2%, pooled average 11.7%) [37]. They found the most common surgeries for persistent urinary symptoms were meatoplasty with a rate of 0.4%–15% (10 studies, median 5.3%) and urethral revision with a rate of 1.5%–27% (5 studies, median 7.1%) [37]. As noted by these authors, the most common LUTS can typically be treated by general urologist/urogynecologists as they often require minimal intervention or readily self-resolve. Early pelvic floor physical therapy has been shown to be vital in addressing pre- and postoperative PFDs [77,78]. For patients with persistent SUI despite PFPT, urethral bulking or autologous sling could be considered [22].

In a smaller study of 18 patients who underwent PIV, Kuhn et al. sought to describe postoperative micturition disorders along with degree of bother. They found a 33% rate of urinary incontinence, 50% rate of diverted stream, 22% rate of feeling of incomplete emptying, 22% rate of recurrent UTI, 16% rate of stress urinary incontinence, and 6% rate of overactive bladder with a median follow-up of 13 years. The rates of LUTS preoperatively were not known in this study. They postulate the reason for high LUTS rates after PIV includes, small estrogenized prostate which may predispose to SUI, direct or indirect (pudendal nerve) injury to the urethral sphincter or levator ani complex during canal dissection, and overall effects of estrogen on continence mechanisms. Despite the LUTS, their cohort reported an overall high satisfaction rate, and they didn't find a correlation between LUTS symptoms and satisfaction [79]. Interestingly, a study by Hazin at el. measured pre- and postoperative pelvic floor strength and found a near complete return to baseline strength at 30 days postoperative [80].

Pelvic floor physical therapy (PFPT) can play an important role in the perioperative period. Manrique et al. assessed patients for PFDs pre and postvaginoplasty and sought to understand the role of PFPT in treatment and optimization of long-term outcomes. They measured PFDs and LUTS using validated measures (not validated in TGD population) in the pre- and postoperative periods. Their patients were encouraged to visit PFPT pre- and postoperatively. The rate of preoperative PFDs was 77.5% specifically those related to urinary and bowel distress symptoms. Postoperative PFD distress symptoms at 4 months were statistically significantly improved from preoperative scores [78].

Similarly, Jiang et al. evaluated the impact of PFPT on patients undergoing fgGAS and found a high rate of preoperative PFDs including pelvic floor muscle dysfunction (42%), urinary dysfunction (43%), and bowel dysfunction (37%). Postoperative improvement was noted in all domains. Most PFDs identified and addressed by preoperative PFPT experienced postoperative resolution of symptoms. A history of abuse was correlated with higher rates of PFDs [77]. These studies stress the importance of pre- and postoperative integration of PFPT. Furthermore, future use of validated measures such as AFFIRM [9] and GENDER-Q [10] will allow for a more accurate comparison of these important functional metrics.

Neovaginal prolapse is also an area of concern postvaginoplasty and has been reported in up to 5% of patients after PIV [34]. It is important to note that neovaginal prolapse has different etiology than prolapse in the cisgender patient. In the latter, prolapse is a result of failure of the fibromuscular supports to the vagina, while prolapse in the transgender woman is most commonly a result of graft/flap loss or nonadherence in the early phase following surgery [34], especially if the neovaginal cavity is not fully dissected. The majority of PIV vaginoplasty procedures do not affix the vaginal apex, whereas most descriptions of sigmoid/intestinal vaginoplasties include an apical suspension at the time of the index procedure. Some groups prefer to suspend the neovagina at the time of canal creation and often utilize fixation to the sacrospinous ligament [81] or Denonvilliers' fascia [82]. It is unclear whether prophylactic neovaginal vault suspension reduces the long-term rate of prolapse. There is evidence to suggest that prolapse rates do increase over time [18,25]. Furthermore, there is no consensus on resuspension techniques if prolapse does occur. The overall rate of vaginal prolapse is similar between PIV and intestinal/sigmoid vaginoplasty at 2%–3% [8]. Considering presence of postoperative scarring in the perineal and deep pelvis, some may elect for an abdominal approach via sacrocolpopexy for prolapse repair [83–87]. Currently, there are no large trials to recommend nonabsorbable mesh grafts, absorbable biologic grafts, or direct suture plication. Lastly, an introital bulge may not be an apical prolapse issue, rather residual erectile tissue.

Pain

Postoperative pain occurs in up to 20% of patients after vaginoplasty [21,16,37,88,89]. Lawrence et al. reported pelvic pain as the second most common postoperative complications and was the only postoperative outcome associated with decreased quality of life [88]. Creation of the canal with disruption of the pelvic diaphragm is thought to contribute to postoperative pain. Persistent levator spasm can lead to persistent pain and difficulty with dilation [31]. Early referral to PFPT is recommended in these cases. Use of nonopioid pain medications, specifically neuropathic medications, may also provide relief.

External genital revision

External genital revision is the primary reason for reoperation after vaginoplasty [15,22,90,91] with rates ranging from 2.5% to 50% [25,92–94]. Concerns expressed by patients include inadequate coverage of the neoclitoris, poorly defined labia minora, labial asymmetry, widely spaced labia majora, fullness of labia majora, and appearance of surgical scars [93].

In a large series on the PIV Ghent technique, 8.4% underwent early revision (hematoma, wound dehiscence) during initial hospitalization and 37.1% underwent later revisions.

They found that diabetes was an independent risk factor for late revision surgery. The most common reasons for later revisions were aesthetic refinement of the labia in 12.5% and diverted urine stream in 8.9% [95].

In a single-surgeon series by Boas et al., they reported that of 117 patients who underwent PIV, 23.9% underwent revision labiaplasty and/or clitoroplasty with 7.7% undergoing both procedures [96]. Eighty-two percent of patients who underwent revision reported satisfaction with their final surgical outcome.

Dy et al. report a vulvar revision rate of 7.8%. The most common concerns for revisions included esthetic labial concerns (77.1%). Other concerns included clitoral complaints (58.3%), forward urinary stream (47.2%), and introital concerns (22.2%). The authors recommend waiting 6−12 months before pursuing esthetic external revisions to allow for scars to soften and fade [90].

Introital concerns can include introital stenosis due to persistent erectile tissue, excess corpus spongiosum tissue beneath the bulbar urethra, or a high posterior fourchette. These concerns are amenable to revision [90,93]. Other common aesthetic revisions include lipofilling of the labia majora, perineoplasty, and scar revisions [34].

Conclusion

In summary, gender-affirming vaginoplasty stands as a pivotal procedure in the journey of transgender and nonbinary individuals toward aligning their physical appearance with their gender identity. Yet, the complexity of this surgery also underscores the importance of acknowledging and addressing potential complications that may arise. From the risk of infection and wound healing issues to concerns about functional outcomes and psychological well-being, a comprehensive understanding of these challenges is essential for both surgeons and patients.

By delving deeper into the intricacies of surgical techniques, patient selection, and postoperative care, the medical community can work collaboratively to minimize risks and optimize outcomes. Moreover, ongoing research aimed at refining surgical approaches, enhancing patient education, and improving support systems plays a pivotal role in advancing the field of gender-affirming surgery.

Future progress must also include the development and implementation of patient-centered outcome measures and core surgical outcome measures. These metrics, tailored to the unique needs and experiences of transgender and nonbinary individuals, provide invaluable insights into the effectiveness and impact of gender-affirming surgeries. By prioritizing patient safety, holistic care, and the promotion of patient autonomy and satisfaction, we can strive toward a future where gender-affirming surgery not only affirms gender identity but also fosters improved overall quality of life for transgender and nonbinary individuals.

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CHAPTER

20

Rectovaginal fistula following gender-affirming vaginoplasty: Prevention, management, and surgical corrections

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Introduction

Rectovaginal fistula (RVF) is a well-known risk for patients undergoing gender-affirming vaginoplasty. RVF after canal dissection often requires staged surgical interventions, and treatment is plagued by a high rates of recurrence, resulting in catastrophic impact on patient quality of life. In this chapter, we will review the literature on the diagnosis and management of RVF and also describe our center's approach to management.

Prevalence

In larger, single-center series of primary vaginoplasty, prevalence following vaginoplasty ranges from 0.53% to 1.81% [1], with smaller series often reporting higher values [2,3]. Taking the literature as a whole the estimated, pooled prevalence of RVF following gender-affirming vaginoplasty (GAV) across reported studies is 1.28%. This may be an underestimate as single-

https://doi.org/10.1016/B978-0-443-21776-0.00020-0

center studies may not capture patients who present for follow-up at other centers and some centers do not publish their complication rates. Following secondary vaginoplasty, the prevalence of RVF is thought to be higher, around 6%–8% [4,5]. It is unclear whether newer, robotic approaches to both primary and revision vaginoplasty will reduce the prevalence of RVF [6].

Etiology

The most common and well-accepted etiology of RVF following GAV is overt or occult rectal injury during canal dissection [7]. Rectal injury is often noted and repaired during the index operation, and in these cases is the clear cause of RVF [5,8–11]. In other cases, occult rectal injury is thought to be the underlying cause as RVF appears in the immediate postoperative period in absence of recognized rectal injury [5,12]. In general, rectal injury is uncommon, occurring in 1.1%–3.3% percent of cases [7]. When it does occur, rectal injury is thought to progress to RVF in approximately 17.4% of cases [5]; however, some report rates as high as 55% [11]. Rectal injury, and subsequent progression to RVF, is thought to be more common in cases of secondary vaginoplasty, where prior scarring and the need for more extensive dissection to remove vaginal remnants may increase the risk of rectal injury [5]. Other complications from vaginoplasty, such as infection, hematoma, or partial skin flap necrosis, may also contribute to the development of RVF [5].

Although most cases of RVF occur in the immediate postoperative period, RVF may occasionally occur months, or years following GAV. In these cases, the most common etiology is traumatic dilation [8,13,14]. In one reported case, squamous cell carcinoma was the cause of RVF presenting 45 years following initial surgery, underscoring the need for regular speculum examinations during yearly, routine health maintenance visits [13].

Diagnosis

Most cases of RVF following GAV are easily diagnosed clinically. Feculent material at the time of vaginal bolster removal [3,5,12], feculent neovaginal discharge, and/or passage of flatus from the neovagina are pathognomonic. If the diagnosis is not clear from clinical symptoms alone, exam under anesthesia (Fig. 20.1) as well as imaging (Fig. 20.2) should be considered. Imaging techniques include contrast enema studies, CT, and MRI [5]. There is currently no agreed-upon gold standard imaging study for diagnosis of RFV following GAV. As fistula protocol MRI can define the location and size of the fistula, can rule out multiple fistulae, and is the preferred imaging modality to visualize RVF in cisgender women [15], it is also our preferred modality to determine the full extent of RVF following GAV and to plan the optimal surgical approach in patients after gender-affirming vaginoplasty.

Management

Cisgender women

There are obvious and important differences between postoperative RVF in transgender individuals and RVF in cisgender women. However, since the management of RVF following

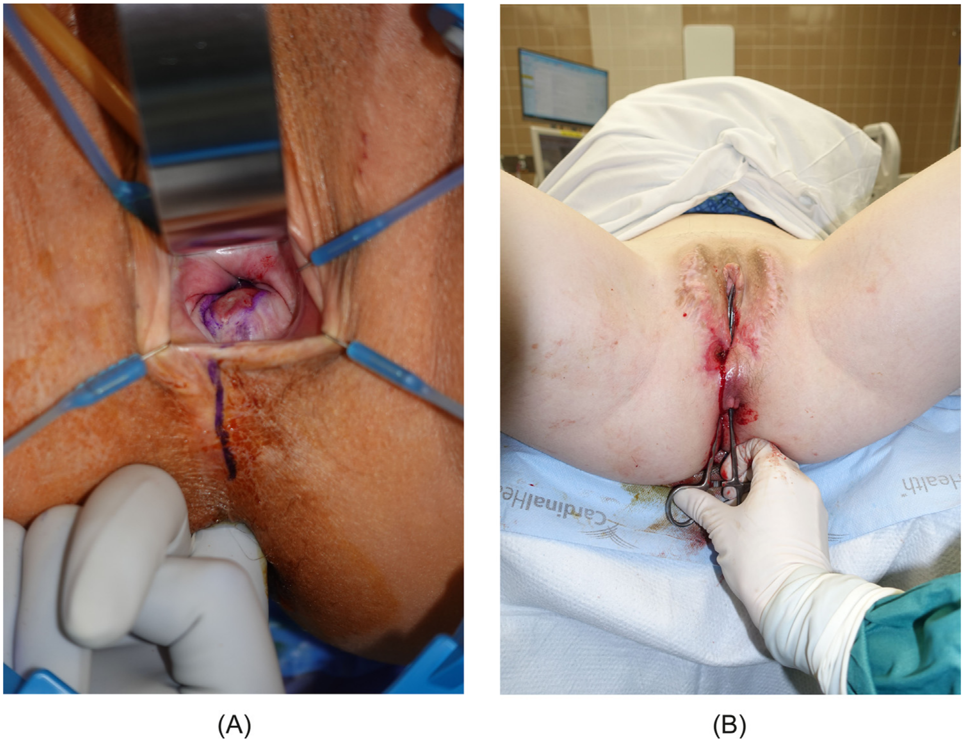


FIGURE 20.1 Example of rectoneovaginal fistula. (a) Intraoperative markings for RNVF debridement in one patient. (b) A second patient undergoing exam under anesthesia. Fistula is confirmed by passing an instrument through the fistula. *(a) Courtesy of Shane Morrison.*

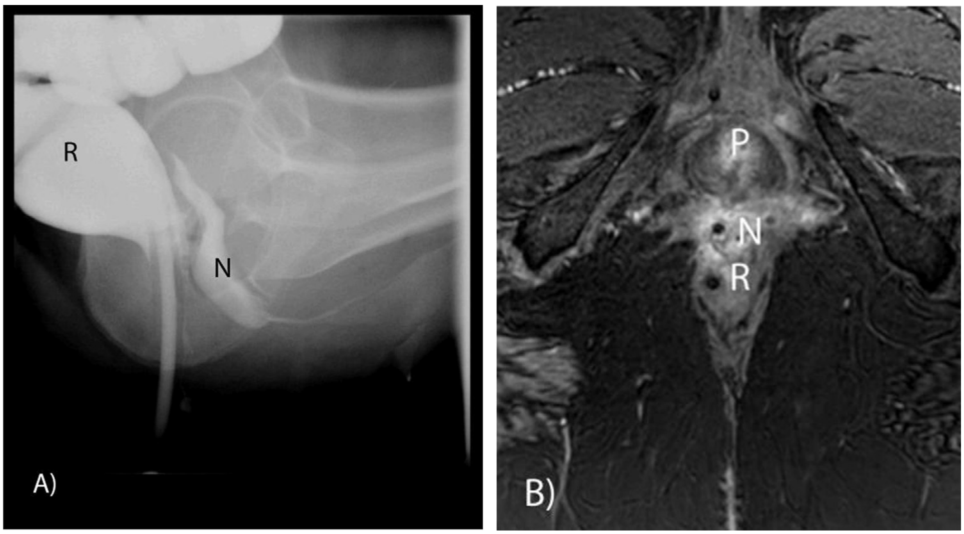


FIGURE 20.2 Imaging of rectoneovaginal fistula. (a) Water-contrast enema, lateral view. Contrast in the rectum (R) freely flows to the neovagina (N) confirming a rectovaginal fistula but providing no specific localizing information. (b) Fistula protocol MRI, coronal section. Note the prostate (P) and the presence of contrast in both the neovagina (N) and rectum (R). Although the interpretation of MRI images requires specific expertise, the radiologist can give very detailed information. In this case, the report read: "There is a curvilinear enhancing, fluid-filled tract extending from the right para-midline posterior neovagina towards the right anterior lower rectum (7:00, 3.8 cm from the anal verge) (series 701, image 27; series 1001, image 115). This is presumably a site of persistent rectovaginal fistula.".

GAV is extrapolated from, and uses the same surgical techniques as the management of RVF in cisgender women, we briefly review the management of RVF in cisgender women for context and comparison.

The most common cause of RVF in cisgender women is obstetrical trauma [16]. Other causes include inflammatory processes, such as Crohn's disease, as well as gynecologic or rectal malignancy [16–18]. Malignancy may cause fistula directly, or fistula may be a complication of surgical treatment or radiation therapy.

The management of RVF in cisgender women is determined by the underlying cause. For RVFs caused by obstetrical injury or other benign causes, initial conservative management is often recommended as tissue injury is confined to the site of the fistula and the tissue is generally well vascularized [18]. In cisgender women, conservative management is recommended for small fistulas (<0.5 cm) for a period of 3–6 months [19,20]. Hygiene measures, including keeping the area dry, washing frequently with water and avoiding chemical irritants such as harsh or scented soap, and vaginal rinsing should be instituted in all patients [21]. Stool-bulking fiber supplements to minimize constipation and antibiotics if infection is present are offered to encourage spontaneous healing of the fistula. If conservative management fails, except where obstetric RVFs involve the anal sphincter, local endorectal advancement flaps are often sufficient to resolve obstetric RVFs [18]. Fecal diversion is not widely used in these cases and has not definitively been shown to improve outcomes [18]. More invasive surgical approaches are generally reserved for recurrent fistula.

Nonobstetric RVFs in cisgender commonly require more invasive approaches [17]. In cases where definitive repair, rather than palliation is attempted, several surgical approaches are common, and stoma creation for fecal diversion is generally utilized to reduce local inflammation and control symptoms [17,18]. Although this may allow the RVF to close, flap-based reconstructions are often used for persistent or recurrent fistulas. Workhorse flaps include the gracilis flap, bulbocavernosus flap, and modified Martius flap [16–18]. Fecal diversion is generally recommended for flap-based repairs, although there are some reports of successful flap reconstruction without diversion [18]. Another approach for the treatment of recurrent RVF is proctectomy with colo-anal anastomosis, as either a primary or delayed, Turnbull-Cutait procedure [18].

RVF in transgender individuals

The management of postoperative RVF in transgender patients applies the same overall principles of treatment as in RVF in cisgender woman. However, following penile inversion vaginoplasty (PIV), the neovaginal lining is composed of keratinized squamous epithelium, derived from local flaps and skin grafts [22], and the blood supply of this tissue is less robust compared with the vaginal vault of cisgender women. Additionally, residual scar tissue complicates repair, making it more difficult to identify the correct planes and limiting both the tissue availability and mobility. Although conservative approaches can sometimes be attempted for smaller RVFs following GAV, escalation to surgical intervention is more common than for RVF in cisgender women. When intervention is necessary, the same reconstructive procedures used in cisgender women are also used in the repair of RVF in transgender women [8,12,23]. Although we discuss conservative management, local repair, fecal diversion, endorectal advancement flaps, and flap-based vaginal repair separately in the following, it is important to note that these approaches are often used hierarchically in series or in various combinations. In addition, some centers will manage RVF following GAV by foregoing preservation of the neovagina, and doing an immediate or delayed second neovaginal reconstruction, most commonly a sigmoid vaginoplasty [24]. Again, each patient's individual circumstances and the treating surgeon's experience will determine which of the endless permutations is appropriate.

Conservative management

Conservative measures described in the following should be instituted as soon as an RVF is confirmed, as in cisgender women. In transgender women, an important consideration is whether to advise the patient to continue, or to discontinue, vaginal dilation. Dilation can result in repeated trauma to the fistula making conservative management less likely to be successful. On the other hand, cessation of dilation risks vaginal stenosis or complete atresia. The decision is individualized and center-dependent; there is no data to allow a consensus recommendation.

Among transgender patients with RVF, there are only a few reported cases of resolution with conservative management alone. Van Der Sluis et al. reported that of 13 cases of RVF cases, only one resolved with conservative measures only, while all the others required surgical intervention [5]. Sarrau et al. presented a case of RVF occurring 2 years following initial vaginoplasty with neovaginal bleeding and passage of gas without stool, likely due to acute trauma [14]. The patient was found to have a 1-cm low fistula and was placed on conservative management for symptomatic control while awaiting definitive surgical intervention, with complete resolution [14]. Therefore, based on available the available literature [3,5,14,23], patients should be advised that conservative interventions alone are unlikely to resolve RVF but are important in preparation for surgical management.

Fecal diversion

Fecal diversion with colostomy or ileostomy is more commonly employed in the management of RVF in transgender women, compared with cisgender women [18]. Diversion is thought to facilitate resolution of the fistula not only through eliminating stool soiling at the fistula, but also possible modulation of the pressure differential between the rectum and neovagina and reduce the "forcing" of material through the fistula.

Pooled data from all series indicates that the majority (52.2%) of reported cases of RVF ultimately required fecal diversion [1,3,5,8,9,12−14,23−28]. The frequency of fecal diversion varied widely by practice setting, and some large volume vaginoplasty practices do not routinely perform fecal diversion [5,24]. Of these, one center routinely performed revision sigmoid vaginoplasty as part of the treatment protocol [24]. When these two centers are excluded, the rate of fecal diversion among other reported cases was 80%, although this may be skewed by reporting bias [1,3,5,8,9,12−14,23,25−28].

In reviewing the use of, and success of, fecal diversion, it is critical to emphasize that the relative lack of data, the heterogeneity of RVF between patients, and the vastly differing philosophies between centers performing GAV makes interpreting data and drawing generalized conclusions difficult. That said, available reports collectively provide insight into the use of diversion as a treatment, or as an adjunct to treatment, of RVF.

In select cases, fecal diversion alone can be sufficient to resolve the RVF [27,28]. Two cases were reported in which the fistula appeared shortly after the initial vaginoplasty, and immediate diversion was performed [27,28]. In one case, the RVF was resolved on follow-up at 4 months [27]. In the other, it spontaneously resolved while awaiting definitive management [28]. Additionally, van der Sluis et al. reported a case in which fecal diversion has been used following failed primary closure, where it was then sufficient to resolve RVF without additional surgical repair [5]. In several other cases, diversion alone has been utilized, but outcomes are either not reported [1], or remain unclear since the patient was lost to follow up or is still undergoing treatment [5]. Fecal diversion alone, however, is insufficient to resolve RVF in most situations, requiring intervention to directly address the fistula [9,23].

It is important to note that, even when diversion does not fully resolve an RVF, it can stabilize the fistula or even allow partial closure. Diversion also provides for better fecal hygiene during the time necessary to resolve postsurgical inflammation and swelling, and for scars to soften, prior to attempts at surgical repair [27]. Therefore, the consensus in the literature is that the majority of more complicated cases of RVF will ultimately require fecal diversion in addition to surgical closure [8,9,12,23,25,27].

Surgical closure of recto-vaginal fistulas

When conservative management or conservative management plus diversion have failed, direct surgical intervention is indicated. Interventions will vary widely based on individual patient circumstances and on the preferences and experience of the center. That said, there is consensus that a fistulectomy to remove all epithelium or mucosa from the tract is important and that, ideally, all three-layers (rectal mucosa, intermediate connective tissue, and vaginal epithelium) are securely repaired separately. The options for three-layer repair after fistulectomy include simple suture repair in three layers, endorectal advancement flaps for the rectal mucosa, and local or regional flaps for the vaginal epithelium.

Direct suture repair

Repair using direct fistula excision and closure in layers can be considered if the adjacent tissue is well vascularized and easily approximated, and if the size and location of the fistula allows a secure, watertight closure. van der Sluis et al. successfully used fistulectomy with closure in layers without fecal diversion in six of nine cases [5]. Several other variations on local repair have been described. Dy et al. reported management with primary repair using a robotic approach, resulting in a smaller, asymptomatic fistula, although specific details of the procedure are not described [26].

Local repairs may be augmented by adjacent tissue rearrangements, including local v-y or other random pattern skin flaps or endorectal flaps [5]. Additionally, a number of grafts have been described for the repair of RVF in transgender individuals, including dermal xenografts and autologous buccal mucosa grafts and rectal grafts [3,8,9,27]. The overall failure rate of local repair remains unclear, but since a local repair does not preclude subsequent axial flap-based repair options, local repair is a reasonable initial step even if further repair is ultimately required [8,12,27].

Endorectal advancement flaps

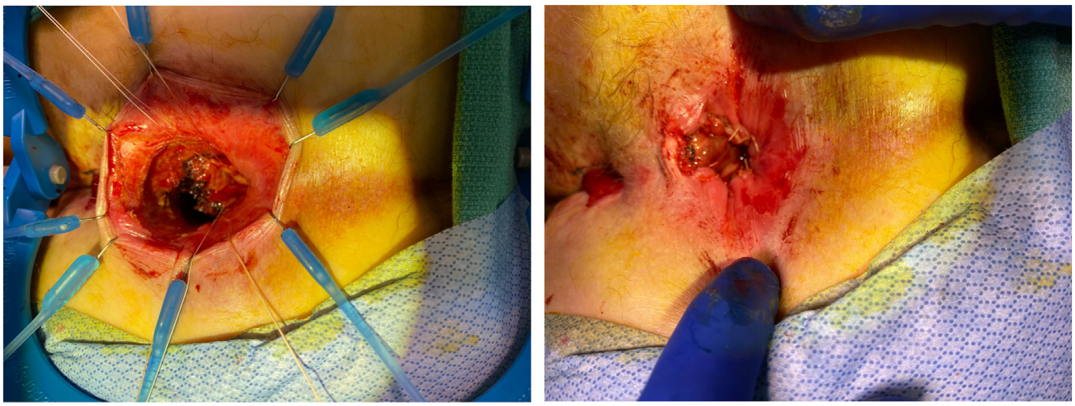
Endorectal advancement flaps (Fig. 20.3) are well accepted for the treatment of RVF in cisgender women [18,29,30]. A variety of geometries have been described, with none being clearly superior, but traditionally a rhomboid flap is elevated proximately and advanced distally toward the anus [29,30]. For RVF following GAV, successful closure using endorectal advancement flaps only has been reported [27]. However, the role and success rates of endorectal advancement along with local repair, but without a vaginal-side flap, are unclear and are obviously dependent on the exact clinical circumstances. Endorectal advancement flaps are beyond the scope of practice for plastic surgeons, therefore, the clinical and technical expertise of colorectal surgery colleagues is critical when considering this option.

Axial flap-based repairs

Either as a primary repair strategy or in case of refractory fistula, axial design, pedicled flap-based approaches for endovaginal repair are used extensively for RVF repair. Axial, pedicled flaps bring well-vascularized tissue to the site of the RVF, which may itself be poorly vascularized due to scarring and can also augment the mechanical strength of the repair.

Guidelines for the repair of RVF in cisgender women recommend the gracilis flap for the treatment of complex or recurrent RVF [18]. The gracilis flap is the also the most common muscle flap used in RVF repair following GAV [12,23]. However, the gracilis flap may be more technically challenging to perform in transfeminine individuals due to smaller pelvic outlet size where any added bulk may restrict the caliber of the neovaginal canal.

As a result, axial pattern faciocutaneous flaps based on pudendal artery perforators are most commonly used in RVF repair. The Singapore flap, described by Chong et al., can be rotated into the neovagina on a cutaneous pedicle, which is incorporated into the neovaginal introitus [25]. As a result, the repair also widens the neovagina and is useful approach in



(A) (B)

FIGURE 20.3 Example of endorectal advancement flap repair. (a) Elevation of advancement flap, (b) inset of advancement flap. *(a,b) Courtesy of Shane Morrison.*

cases of cooccurring neovaginal stenosis. The lotus petal flap (Fig. 20.4) can be used in the same way, or as interpolated flaps if there is no introital stenosis [31]. Gluteal artery–based fasciocutaneous flaps have also been described for the repair of RVF [5]. These axial pattern flap-based approaches should be considered if less invasive approaches are unsuccessful. Note that the classic Marius flap [15], used extensively for RVF repair in cisgender women, is not available for RVF repair after vaginoplasty because the axial vessel supplying the labia majora fat pad is not present.

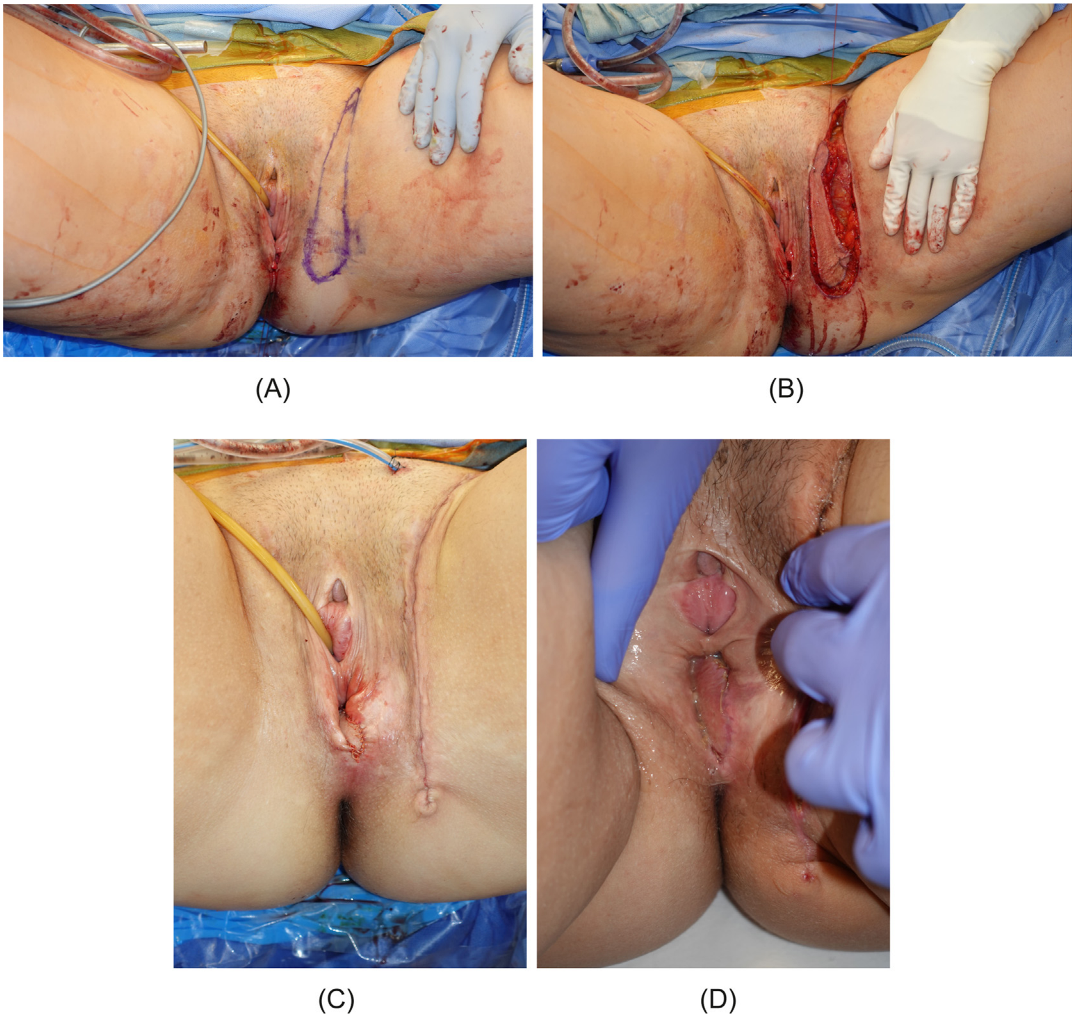


FIGURE 20.4 Lotus petal repair of rectoneovaginal fistula following rectal mucosa closure with direct suture repair. (a) Flap design based on internal pudendal artery perforator, (b) intraoperative view of lotus petal flap, (c) immediate postoperative result. Flap is inset into neovagina, and donor site is closed primarily. (d) Outcome at 2 week follow-up. Patient has an ostomy in place to facilitate fistula healing, which was closed several months postoperatively after imaging confirmed no recurrence of the RNVF. *(a–d) Courtesy of Shane Morrison.*

Colo-anal anastomosis with neovaginal preservation

Colonic pull-through with colo-anal anastomosis has been used successfully to repair refractory RVF in cisgender women following failed flap-based repairs [32,33]. The technique is considered a last-line technique to avoid permanent stoma in patients in whom it would otherwise be unavoidable [34]. Guidelines recommend that the approach be considered in the case of complicated recurrent fistula, or in repairs complicated by a history of pelvic radiation [18]. The procedure is outside the scope of practice for gender-affirming surgeons and requires interdisciplinary collaboration with a colorectal team. During the procedure, the left colon and splenic flexure are completely mobilized [34]. Then, a complete rectal mucosectomy is performed, and the mobilized left colon is brought through and anastomosed to the anal canal [34]. In some cases, omentum can also be used to reinforce against fistula recurrence [34]. Anastomosis of the colonic segment to the anal canal can be delayed by 5–10 days to reduce the likelihood of anastomotic leak, which is referred to as the Turnbull-Cutait procedure [35].

In transgender individuals, Bandi et al. reported on two cases of resolution of RVF following Turnbull-Cutait colonic pull [8]. In one case, the patient had a fistula, which had not resolved following several attempted gracilis flap repairs [8]. In the other, immediate ileostomy, local repair, and hyperbaric oxygen therapy were attempted without success, prior to ultimate resolution with colo-anal anastomosis [8]. Colo-anal anastomosis can be considered for the repair of refractory fistulas, including those in which pedicled flap-based approaches have failed.

Revision vaginoplasty

Immediate or delayed revision vaginoplasty is another approach described for the repair of RVF. Pansritum et al. describes the use of revision sigmoid vaginoplasty with a rectoprostatic fascia reinforcement flap, and without fecal diversion, in seven cases with no return of fistula at 1 year [24]. Drawbacks to this approach include the need for sigmoid resection, which may limit other reconstructive options such as colo-anal anastomosis, and the inherent disadvantages of intestinal vaginoplasty including muccorhea, diversion enteritis, and vaginal prolapse [36–38]. Last, if the neovagina is allowed to stenose, secondary vaginoplasty using the Davydov, peritoneal pull-through approach has resulted in successful neovaginal reconstruction and resolution of RVF [8].

RVF treatment failure

Treatment failure, or recurrence, of RVF following first-time repair is common, although limitations of available literature, reporting bias, and variability between cases prevent precise estimation of recurrence rates. For all repair attempts that reported outcomes in the available literature, we calculated RVF recurrence to be 44% (n = 52 attempts, 31 patients), [3,5,8,12–14,20,23–28,39]. Recurrence rates among case reports or series with only RVF cases were 69.23% (n = 29 attempts, 13 patients) [8,9,12–14,20,23,25,26,39], while among cohorts of vaginoplasty patients, they were only 28% (n = 29 attempts, 18 patients) [5,14,24–26,28]. Recurrence rates among first repair attempts were similar overall (45%) and for cohort studies

(27%), but higher for case reports and series (69%). According to a recent systematic review, recurrence rates were approximately 45% for conservative management and either fecal diversion or local repair alone, but decreased to 11% for reconstructive techniques, which in practice are commonly combined with fecal diversion [40]. Based on these data, patients should be counseled that, although successful resolution of RVF can be achieved in most cases, recurrent fistulas and the need for multiple repair attempts are common.

Author's recommendations for RVF management

First and foremost, it is critical to recognize the devastating psychological effect that RVF can have on patients after gender-affirming vaginoplasty. Gender-affirming surgeries are high-stakes, transformative procedures for gender diverse patients, and the disappointment and distress resulting from an RVF requires the clinical team to be available, engaged, and supportive at all times.

As discussed before, RVF is almost always diagnosed clinically, and the conservative measures discussed before are immediately implemented in all patients. Especially if an examination in the clinic is difficult due to patient discomfort or is not conclusive, an examination under anesthesia is performed. Synchronously, a fistula protocol MRI is obtained in all patients. This imaging modality can define the precise location and size of an RVF, can determine if one or more than one RVF is present, and can visualize fluid collections, abscesses, or anatomic issues that can affect attempts at repair. Depending on the individual circumstances, a decision is made regarding continuing vaginal dilation. If the patient is able to dilate effectively without enlarging or otherwise traumatizing the fistula, and if a shared decision is made to attempt neovaginal preservation, dilation is generally continued with a small dilator and with frequent clinic visits for careful monitoring. If these measures do not show an improvement in fecal or gas per vagina in a few weeks, we then move to fecal diversion. Although fecal diversion is a drastic measure and is not certain to resolve the fistula as a single-modality intervention, the high rate of treatment failure compels us to maximize conditions for subsequent surgical repairs. How long to persist with diversion alone is an individualized, shared decision with each patient. We usually advise patients that if diversion alone has not allowed an RVF to close in 3 months, that surgical repair is indicated.

Once we move to operative repair of an RVF, we bring the maximum level of experience to bear in the OR by working in collaboration with our colleagues from gynecology who have expertise in the management of RVF in cisgender women and with our colleagues in colorectal surgery who can perform endorectal repairs or flaps. Our goal in the operating room is to achieve a water and airtight repair, ideally in three layers. Although the surgical strategies discussed before are all utilized, in most situations we will perform a fistulectomy, an endorectal advancement flap, a mobilization and repair of any available intermediate tissue, and a pudendal artery perforator-based flap for repair from the vaginal side. To ensure a water and airtight repair, the neovagina is filled with saline solution and air is injected into the rectum. The absence of bubbles in the vagina confirms a sound repair.

Postoperatively, patients are maintained on conservative measures and the modified dilation protocol. A clinical examination and an imaging study are performed at 3 months postoperatively. If there is no evidence of recurrence on imaging, we proceed to ostomy reversal. We emphasize that, because RVFs can be very small, especially in a scarred surgical site after repair, it is not possible to confirm successful resolution clinically. That is, we believe that obtaining imaging prior to ostomy reversal is mandatory.

If clinical examination and imaging indicate a recurrent fistula, the decision on how to proceed is very individualized and discussed in detail with patients. Options include a repeat repair, which should be delayed until the surgical site is quiescent and the scars are soft and mature, or surgical obliteration of the neovagina and filling of the dead space with a gracilis muscle flap. A rectal side repair is important in either situation.

Our experience is anecdotal, and our data are unpublished, but we have managed 11 RVFs, both in our own postoperative gender-affirming vaginoplasty patients and in patients presenting from elsewhere. Of the 11, 1 patient had resolution with conservative measures only, 3 had resolution with the addition of fecal diversion, and 4 had resolution with three-layer surgical repair as described before. These eight patients all were able to preserve the neovagina with varying degrees of vaginal stenosis. Two patients have recurrent fistulas after three-layer repair, and one has a recurrent fistula after failed three-layer repair and after a second surgery for vaginal ablation and gracilis flap placement. Our experience mirrors that in the literature and underscores the challenge presented by RVF after vaginoplasty. As a result, we advocate more aggressive use of fecal diversion and reconstructive approaches, as in RVF repair following radiation in cisgender women [18].

Summary

Repair of RVF in transgender individuals following GAV requires an individualized approach to management and is plagued by a high recurrence rate. Management depends heavily on each individual patient's clinical presentation, and there is no consensus for a protocolized or algorithmic treatment plan. That said, the principles of management are strict hygiene, which can include fecal diversion, fistulectomy, and three-layer repair. By properly supporting patients psychologically and by employing the strategies discussed here in a hierarchical fashion, the majority of patients can see resolution with preservation of the neovagina, albeit after a prolonged course that includes complex surgical reconstruction. In cases of failed repair, vaginal ablation and delayed, secondary vaginoplasty can be considered.

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CHAPTER

21

Sexual wellbeing and sexual health following vaginoplasty

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Introduction

This chapter aims to shed light on sexual health and sexual wellbeing following gender-affirming vaginoplasty. Although these terms may sound similar and are often not clearly differentiated, they will be discussed as two separate entities in this chapter. Definitions of both sexual health and sexual wellbeing will be provided. This will be followed by the results based on findings within medical literature on different themes, such as sexually transmitted infections (STIs), sexual dysfunction, pelvic pain, and sexual violence for sexual health, and sexual activity, sexual response cycle, genital and sexual function, and sexual satisfaction for sexual wellbeing. Then, the effect of complications is highlighted, wrapping up with limitations and recommendations for research and practice.

Gender-affirning vaginoplasty

A gender-affirming vaginoplasty (GAV), which involves vulvoplasty, penectomy, orchiectomy, and the creation of a vaginal canal, aims to achieve both aesthetic appeal and functional integrity of the genital region, comprising the vulva and neovagina, with appropriate width and depth. Direct comparisons of the different GAV techniques are challenging due to patient differences, characteristics of surgeons' armamentarium, and divergence of research. The results discussed in this chapter are only specified per technique when indicated [1,2].

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00021-2

Sexual health

Sexual health, according to the WHO, involves maintaining wellbeing in sexual aspects of life. It requires a positive and respectful approach to sexuality, ensuring the possibility of enjoyable and safe experiences without coercion or discrimination. Achieving sexual health involves access to good-quality information, awareness of risks, availability of sexual healthcare, and a supportive environment. Issues include sexual orientation, gender identity, relationships, and potential problems such as infections, unintended pregnancy, sexual dysfunction, violence, and harmful practices [3].

Reviewing medical literature based on this definition resulted in studies concerning LGBT+ populations in general when it comes to good-quality information, awareness of risks, availability of sexual healthcare, and a supportive environment. These studies do not specifically focus on transgender women or individuals assigned male at birth (AMAB), and certainly not following vaginoplasty. The studies found on sexual health after vaginoplasty mainly focused on sexually transmitted infections, sexual dysfunctions, and sexual violence.

Sexually transmitted infections

Research on sexually transmitted infections (STIs) postvaginoplasty is scant but crucial for comprehending sexual health requirements. Elevated occurrences of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections have been observed, particularly after rectosigmoid vaginoplasty. Increased vulnerability to HIV, herpes simplex virus, and syphilis is evident, with uncertainties regarding how vaginoplasty influences infection presentations. This highlights the necessity for customized prevention measures and routine screening within this demographic. Instances of bacterial vaginosis following vaginoplasty have been noted, indicating notable distinctions in neovaginal microbiomes compared with cisgender women. This observation underscores the necessity for targeted treatment strategies and further exploration into the determinants impacting neovaginal wellbeing [4].

Sexual dysfunctions

After vaginoplasty, transgender women commonly experience sexual dysfunctions such as difficulty achieving orgasm (29%), pain during intercourse (27%), trouble initiating and seeking sexual contact (23%), low sexual desire (18%), and arousal difficulties (16%), based on the ENIGI study. The prevalence of these dysfunctions is higher in transgender women compared with cisgender women, mirroring common issues experienced by the latter [5].

Complications following GAV, such as scarring, loss of sensation, and pain, can impair sexual function and satisfaction. Swelling and pain may delay orgasm attainment, while issues such as bleeding and scarring can affect intercourse frequency. Intravaginal scarring, often due to surgical techniques or noncompliance with aftercare, is more common in the first-year postsurgery. Neoclitoral scarring, affecting sensation, can occur in up to 30% of patients, with diabetes and nerve injury increasing the risk. Hypersensitivity may necessitate additional surgery, with revision often improving orgasmic function [6].

Dyspareunia, occurring in 25%–75% of patients post-GAV, can stem from issues such as lubrication problems, inadequate arousal, or pelvic floor dysfunction. The wide range in occurrence is influenced by various factors, including surgical complications and follow-up duration. Causes can be hair in the vaginal canal, narrow vaginal canal, stenosis, inadequate depth, painful clitoris, spongiosum remnants, fear of injury, anxiety/depression, bleeding during or after, vaginal cramps, stenosis, clitoral necrosis, genital pain, stress incontinence, infection, anorgasmia, hypersensitivity, malodor, and dryness. Pelvic pain postvaginoplasty may result from pelvic floor muscle spasticity due to surgical dissection. Patients are more likely to experience pain during sexual activity postsurgery. Studies don't distinguish between different penetration methods. Dyspareunia may improve within 3–6 months postsurgery without intervention, but unresolved pain is linked to lower sexual satisfaction [5].

Hormone therapy and socioeconomic factors may contribute to a higher incidence of pelvic floor dysfunction in patients undergoing vaginoplasty. This dysfunction can stem from practices such as "tucking" the penis and scrotum prior to GAV, medication usage, and a history of sexual abuse. Poor healing after surgery can also lead to persistent pelvic pain, affecting dilation and sexual activity [7].

Hypoactive sexual desire (HSDD) is relatively common among transgender women, and there is a correlation between lower testosterone levels and decreased sexual desire. Despite only a minority experiencing distressing HSDD, one study discovered that treating HSDD with transdermal testosterone, which maintains testosterone levels similar to those in cisgender women (around 300 mg/day) for 24 weeks, resulted in a notable enhancement in sexual desire. During this treatment, no adverse events were observed, and 86% of patients opted to continue the therapy [8,9].

Pelvic pain

Pelvic pain post-GAV may result from pelvic floor muscle spasticity due to surgical dissection. Poor healing after surgery can also lead to persistent pelvic pain, affecting dilation and sexual activity. Preoperative assessment is crucial to identify pelvic floor dysfunction, and proper body positioning can aid in postoperative recovery [7]. Despite lacking validation in transgender women, the pelvic floor distress index (PFDI-20) reveals significant preoperative symptoms of distress that should be treated before surgery, as they can cause problems after surgery. Physical therapy interventions, including patient education and therapeutic exercises, can address these issues. Early pelvic floor physical therapy (PFPT) can lead to symptom resolution postoperatively, highlighting its importance in the management of pelvic floor dysfunction in transgender patients [10].

Sexual violence

Sexual violence against transgender individuals is a serious issue that often intersects with various forms of discrimination and marginalization faced by the transgender community. Transgender individuals may be at a heightened risk of experiencing sexual violence due to factors such as societal stigma, discrimination, and lack of legal protections.

Efforts to address sexual violence against transgender individuals require comprehensive strategies that address the root causes of violence, improve access to support services, and promote cultural competency and sensitivity among healthcare providers, law enforcement, and the broader community. Advocacy for transgender rights and visibility also play a crucial role in combating stigma and discrimination that contribute to sexual violence [11,12].

Three studies reported on individuals after vaginoplasty who had experienced sexual violence at some time throughout their lives, with rates ranging from 10% to 25%, and two studies had 10 and 18 participants, respectively. No data was found on sexual violence after vaginoplasty [13–15].

Sexual wellbeing

Sexual wellbeing lacks a clear definition. In essence, sexual wellbeing encompasses the overall health and contentment in one's sexual life, addressing physical, emotional, mental, and social dimensions. It entails cultivating positive and satisfying experiences, devoid of distress, while nurturing a feeling of ease, confidence, and openness in sexual identity and expression. This contributes significantly to overall life satisfaction and quality. The interplay of self-acceptance, connections, and positive encounters plays a pivotal role in sustaining sexual wellbeing, with individual sexual development and assumptions exerting notable influences on this facet of life [16–18].

Although 10 themes could be identified in medical literature related to sexual wellbeing—sexuality, enacted sexual script, sexual activities, sexual relations, sexual response cycle, genital function, sexual function, sexual pleasure, sexual satisfaction, and quality-of-sex-life—the main focus in the majority of the studies was genital function and sexual function [16,19]. Most of these themes were assessed for other purposes. For instance, questions related to sexuality and sexual relations were mostly aimed toward romantic or sexual attraction and sexual preference. Those questions were predominantly asked for demographic reasons, like the question covering the theme of sexual relations. The theme of enacted sexual script covered questions aimed to answer genital function questions. The main question being: what do trans women actually do with their neovagina? This, without being specific, but rather heteronormative: is the neovagina suitable to be penetrated with a penis? [20].

Sexual activity

Sexual activity is the most reported topic in medical literature after vaginoplasty. Although some patients may delay sexual activity due to the lack of emotional readiness or postsurgical issues, most patients experience an increase in sexual activity, particularly in orogenital stimulation, with 57% regularly engaging in intercourse postsurgery. Those who are sexually active tend to have higher levels of satisfaction, especially if they have partners. Conversely, patients who are not sexually active are often single and place less importance on sexuality. Factors like older age and childhood sexual abuse are linked to sexual inactivity, and some patients cite persistent body dysphoria as a reason for not being sexually active postsurgery [21].

Sexual response cycle

The pillars of the sexual response cycle are simplified in research into sexual desire, sexual arousal, and orgasm. The cycle starts with a stimulus, which can be a picture/movie, a scent, a sound, or a touch, leading to sexual desire (expectation). Acting upon that desire initiates sexual arousal (consumption), culminating in an orgasm and refraction (satiety).

Transgender women commonly find their sexual desire decreases about 3 months into hormone therapy, yet many notice an increase in spontaneous desire following vaginoplasty. Research on postsurgery sexual desire yields mixed results, likely due to the intricate interplay among an individual's sexual functioning and various biological, psychological, social, and relational factors [22].

While some transgender women may rarely feel sexual desire, particularly those in relationships, individuals in heterosexual relationships tend to exhibit higher levels of desire than those in same-gender relationships. Additionally, age tends to have a negative impact on the frequency of sexual desire. Despite reports of low desire, only a small minority experience distressing hypoactive sexual desire disorder (HSDD) [8]. For many, genital affirmation surgery can enhance sexual satisfaction by alleviating gender dysphoria. However, it is crucial to acknowledge study limitations such as retrospective design and potential bias due to response rates. In arousal, subjective arousal is more relevant than physiological arousal for assessing sexual satisfaction in transgender women [23].

After vaginoplasty, most women are able to get sexually aroused easily, with increased arousal after vaginoplasty [24]. Postvaginoplasty, orgasm rates vary widely from 25% to all participants being able to achieve an orgasm, influenced by surgical experience and techniques, in which clitoroplasty increases orgasm likelihood. Masturbation is the most common route to achieving an orgasm [25].

Post-GAV, orgasm rates vary widely from 25% to all participants being able to achieve an orgasm, influenced by surgical experience and techniques in which a clitoroplasty increases orgasm likelihood. Masturbation is the most common route to achieve an orgasm [26]. Being able to orgasm leads to greater sexual satisfaction after a vaginoplasty with improved orgasm intensity and duration. Persistent body dysphoria or medication effect can negatively influence the ability to orgasm [10]. Ejaculation during orgasm is reported by many due to residual prostate and seminal vesicles [27].

Genital and sexual function

As stated before, many studies primarily focus on receptive vaginal intercourse. Studies show that more than half of the trans women engage in vaginal intercourse regularly. Buncamper et al. pointed out that reasons for transgender women not engaging in vaginal intercourse after GAV can vary widely and are often personal and complex. This could be due to personal preference; some are simply not interested in vaginal intercourse due to individual sexual preferences, same-sex relationships, not being in a sexual relationship, or due to comfort levels [2,28].

Issues such as hematoma, excessive bleeding, and scarring or stenosis, often due to graft or flap issues or noncompliance with dilation, can impact vaginal depth and width and therefore the ability to have vaginal intercourse [14].

Genital sensitivity

Postoperative genital sensitivity was present in nearly all patients; studies looked at total genital sensation, specific clitoral sensation, vaginal sensation, and erogenous or orgasmic sensation [16,29]. Neoclitoral sensitivity is influenced by surgical technique, specifically how the neurovascular bundle is dissected, how the clitoris is formed and placed, and whether all surgeons create a clitoris, labia minora, or clitoral hood. Preservation of the neovascular bundle is crucial for maintaining sensitivity, which positively correlates with arousal, pleasure, and the capability to orgasm, and therefore with sexual satisfaction [30].

Next to the clitoris, the neurovascular bundle itself can give an erogenous sensation as well, especially where the bundle is draped in the pubic area [10,31]. One study presented the results of splitting the neurovascular bundle in two, together with a small part of the glanspenis. One part was used as a clitoris, and the other was placed in the anterior wall of the vagina, aiming to enhance erogenous sensation [32].

Lubrication

Regardless of the retrospective nature of the studies on lubrication postvaginoplasty and their incomplete response rates, the results show that more than half of the trans women experience natural lubrication during arousal. This is due to pelvic vasocongestion followed by fluid transudation into the vaginal lumen or due to the preservation of Cowper glands. Still, many postvaginoplasty patients require additional lubrication for comfort during sexual intercourse [22].

Studies show that intestinal vaginoplasty, with its self-lubricating bowel mucosa, offers an advantage over PSIV, which in turn offers an advantage over a perineal or scrotal flap. Lubrication is consistently the least satisfying sexual function domain postvaginoplasty for transgender patients [33].

Vaginal dimensions

Inadequacy of the depth and width of the neovaginal cavity can cause pain during vaginal intercourse or an inability to engage in vaginal intercourse, which was the case in 50% of the transgender women in the ENIGI study, which leads to sexual dissatisfaction [5]. Despite this high percentage of sexual dissatisfaction due to pain caused mainly by the inadequacy of the depth and width of the neovaginal cavity, Buncamper et al. found that the vaginal dimensions were more than adequate. Most studies included in the ESSM Position Statement reported that the majority (77%) of postvaginoplasty patients reported a rather high sexual satisfaction instead of a low one [16].

Sexual pleasure

Sexual pleasure is the least studied topic when it comes to the effects of vaginoplasty, mostly described as pleasurable penis-in-vagina sex, orgasms, and sexual activity. Results show that sexual pleasure is enhanced with intact sensitivity of the vulva and the clitoris. Pleasure in sexual activity is enhanced with sensation of the clitoris, which leads to overall happiness [31].

Sexual satisfaction

Most transgender women experience sexual satisfaction after GAV. Sexual satisfaction is positively correlated with adequate depth and width, absence of pain, frequency of achieving orgasm, overall success of GAV, clitoral sensation, appearance of vulva, intercourse, and natural lubrication. Sexual satisfaction is negatively correlated with vaginal stenosis, clitoral necrosis, genital pain, stress incontinence, bladder infections, anorgasmia, aging, chronic illness, surgical complications, decreased libido from hormonal therapy, stress, breast appearance, and depression [34].

In a qualitative study, all participants were not only sexually active during all stages of transition (preoperative, between surgeries, and postoperative), but they also experienced sexual satisfaction in their sex lives, both alone and with partners. They reported that the greatest gain in sexual satisfaction was experienced when they started hormonal treatment [17].

Complications

Complications such as intravaginal scarring, excessive external scarring, loss of sensation, prolonged pain, hematoma, or excessive bleeding can negatively affect sexual function and satisfaction post-GAV. Prolonged swelling and pain can hinder orgasm achievement within 6 months, while issues such as hematoma, excessive bleeding, and scarring can impact weekly intercourse. Intravaginal scarring or stenosis, often due to graft or flap issues or noncompliance with dilation, may occur [14]. Erogenous sensation can be affected by necrosis or scarring of the clitoris, which can lead to hypersensitivity and lack or diminished sensation [26,35].

Limitations in research of sexual wellbeing in transgender women post gender-affirming vaginoplasty

Most studies assessing sexual wellbeing focus primarily on the outcomes of the own surgeries of the principal researcher, with genital function, particularly the ability to engage in sexual activity, being the primary focus of their research. For instance, the FSFI is the most used questionnaire, leading to results on the sexual response cycle. Sexual satisfaction and quality-of-sex-life are deemed to be covered mostly by one question within a (self-developed) questionnaire. It is important to emphasize that only 9% of the found studies were prospective research.

A review by Özer et al. specifically focused on tools used to assess sexual wellbeing in treatment-seeking gender incongruent individuals found 35 questionnaires employed for this purpose. Three of these questionnaires were adapted to fit the gender incongruent population, but only 24 were validated, and only for a cisgender population [19]. Kloer et al. more recently added two other questionnaires to this list, namely Q-SF (Quality of Sexual Function) and SPQ. However, the latter questionnaire was not found; most likely, it should refer to the Amsterdam Sexual Pleasure Inventory or the Sexual Pleasure Scale [21]. Other questionnaires found tailored for transgender populations, although not validated for trans women after vaginoplasty, include the Wierckx Questionnaire [36], the Morrison Questionnaire [37], the Short Questionnaire for Self-Evaluation of Vaginoplasty [2], the Biographical Questionnaire for Transsexuals and Transvestites [38], and the Sexual Functioning Index-Gender Spectrum [39]. An overview of all questionnaires used to assess sexual wellbeing in gender incongruent individuals can be found in Table 21.1.

Recommendations for research and practice

The existing research has significant gaps when it comes to understanding how genital surgery impacts sexual wellbeing in transgender individuals. Both theoretical analyses and empirical studies have largely overlooked this aspect, and there is a noticeable absence of validated tools for assessing sexual wellbeing in this population.

It is becoming increasingly clear that we need to shift our focus from solely the perspectives of healthcare professionals and researchers to those of transgender individuals seeking care. This shift could lead to the development of more tailored tools and better address their needs.

There is a pressing need for further research that integrates both insider (emic) and outsider (etic) perspectives in research and clinical practice. Valid measures of sexual wellbeing in transgender individuals should be a priority, and a comprehensive approach that considers both internal and external viewpoints could improve the quality of care provided.

The hypothesis is that this shift will result in greater satisfaction among patients undergoing gender-affirming surgery, particularly in terms of sexual outcomes. However, rigorous empirical research using robust methodologies is necessary to confirm whether this approach indeed improves results, including sexual satisfaction and overall sexual wellbeing for transgender individuals.

TABLE 21.1 Sexual health.

Sexually transmitted infections	
Problem	**Cause**
Chlamydia trachomatis and *Neisseria gonorrhoeae*	Specifically after rectosigmoid vaginoplasty
Vulnerability to HIV, herpes simplex virus, syphilis	Uncertainties about influence of vaginoplasty
Bacterial vaginosis	Neovaginal microbiomes distinctions from cis women

Conclusion

In conclusion, the exploration of sexual health and sexual wellbeing following GAV reveals a complex landscape shaped by various factors, including surgical techniques, hormonal therapy, expectations, and individual experiences.

The distinction between sexual health, focusing on physical aspects and disease prevention, and sexual wellbeing, emphasizing overall satisfaction and contentment in sexual life, underscores the multifaceted nature of postoperative experiences. Despite lacking a precise definition, sexual wellbeing emerges as a crucial aspect of transgender individuals' overall quality of life, encompassing physical, emotional, and social dimensions.

Our examination of sexual health highlights the elevated risks of sexually transmitted infections postvaginoplasty, emphasizing the need for tailored prevention strategies and routine screening. Additionally, common sexual dysfunctions such as difficulty achieving orgasm and pelvic pain underscore the importance of preoperative assessment and postoperative care to address these challenges effectively.

Furthermore, the sobering reality of sexual violence against transgender individuals highlights the need for comprehensive strategies to combat this pervasive issue and improve support services for vulnerable populations.

Moving forward, there is a need for a broader exploration of sexual pleasure, satisfaction, and quality-of-sex-life in transgender populations postvaginoplasty. By adopting a patient-centered approach in research and clinical practice, prioritizing the perspectives and needs of transgender individuals, tailored interventions and comprehensive strategies to enhance sexual outcomes and overall wellbeing following gender-affirming surgery can be developed.

Ultimately, through rigorous empirical research and the development of validated tools to assess sexual wellbeing, there can strive toward fostering greater satisfaction and fulfillment among transgender individuals in their postoperative journey.

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CHAPTER

22

Pelvic floor physical therapy for AMAB persons undergoing gender-affirming vaginoplasty

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Introduction

Promising results from studies looking at physical therapy involvement in other major abdominal pelvic surgeries include improved postoperative outcomes through improved preoperative physiologic reserve and functional capacity after surgery [1]. These results suggest that physical therapy interventions can reduce postoperative pain and analgesic use, reduce pain when returning to daily activities, promote shorter lengths of hospital stay [2]; reduce postoperative medical complications [3]; improve symptoms of postoperative ileus [4]; improve UI frequency symptoms and quality of life [5,6]; and significantly improve sexual function [7].

Pelvic floor physical therapy (PFPT) is an essential component of perioperative management for persons undergoing gender-affirming vaginoplasty, as such the World Professional Association for Transgender Health (WPATH) Standards of Care 8 advised inclusion of pelvic floor physical therapy (PFPT) for anybody undergoing gender-affirming vaginoplasty [8].

Evidence to support involvement of pelvic floor physical therapy

Two peer-reviewed studies published in 2019 demonstrated that incorporating pelvic floor physical therapy (PFPT) into perioperative care improves patient outcomes by effectively managing pelvic floor impairments [9,10]. One of these studies found that PFPT significantly reduced symptoms of pelvic floor dysfunction following vaginoplasty, as measured by

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00022-4

validated survey assessments [10]. The other study demonstrated that attending both preoperative and postoperative PFPT sessions provided greater benefit compared with only postoperative PFPT attendance [9]. A small randomized, controlled trial in 2023 comparing sham PFPT, preop and postop PFPT, and postop PT only, showed similar outcomes for each of the three groups [11]. All three studies focused on the perioperative period and recommended incorporating physical therapy, either as standard of care or as an early intervention when complications arise.

Vaginoplasty directly and indirectly affects the pelvic floor anatomy and function. Assessment of preoperative bladder, bowel, and sexual function can allow for preoperative treatment and postoperative planning. Pelvic floor physical therapists, through interview and examination, can screen for stress urinary incontinence (SUI), urge urinary incontinence (UUI), fecal incontinence (FI), and constipation. Optimizing these conditions before surgery is essential. Pelvn floor physical therapists routinely work with both assigned-male-at-birth and assigned-female-at-birth patients to address pain and sexual dysfunction (Table 22.1). Their training, in trauma-informed care is particularly valuable for this population, as many individuals have experienced trauma and present pelvic floor dysfunction [9]. PFPT also can assist with identifying and managing orthopedic pain conditions in the lumbar spine, pelvis, and hip, as well as wrist, elbow, and shoulder problems that can make dilation and postoperative recovery difficult.

Neovaginal dilation

There is limited data on dilation techniques and the advice to offer patients. Many surgeons provide a set of dilators after surgery, with some recommending that dilation begins immediately after the neovaginal packing is removed [12]. Others delay the initiation of dilation for several days to a week, aiming to allow the skin graft to mature and to reduce pain and swelling from surgery. We believe that if dilation is less painful at the outset, patients are more likely to continue with dilation process. In our setting, patients begin dilation with water-based lubrication three times per day for 30 min per session. Once they return to their routine activities, such as work and school they switch to twice daily for 45 min per session.

TABLE 22.1 Pelvic floor conditions managed by PFPTs and Incidence in penile inversion vaginoplasty.

Condition	Incidence in penile inversion vaginoplasty (%)
Pelvic and/or genital pain	1.3–20
Dyspareunia	2–8
Vaginal stenosis	0–12
Introital stenosis	2.5–15
Urinary incontinence (UUI, SUI, mixed presentation)	4–16

Data from R. Hontscharuk, B. Alba, A. Hamidian Jahromi, L. Schechter, Penile inversion vaginoplasty outcomes: complications and satisfaction, Andrology 9 (6) (2021) 1732–1743. https://doi.org/10.1111/andr.13030

To ensure the patency of the newly constructed vagina and prevent neovaginal stenosis, surgeons almost universally instruct their patients to engage in regular dilation after surgery, although dilation practices vary significantly [12]. Neovaginal stenosis is one of the most common complications after gender-affirming vaginoplasty. The most frequently cited cause of both introital and neovaginal stenosis is insufficient dilation [13]. In our experience, many patients have significant anxiety about dilation, both before and after surgery. Many patients report discomfort or pain during dilation, which we attribute to difficulty relaxing their pelvic floor muscles. Since many individuals have limited awareness of the anatomy or function of the pelvic floor, education and guidance in this area can be extremely beneficial [14].

A common issue that can hinder dilation is elevated pelvic muscle tone. Therapists can help by providing relaxation techniques that facilitate successful dilation. They employ various methods to help relax the pelvic floor muscles (PFM), including teaching positions that promote relaxation. Additionally, specific breathing techniques can aid in PFM relaxation. Visualizing the PFM as soft and relaxed has been shown to help cisgender women achieve relaxation of the same muscles [15,16] and could similarly benefit those undergoing dilation. Moreover, electromyography (EMG) biofeedback and rehabilitative ultrasound imaging (RUSI) can be effective tools for training PFM relaxation [17,18].

Recommendations for dilation

Positioning

Body positioning during dilation can influence PFM tension or relaxation. Maintaining a neutral position of the pelvis and lumbar spine can facilitate placement of the dilator by optimizing the sagittal diameter of the pelvic outlet. We recommend placing pillows or cushions under the head, neck, and thorax to achieve a semireclined position of about 30–45 degrees (Fig. 22.1). This position makes it easier to reach the introitus for dilator placement without contracting the abdominal muscles, which can lead to PFM contraction and narrowing of the genital hiatus, as seen in cis gender females [19]. A wider base of support of the feet can reduce tension in the PFM. This can be achieved by bending the hips and knees, with feet positioned wider than hip-width (slight hip abduction) in a supine hook-lying position. Alternatively, support can be placed under and along-side the knees, allowing the legs to relax into this support. Engaging the adductor muscles to hold leg positioning can contribute to PFM contraction, so this support helps alleviate that tension [19]. Bolsters under the thighs and legs can help support the hips and knees in this position, although they might also interfere with dilator placement. For individuals with central adiposity, a modified side-lying position can make reaching for dilator placement easier (Fig. 22.2). Therapists and patients may need to experiment with different positions to facilitate comfortable placement and optimal depth of insertion. Position variations are described in Table 22.2.

Progression of dilator size

Many surgeon dilation protocols use a strict timeline based on time from-surgery to determine when to progress to the next dilator size [12]. At the same time, these protocols often

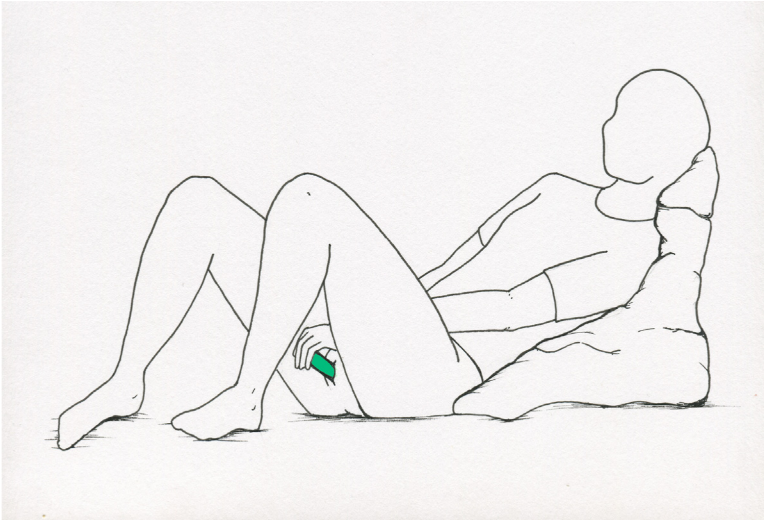

FIGURE 22.1 Trunk-supported hook-lying for dilation. *From Sandra Gallagher LLC. Illustration created by Erica Fisher DPT.*

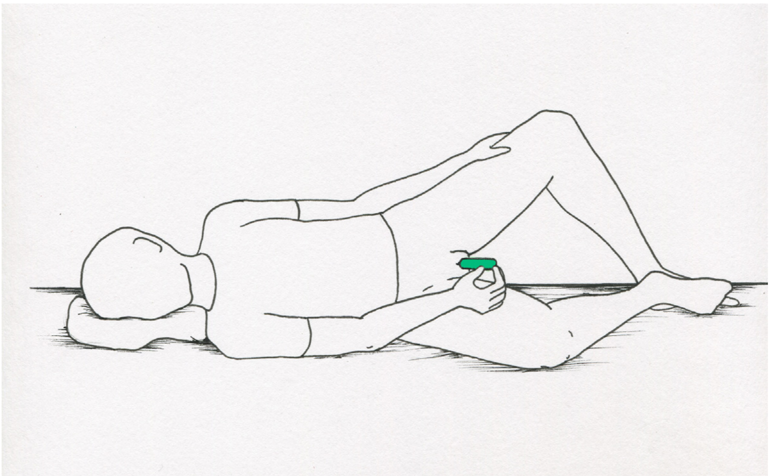

FIGURE 22.2 Supported side lying dilation. *From Sandra Gallagher LLC. Illustration created by Erica Fisher DPT.*

reduce the daily frequency of dilations based on a strict timeline. While many surgeons recommend a standardized timeline for dilation progression, progression in PFPT typically follows a response-based model. In practice, we monitor patients' responses by tracking factors such as pain, resistance, depth, time required to reach the target depth, and post-dilation soreness. Once a dilator size feels manageable for two to three sessions, patients can progress

TABLE 22.2 Position considerations.

Positions to use
Potential adjuncts to dilator use
Vibrator
	• Hook lying with lumbar spine flat on bed, head and shoulders elevated on pillow
	• Semi-reclined with lumbar spine neutral on bed
	• Graduated $^3/_4$ supine
	  ◦ Halfway between side lying and supine or as patient is comfortable
	  ◦ Positioned with back support near wall or on sofa
	• Side lying
	• Cautiously, mid-range butterfly pose with cushions for support of legs

Positions to avoid	• Full butterfly pose especially if wound dehiscence is present • Sitting or semi-sitting • Positions with a lumbar lordosis and anterior pelvic tilt • Positions with active trunk flexion as this may interfere with pelvic floor relaxation

to the next size. Manageable is defined as pain below 3/10 during and after dilation, minimal resistance, and the ability to reach full depth within five minutes. A sensation of tightness or stretch is expected, but patients should not "push through" pain.

Progression to the next dilator size is gradual, with the first 5–15 min dedicatedto the current, manageable size, followed by the next 10–15 min with the next larger size. To prevent potential permanent loss of depth, the current dilator should continue to be used until the larger dilator can reach full depth. Once a patient can reach full depth with the new dilator, that dilator is used for the entire duration of each subsequent session until transitioning to the next size is appropriate. Table 22.3 outlines a progression in dilator size using Soul Source GRS dilators from size #1 to size #2 (Table 22.3, Fig. 22.3). Additional techniques to aid progression include subtle movement with the dilator, such as slowly moving it in and out, making a slight twist, performing a gentle PFM contraction around the dilator, or applying a sustained stretch to the puborectalis muscle by pressing the dilator evenly (without tilting)

TABLE 22.3 Transitioning dilator sizes #1 to #2 (Soul source Genital reconstruction surgery (GRS) dilators colors purple and blue).

Transitioning dilator sizes	10 min	20 min	30 min
At least three sessions easy	#1 purple	#1 purple	#1 purple
At least three sessions easy	#1 purple	#1 purple	#2 blue
At least three sessions easy	#1 purple	#2 blue	#2 blue
Once target depth is reached complete dilation with # 2 blue only	#2 blue	#2 blue	#2 blue

FIGURE 22.3 Soul source GRS dilators. Diameter range 7/8″ to 1 $^{1}/_{2}$ ", length 9″ with marking for 4″-6″. *Used with permission from Soul Source Therapeutic Devices, Inc. www.SoulSource.com.*

toward the coccyx. It is recommended to use only one of these techniques at a time, avoiding simultaneous modifications or PFM squeezing during dilator placement. Combining these steps too early in the healing phase may place undue stress on healing tissue.

Additional interventions

Pelvic floor exercise

Pelvic floor exercises (PFE) that emphasize exhalation during contraction generate minor mechanical forces, which can stimulate angiogenesis [20] and enhance tissue strength. Isometric contractions can help reduce pain [21,22] and are commonly employed to decrease swelling following injuries or surgical procedures.

There is currently no data on PFE exercise in transgender women. Studies show that the incorrect execution of PFEs in cis women ranges from 23% to 40% [23] and can be as high as 68% [24]. Providing instruction and feedback is strongly associated with correct performance and can be easily integrated into pelvic examination [25]. Proper PFE performance is essential for improving pelvic floor disorders [26]. Additionally, the use of surface EMG biofeedback or transabdominal RUSI can be effective teaching tools for training PFEs [17,18,27,28].

Aerobic activity

Everyone benefits from appropriate aerobic activity, and walking is a sufficient form of exercise shortly after vaginoplasty. Patients should be advised to choose walking routes with available seating for rest breaks. They should monitor their responses to walking, considering factors such as pressure, pain, soreness, swelling, and fatigue. If they experience increased pain or bleeding, they should reduce the duration of their walks rather than stopping completely. If patients notice decreased pain and swelling, they can gradually increase the lenght of their walks, starting on flat surfaces before slowly incorporating inclines. Additionally, patients should be taught proper lifting mechanics and lower extremity strengthening exercises while coordinating with pelvic floor engagement. High-impact or high-intensity training should be tailored based on preoperative fitness, healing status, and consultation with the surgical team [29].

Abdominal, vulva and vaginal manual therapy

Since early, gentle mobilization of postsurgical tissue influences angiogenesis and fibroblast activity [20], patients can begin manual therapy as early as postoperative day one. This therapy can continue throughout the healing process, with gradual increases in pressure and movement applied to the tissues. On postoperative day one, to promote mobility and reduce vulvar swelling, patients can place their hands on the lower abdomen or inner thigh, if whitin easy reach, and gently apply light distraction away from the vulva tissues. This technique creates subtle movement in the vulva whitout provocking pain. Once the vulvar dressing has been removed, patients can place clean hands on the vulva and perform gentle hip adduction/abduction, external/internal rotation, anterior and posterior pelvic tilts, and PFM contractions. These movements help create motion between their hands and the layers of healing tissues. At six weeks, assuming typical healing without dehiscence, tissue reaches approximatively 50% of its tensile strength, making it safe to begin gentle mobility exercises on the labial tissues, such as skin rolling [20]. Emphasizing the importance of hand hygiene to the patient is essential.

Neovaginal anatomy differs from natal vaginal anatomy. In the first 12 weeks postoperatively, trigger point pressure and PFM massage, such as Thiele massage, are unnecessary and may overstress healing tissue. During early recovery, performimg vaginal dilation two to three times daily is sufficient for preventing stenosis and promoting tissue mobility.

Electrical stimulation

Transcutaneous electrical nerve stimulation (TENS) is a valuable therapeutic approach for modulating pelvic floor pain in both acute and chronic conditions [30]. Application of TENS to the thoracolumbar, lumbosacral, suprapubic, and perineal areas has been shown to effectively reduce pain following vaginal and cesarean births [31], episiotomy [32,33], and hysterectomy [34]. These studies commonly used conventional TENS settings, with a frequency of 80–100 Hz and a pulse width of 100–250 μs. Similar settings and electrode placement may be applied post-vaginoplasty to help reduce general pain or alleviate discomfort during vaginal dilation.

Water based lubricant and wound healing

In the early phases of healing, neovaginal tissues are frequently exposed to water-based lubricant. The type of water-based lubricant is important, as its pH and osmolality can affect healing. An acidic pH in the stratum corneum supports effective wound healing by preserving the epidermal barrier, maintaining homeostasis, regulating cytokine signaling [35,36]. A topical preparation with a pH between 4.0 and 6.0 promotes better healing by restoring the skin barrier, suppressing the growth of pathogenic bacteria, reducing proteolytic activity, and encouraging fibroblast growth [37–39].

Little is known about the effect of isoosmolar, hyperosmolar, and hypoosmolar preparations in the neovagina, regardless of whether it is created through penile inversion, peritoneal or bowel tissue. Studies in cisgender female vaginal tissue indicate that an osmolality level 380 mOsm/kg is ideal, with levels below 1200 mOsmol/kg considered acceptable [40]. Lubricants with an osmolality of 280 mOsm/kg have shown no damage to rectal epithelium, unlikelubricants exceeding 3000 mOsm/kg, which can cause drying or stickiness, making dilator insertion difficult [41]. Conversely, low-osmolality lubricants may lead to maceration of the surrounding area and might not adhere well to the dilator.

Anecdotally, we have observed that patients with hypergranulation tissue, delayed healing, and pain experienced improvement after switching to a lubricant with a pH range of 4.0–5.0 and an osmolality close to 300 mOsm/kg. These patients had previously been using a lubricant with unpublished pH and osmolality data or personal lubricants with a pH above 6.0 and an osmolality over 2000 mOsmol/kg. When selecting a lubricant, patients and providers should consider the type of vaginoplasty surgery, the pH and osmolality of the lubricant, the stage of healing, and any presence of infection. We recommend that patients test a new lubricant on the vulvar tissue or distal vagina, where it can be easily washed off with a douche if irritation occurs.

Data on pH and osmolality of personal lubricants can be viewed at the following sources [42–46].

Long term: Three months postoperative forward

Vaginal stenosis

There is insufficient research on how often vaginal stenosis occurs despite correct adherence to recommended dilation practices [13]. Regardless of the cause of stenosis, we recommend patients reengage with PFPT. Stenosis caused by scar tissue - whether canal or introital- is not a muscular condition. Treatment for neovaginal stenosis should follow a program similar to that for radiation-induced vaginal stenosis, where time and consistent, pain-free dilation are used to manage the stenosis [47].

Therapists can support patients in techniques to facilitate dilation, including positioning strategies and PFM relaxation training using breathing techniques, EMG biofeedback, or RUSI. They can also inform patients about the availability of smaller dilators that can navigate the stenotic area and help maintain depth while awaiting surgical correction of the stenosis. An example of a low cost, appropriately sized dilator is the Syracuse medical vaginal dilator. Available options include an "X-Small" at 1/2 inch (13 mm), and an "X-Small Plus" that is 11/16 inch (18 mm). Another option for stenosis within 3.5 inches of the vaginal opening is the Milli Vaginal Dilator by Milli, which is 4 inches (10 cm) long and expands from 15 to 40 mm in 1 mm increments. Two affordable options for expanding dilators are the Absolute and the Discovery by Odil, each measuring 3.6 inches in length. The Absolute dilator expands from 1 to 1.5 inches, while the Discovery expands from 0.5 to 1 inch.

While some patients may overcome mild stenosis with improved dilation technique or frequency, many might not see improvement. Individuals with vaginal stenosis often require surgical revision of the neovagina to achieve progress with dilation. In these cases, therapist intervention includes communicating with or re-referring to the surgical team. For patients undergoing revision, therapists can collaborate with the patient and surgical team to develop a postoperative dilation plan and help set realistic recovery expectations.

Pelvic, vulvar, and vaginal pain

A potential long-term postoperative complication of gender-affirming vaginoplasty is pain. It is essential to understand this within the context of pain science, as not all pain indicates tissue damage in the affected area. The International Association for the Study of Pain categorizes pain into three primary types: nociceptive, neuropathic, and nociplastic. Although pain following vaginoplasty may involve components of all three types, it is particularly important to recognize n*ociplastic*, or central pain. Nociplastic pain can occur at any time, but it is tipically characterized as pain lasting longer than four months in apparent healthy tissue, with no obvious injury or pathology present. Nociplastic pain can be severe, highly irritable, and unpredictable, often with no clear relationship between the stimulus and the response. The pain experiences is disproportionate to the provocation [48].

To date, there is no definitive treatment for chronic pelvic pain; however, the safety and low side effect profile of PT interventions are well established. Long-term postoperative pain beyond the 12-week recovery phase is often assessed and treated based on studies on PFPT in cisgender women and men with pelvic pain. Chronic pelvic pain is a complex issue that benefits from a multimodal approach, as various interventions have shown effectiveness in reducing pain [49,50].

The PFPT should assess the level of touch that triggers pain, as well as changes in PFM responses to cues for contraction and relaxation, and the effect of controlled breathing. Numerous factors can influence outcomes with manual therapy interventions for chronic pain [51]. Recent high-quality studies have indicated significant clinical effects of PFPT, including manual myofascial treatment for chronic pelvic pain [52]. Although manual myofascial treatment is commonly used for patiens with chronic pelvic pain [53], it is not considered superior to other interventions for pain reduction and symptom improvements in cisgender females [54].

There are additional treatment interventions available. Electromyograph (EMG) biofeedback can help determines whether the pain is caused by stenosis or changes in contractile tissue [17,18,55]. Rehabilitative ultrasound imaging (RUSI) can assist in assessing and training relaxation of the PFM [28].

Transcutaneous electrical nerve stimulation (TENS) can be effective for managing chronic pain [56–62]. A home unit can be incorporated into the patient's home program for pelvic pain. The effectiveness of TENS is influenced by various factors, some of which are clear, while others may be more subtle [60]. The therapist can utilize tibial nerve, sacral, suprapubic, or perineal electrode placement. The mode of application for TENS may be conventional, using a frequency of 100 Hz and a pulse width of 100 μs, or acupuncture-like, with frequency under 20Hz and a pulse width range of 50–400 μs, depending on the individual's sensitivity. TENS should be considered one component of the rehabilitation program, supported by careful and continuous patient assessment [59,60].

More details about the role of pelvic floor therapy in gender-affirming vaginoplasty can be found in Table 22.4.

TABLE 22.4 Vaginoplasty complications and proposed role of therapist.

Complication	Proposed role of therapist
Healing	
Minor wound healing issues Tissue necrosis	Monitor, assist with autolytic debridement, warm moist towel, and gentle cleaning. Pelvic floor exercises, assuring coordination with breathing, and adequate rest periods. Limit gravity-dependent positions and sheering forces, like sitting. Change position hourly. Encourage good nutrition.
Clitoral necrosis	As before, and discourage early manual masturbation. Vibrator or remote (mons pubis) stimulation ok.
Granulation tissue	Monitor, avoid early tissue stresses, such as increasing dilator size too quickly. Avoid end range hip abduction positions. Limit time in sitting. Nutrition screening. Consider the pH and osmolality of lubricant, and douching solution.
Infection	Monitor and educate on hygiene and dilator cleaning. Support douching. pH of lubrication: Guidance toward pH of 4.0–6.0.
Urinary	
Spraying urinary stream Urethral or meatus stenosis	Narrowing of the urethral meatus could be related to swelling, stenosis, or muscle tension. Therapists examine muscle or fascial, connective tissue component related to narrowing of urethral meatus. Connective tissue components might need surgical revision. therapists *cannot* determine urethral stenosis from scar or muscle origin. Teach PFM relaxation, with tactile, visual, and verbal cues, RUSI, or EMG biofeedback.
Urinary tract infection	Monitor symptoms and support compliance fluid intake and hygiene.
Urinary incontinence Urethroneovaginal fistula Urethral injury	Determine type of UI, urge, stress, mixed, insensate, postvoid, or functional. Treat with appropriate measures, including pelvic floor exercise training with proper time parameters and need of facilitation, regional hip and abdominal muscle training, PFM stretches, timed voiding, tibial nerve stimulation (TTNS) or sacral nerve stimulation (SNS), and manual therapy. Monitor vaginal discharge versus insensate leakage.

TABLE 22.4 Vaginoplasty complications and proposed role of therapist.—cont'd

Complication	Proposed role of therapist
Urinary retention	Toileting strategies for relaxing PFM, specific breathing strategies, to relax PMF, Credé maneuver. EMG biofeedback, RUSI. TTNS for urinary retention, SNS.
Rectal and bowel	
Rectal injury Recto neovaginal fistula	Monitor discharge versus insensate fecal leakage. Assure dilation is not placing tension on postvaginal wall. Postrecovery from surgery assist with BM. Toileting strategies: Using toileting stool to keep knees elevated above hip, vaginal splinting or splinting on anococcygeal ligament.
Canal	
Neovaginal stenosis	Monitor, train for techniques to make dilation easier. Positioning, breathing, EMG relaxation training. Appropriate dilator size including smaller diameter dilators such as Syracuse medical X-small (1/2 in, 13 mm), X-Small Plus (11/16 in, 18 mm), and/or an expanding dilator, such as the Milli Vaginal Dilator (™) by Milli or the absolute ™, or the discovery™, by Odile. Additional motions with dilator, out and in, very small twist, Kegel around the dilator, sustained stretch of puborectalis muscle. It is not advised to combine these four modifications, nor to squeeze the PFM while placing the dilator. Attempt to determine muscle, or noncontractile (passive) components through exam. Examine muscle contractile components (EMG biofeedback), ability to change position, visual, palpation or RTUS, versus scar tissue (keloid or hypertrophic scaring) circumferentially.
Introital stenosis	Expanding dilator, i.e., Mill or Odile absolute or resolve.
Inadequate vaginal depth	OhNut for dilator use, and with vaginal receptive intercourse.
Neovaginal prolapse	Assure relaxation of PFM with removal of dilator. Assure patient that width gains can be made once vaginal lining is fully adhered to surrounding tissue.
Sensory	
Pelvic and/or genital pain	Appropriate dilators, pain neuroscience education, graded motor imagery, desensitization, self-manual therapy, TENS, TTNS EMG biofeedback.
Dyspareunia	
Loss of clitoral sensation	Graded imagery linking erogenous and tactile stimulation to clitoris to other sensations. TENS suprapubic or perineal (blood flow to area).
Clitoral hypersensitivity	Desensitization, TENS even TTNS. similar to pain, hypersensitivity can be an unpleasant sensory experience.

Compiled from coursework created by Sandra Gallagher PT, DPT and Caitlin Smigelski PT, DPT.

Conclusions

Pelvic floor physical therapy (PFPT) plays an important role in the treatment of various pelvic health conditions. Examples of conditions addressed through PFPT include SUI, UUI, urinary hesitancy, constipation, fecal incontinence, and pain in the lumbar, hip, and pelvic regions. PFPT aims to enhance lumbopelvic and genital pain management, as well as improve urinary, defecatory, and sexual function. A key objective of PFPT is to increase awareness of PFM contraction and relaxation.

PFPT should be an integral part of the care for individuals undergoing gender-affirming vaginoplasty. PFPT treatment includes education about the PFM and related symptoms, behavioral modifications, and exercises designed to promote both PFM contraction and relaxation. Additionally, dual-channel surface electromyography (s-EMG) can be utilized with perianal, intravaginal, or intraanal electrode sensors to measure PFM activation, isolation, and relaxation. RUSI can also be used for muscle training. TENS, utilizing surface electrodes, serves as a form of neuromodulation for various conditions, including urinary urgency, hesitancy, fecal urgency, constipation, and (post-surgical) pain. Electrode placement for neuromodulation can be on the tibial nerve, or in the sacral, suprapubic r, or perineal region. Additionally, regional- and vaginal-specific soft tissue manipulation and myofascial release are frequently utilized in physical therapy treatments.

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CHAPTER

23

Individually customizable procedures for patients Assigned Male at Birth (AMAB)

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Introduction

Transgender and gender diverse patients with male genitalia (i.e., penis, scrotum, and/or testicles) may desire genital configurations that do not match the most common configurations of binary genitals. "Individually customized" procedures (ICPs) may include retention of the natal phallus when creating a vagina and/or vulva, complete removal of internal and external genitalia (gender nullification surgery, or "nullification"), or creation of a vulvoplasty without vaginal cavity (previously called "zero-depth neovagina") as described in Chapter 15.

These procedures have very little description in the literature. A systematic review performed at the onset of writing this chapter, using combinations of the terms "penectomy, penis preserving vaginoplasty, vagina preserving phalloplasty, nullification, transgender, nonbinary" and a host of other terms, produced very few references. To date, with exception of a very limited subset of orchiectomy—scrotectomy variations and one case report discussing a penectomy after self-induced chemical burn [1], none of the ICPs have been described in the literature. Further, relevant self-reported patient gender identities for patients desiring ICP, such as altersex, Salmacian, agonadal/agenital, and others have not been described in

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00023-6

the literature. Herein, we describe ICP used by author T.S. for patients with a penis, scrotum, and testicles.

All patients featured in this chapter provided written consent to be included, and the use of patient content in this chapter was approved by our Institutional Review Board.

General preoperative clinical counseling

Patient population and gender identities

Patients may experience gender dysphoria due to the presence or the absence of specific primary and secondary sex characteristics at different sites in a pattern that does not match gender binaries. For example, patients may experience dysphoria at the lack of a vaginal canal or vulva but may not experience dysphoria at the presence of a phallus. Gender-affirming surgery for these patients may therefore require individual customization for the removal or creation of specific features while retaining other natal features.

Individuals pursuing these ICPs may identify within or outside of the gender-binary, and others may not identify as TGD at all. In addition to transfeminine and nonbinary individuals, as outlined in Table 23.1, there are additional groups not well documented in the literature who may desire ICPs. At present, patients in private online forums indicate hesitation to share these terms with their surgeons for fear of discrimination or denial of care. When eliciting patient goals, surgeons and surgical teams should remain open during patient interviews to learning community terminology, which may create a greater sense of trust with patients who may not have space to accurately describe their gender, sex, or sexual identities in daily life.

TABLE 23.1 Potential identities of patients seeking ICP.

Identity	Definition
Aphrodisian, Bigenital, Bisex, and Salmacian [2–4]	Desiring mixed genitals, may identify as a binary or nonbinary gender
Sinealt [5]	Transgender individuals who only desire a partial medical transition
Altersex [6]	Umbrella term for individuals who desire mixed primary and secondary sex characteristics
Agenital/agonadal [7]	Desiring no genitals or sexual characteristics
Agender	Individuals who do not consider themselves to have a gender, sometimes falls under the nonbinary umbrella
Eunuch	Cisgender men who desire castration via orchiectomy or total nullification

WPATH Standards of Care

While ICP specific counseling considerations are offered in the following, providers should operate within the most up to date WPATH guidelines when discussing potential surgical options, which at the time of publication are the Standards of Care 8 (SOC8) [8]. This includes counseling of benefits, risks, and potential complications of each relevant surgical option; determining adequate travel and accommodation availability, social support, and discussing adequate preoperative preparation (i.e., biobanking of genetic material, electrolysis); arranging for supportive aftercare and postoperative needs, including activity restriction, dilation and douching when appropriate, resumption of any paused medications, sexual abstinence during recovery period, and having trusted individuals present for emotional and physical support through the postoperative period. Finally, a frank discussion is held regarding realistic expectations and outcomes, to ensure the patient understands that these procedures are nonreversible and, as discussed in the following, to set surgical goals in line with the patient's unique needs.

While WPATH SOC8 no longer requires letters of support from a mental health professional, it still recommends surgeons ensure evidence of a "multidisciplinary approach" (including mental health professionals) in the decision-making process. In this vein, the authors recommend surgeons confirm that the patient has support from their primary care provider, and endocrinologists and/or other subspecialty physician(s) when relevant, to ensure that the patient is medically optimized for surgery. In our practice, this is done by a single letter of support from a mental health professional, in addition to direct communication between our surgical staff and the respective mental health professional. Some insurance providers require two letters of support from mental health professionals; in these cases, a second letter is requested. To proceed with surgery, the operative plan must receive support from the mental health professional, who must also be immediately available perioperatively to manage any psychosocial issues that may arise.

Patients may present with different levels of ICP knowledge and personal goals. Some patients immediately discuss a clear idea of their desired genital configuration, while others may be seeking information about what configurations are surgically and technically feasible to achieve. Patient goals and desires as outlined in Table 23.2 should be elicited so surgeons may appropriately counsel on the possibilities and limitations of individual customizable procedures as outlined throughout this chapter.

Scrotectomy and/or orchiectomy

Introduction

Patients may pursue orchiectomy and scrotectomy either alone or in combination as either a step in their surgical affirmation process or as their sole surgical genital affirmation procedure. First, we discuss the overall clinical counseling points for each individual procedure. Then we discuss the surgical process and additional clinical considerations for each combination of procedures, (1) scrotectomy with orchiectomy, (2) scrotectomy without orchiectomy, and (3) orchiectomy without scrotectomy.

TABLE 23.2 Potential patient desires and surgical goals to discuss with patients.

Category	Potential patient desires or goals
Visual desires	Presence or absence of the following: - Phallus - Testicles - Scrotum - Vaginal canal - Labia majora and minora - Clitoris - Clitoral hood - Any external genitalia
Sexual practices and erogenous sensation desires	- Ability to penetrate someone else - Ability to be penetrated by someone else - Ability for clitoral stimulation - No desire for erogenous sensation and/or penetration
Urination desires	- Urination through penis - Standing micturition - Seated micturition - Urinary diversion
Hormone profile	- Retain native hormone profile (testosterone dominant, assuming patient is not intersex) - Ability to stop using antiandrogens (i.e., spironolactone, cypionate)
Potential future surgeries	- Potentially desires future vaginoplasty

Clinical counselling for orchiectomy

Patients may opt for orchiectomy under many circumstances. Some may consider orchiectomy if they would no longer like to take testosterone blockers (i.e., spironolactone, finasteride, and cyproterone). Other patients may desire orchiectomy due to gender dysphoria at the presence of testicles.

Regardless of circumstance, patients should be counseled on the hormonal effects of orchiectomy. Preliminary evidence suggests that some individuals may decrease their estrogen dose while others may maintain the same dosage [9]. Current recommendations from the University of California, San Francisco, suggest that patients will need to continue with at least minimum dose hormone therapy use until at least 50 years to reduce risk of osteoporosis [10]. All patients receiving an orchiectomy should be counseled to suspend any antiandrogen medications (i.e., spironolactone or cyproterone) immediately after surgery as the patient will have an immediate change to their hormonal milieu. They should, however, continue estradiol use and should subsequently closely follow with their endocrinologist for hormonal medication adjustment.

In alignment with WPATH SOC8 [8], patients considering orchiectomy should be counseled on the loss of reproductive capacity associated with orchiectomy and, if the patient has a desire for biological offspring, offered options for storage of genetic material. Notably, if the patient is currently taking gender-affirming hormones, they may need to suspend use to ensure adequate genetic material biobanking, which may induce dysphoria. Measures should be taking to support patients experiencing any dysphoria in this time period.

Sexual function should also be discussed. There are no published studies exploring ejaculate quality or volume in transgender women or nonbinary people after orchiectomy, though some literature of cisgender men after radical orchiectomy for cancer treatment describes change in ejaculate quality after surgical or chemical castration [11]. While the prostate and seminal vesicles remain intact in gender-affirming procedures and ejaculate volume is still produced [12], the possibility of changes in ejaculate quality and volume should be discussed with individuals who are interested in retaining ejaculation ability.

Clinical counseling for scrotectomy

Patients may desire scrotectomy if they experience dysphoria related to their scrotum. Patients who are considering vaginoplasty in the future should be counseled on their need to pursue an alternative approach to penile inversion vaginoplasty and possible skin graft as typically scrotal flaps and/or scrotal skin grafts are used to create the labia and line the vaginal canal. Patients should be counseled that scrotectomy can be performed with or without orchiectomy, as some patients may desire preservation of the testicles for fertility, hormone, or other reasons.

Similarly, isolated orchiectomy without scrotectomy may be sought by patients who do not wish to have reproductive capacity or may no longer want to take testosterone blockers. However, these patients may not experience dysphoria at the presence of a scrotum or may want to retain maximal scrotal skin for the possibility of a future vaginoplasty.

Orchiectomy, with or without scrotal preservation

Orchiectomy can be performed through a scrotal approach or an inguinal approach. The former is more common in an oncologic setting, and the latter is more common in a gender affirmation context. Scrotal incisions allow for fewer surgical sites, but the scrotal incisions should be carefully positioned to not interfere with potential scrotal flap use in the event that the patient subsequently desires vaginoplasty. Inguinal incisions allow for a minimally invasive approach but carry risk of injury to the ilioinguinal nerve.

Technique—Orchiectomy with scrotal preservation

The patient is prepped and positioned to lie supine. A 2–4 cm vertical midline incision is made over the scrotal septum through the dartos. The dissection is then carried out laterally through the cremaster and tunica of each testicle. Once the spermatic cord is visualized, the genital branch of the genitofemoral nerve is identified and divided as proximally as possible, using the surgeon's preferred technique to avoid neuroma formation. The cord is then suture-ligated as close as possible to the external inguinal ring to eliminate possible palpable residual tissue. The spermatic cord and testicle are excised and delivered, and the surgical site is closed in layers.

Technique—Orchiectomy with scrotectomy

An incision is designed circumferentially around the base of the scrotum, at its junction with the medial thigh, base of the penis, and perineum. The bilateral orchiectomy is performed from a lateral approach, in similar fashion to orchiectomy without scrotectomy. After delivery of the testicle and spermatic cord, the scrotum is excised and the laxity of the surrounding tissues is examined. In some cases, primary closure can then be achieved. If undue tension at the midline or the base of the penis is present, fasciocutaneous flaps or regional pedicled flaps (e.g., descending perineal artery flaps) are then raised if needed, and the site is then closed, yielding an isolated penile base with an otherwise flat perineum (Fig. 23.1). A Penrose or other surgical drain may be used if the undermined area is large.

Scrotectomy with testicular preservation

Patients desiring scrotectomy without orchiectomy are typically dissatisfied with the appearance of a scrotum. These patients may not derive any dysphoria from their penis or from ejaculate or may not desire vaginoplasty due to concerns of complications. However, these patients may desire the ability to retain their reproductive capacity for the potential for future biological children and/or may be comfortable with their endogenous hormone

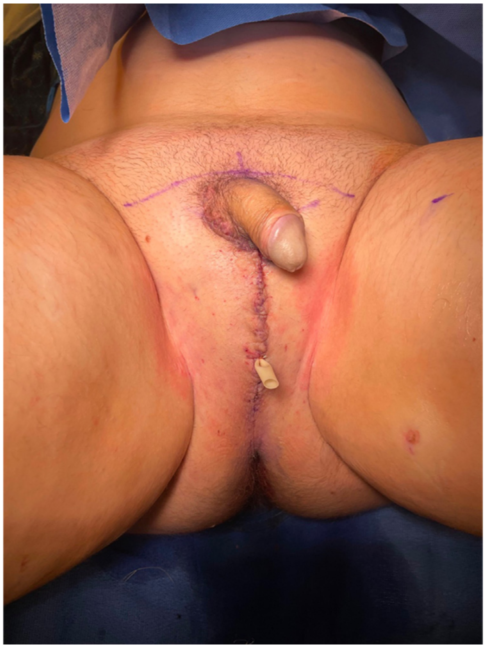

FIGURE 23.1 **On-table postoperative appearance after orchiectomy with scrotectomy.** Immediate postoperative appearance of orchiectomy with scrotectomy, with preservation of the phallus, showing adequate advancement of flaps and zero-tension midline closure. *From Align Surgical Associates, San Francisco, CA.*

profile. This procedure produces the appearance of a penile shaft emerging from an otherwise flat perineum.

Technique

An incision is made between the medial thigh and the scrotum. A dissection is carried out through the layers of the scrotum to the testicle, and the dissection is carried out from distal to the most proximal extent of the scrotum. The testicles are freed from the overlying scrotum and the scrotum is resected from the surrounding penile base and perineum. The size of the defect, the laxity of surrounding tissues, and potential sites for testicular banking are then examined. If primary closure with undermining is feasible and can be performed with concurrent testicular banking, this is performed. If not, local or regional fasciocutaneous flaps are designed bilaterally for perineal coverage and to allow for testicular banking. A multitude of available fasciocutaneous flaps exist, such as deep pudendal artery-based rotation flaps; muscle or myocutaneous flaps are not recommended due to their bulk and donor site morbidity.

Pearls and pitfalls

Some patients may wish to stage orchiectomy/scrotectomy and subsequent genital procedures. This allows time for the patient's hormonal milieu to settle, as antiandrogens will be held and exogenous estrogens may need to be adjusted. However, this staging time may lead to scrotal contraction, which may limit tissues available for subsequent neolabial creation or scrotal skin graft use for vaginoplasty. Patients should be counseled that staged orchiectomy—scrotectomy prior to additional genital surgery may limit their future options.

Primary closure of scrotectomy defects is often possible with fasciocutaneous flap undermining, but this may limit future use of regional pedicled flaps and may cause medial thigh crease obliteration. A wide number of local and regional flaps are available in the perineum, and in this nononcologic surgery, flap choice is entirely guided by the laxity of surrounding tissues and the atypically small defect size. Smaller bilateral flaps are preferred to a unilateral flap, as bilateral flaps ensure symmetry, allow for finer control of tension and insetting, and allow recreation of a surgical midline raphe.

Obesity is a likely risk that increases technical challenge and wound healing complications. In addition, the increased testicle temperature may lead to increased cancer risk over time; while no literature exists, patients should be counseled to continue modified testicular exams and to follow with their primary care physician.

Phallus-preserving vaginoplasty

Introduction

Some patients experience dysphoria at the absence of a vaginal canal or the inability to have receptive nonanal penetrative intercourse, but they have no dysphoria at the presence of a phallus or desire to also perform penetrative intercourse. These patients would likely not seek penectomy as a part of vaginoplasty. For these patients, phallus-preserving vaginoplasty (PPV) may be offered. PPV offers preservation of the phallus, prepuce if present, and glans, while creating a vaginal canal inferior to the base of the penis. This may be combined with scrotectomy, orchiectomy, and/or labiaplasty.

Clinical counselling for PPV

The unique nature of PPV as compared with vaginoplasty presents challenges with skin grafting and potential testicle banking. Because PPV does not invert the phallus or use phallic skin for the neovaginal lining, patients must be counseled that they will require additional skin grafting sites, which inherently have donor site morbidity. Patients should also be counseled that in some patients, groin-based skin grafts and thigh-based testicle banking may be mutually exclusive. The impact of prolonged testicle banking on fertility and oncologic risk is unknown.

The impact of PPV on sexual function is not reported in the literature. Patients report that they are able to achieve erection and engage in active penetrative and receptive neovaginal intercourse after PPV. The impact of PPV on ejaculation, fertility, potential erectile dysfunction, and other measures of sexual and reproductive health are unknown. Surgeons should disclose this lack of current literature to patients during the preoperative consultation. Patients should continue to have prostate cancer screenings as appropriate.

Phallus-preserving vaginoplasty

Technique—PPV and variations

Prior to surgery, a suitable full-thickness skin graft donor site must be identified and may be depilated preoperatively. Approximately 200–300 cm^2 will be necessary; our practice is to harvest skin from bilateral inguinal creases, if orchiectomy is performed; or a mini-abdominoplasty, if more tissue is needed or if the testicles are preserved and banked. Peritoneal tissue can also be utilized as vaginal lining, either as a graft or a pull-through flap. Obtaining peritoneum will require a surgeon who has expertise in laparoscopic or robotic harvesting techniques.

The patient is prepped and draped in lithotomy position, using a Foley catheter and rectal dilator for tactile landmarks. A cruciate incision is made at the inferior scrotum and perineum overlying the central tendon (a), and dissection is carried out to the base of the urethra. The testicles are dissected proximally. If orchiectomy is desired, a high-ligation orchiectomy is carried out at this time (b); if not, the testicles may be immediately banked in the medial thigh or may be wrapped in moist gauze for eventual inset in the neolabia.

The neovaginal canal dissection is performed similarly as to standard vaginoplasty. The central tendon is divided and dissection is carried out through the perineal body, to the prerectal space. The canal is then bluntly dissected to the level of the peritoneal reflection, or approximately 14–15 cm. However, in dissection for PPV, exceptional care must be taken not to resect the bulbospongiosus muscle, as overresection leads to erectile dysfunction and urine dribbling through the retained phallus.

Full-thickness skin grafts are harvested from the previously determined area, such as unilateral or bilateral groin creases (Fig. 23.2a). The skin graft is defatted, depilated if not done preoperatively, and sutured on a neovaginal dilator. The graft is inverted and placed, sutured

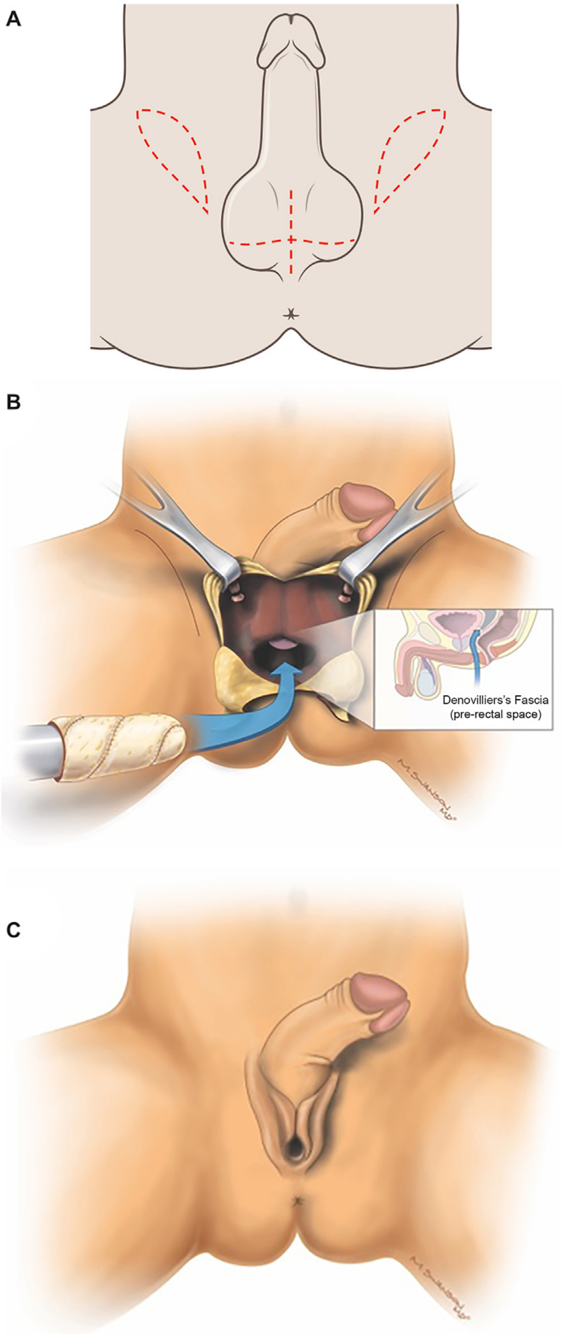

FIGURE 23.2 (a) View of the perineum after orchiectomy and neovaginal dissection, with a dilator in the neovagina. (b) View of the perineum as previous, with skin graft donor sites drawn in the groin creases. (c) View of the perineum as previous, with the skin grafts sewn inverted to the vaginal dilator and the donor sites partially closed. *(b) and (c) Illustrated by M. Swanson, MD, and used with permission.*

to the perineum, and then bolstered in standard fashion (Fig. 23.2b). The medial scrotal edges are then sutured to the neovaginal opening.

Urinary diversion may be carried out, if desired, and may be performed by several techniques. The senior author's preference is to incise the bulb of the urethra and spatulate the urethra at the level of the perineum.

Lastly, labiaplasty is then carried out, if desired. The midline perineal incision is extended superiorly toward the base of the penis, and residual scrotum is undermined to facilitate reshaping. If the testicles were preserved and not banked in the thigh, they are repositioned to the neolabia majora. The elevated scrotal tissue is then folded to form anteriorly projected neolabia majora and minora. The neolabia are secured and defined with horizontal mattress sutures passed transcutaneously, and the sulci are defined with additional sutures passed from the skin to the perineal body for anchorage (c). The neolabia may be created in the index procedure, or patients may undergo staged neolabial reconstruction or secondary revision to improve vulvar architecture, if desired (Figs. 23.3 and 23.4).

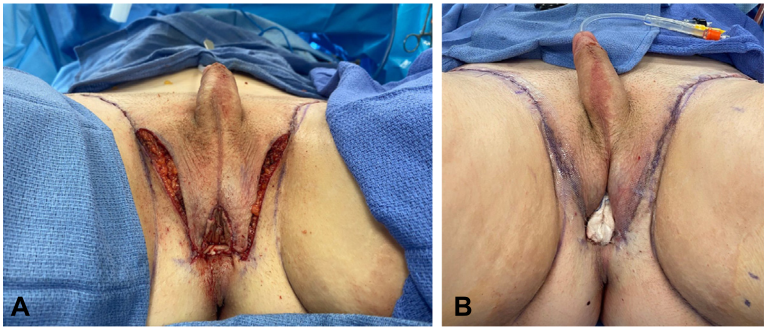

FIGURE 23.3 **Phallus-preserving vaginoplasty—technique (intraoperative).** (a) Completion of groin skin graft harvest and neovaginal construction. (b) Result after closure with neovaginal packing. *(a,b) From Align Surgical Associates, San Francisco, CA.*

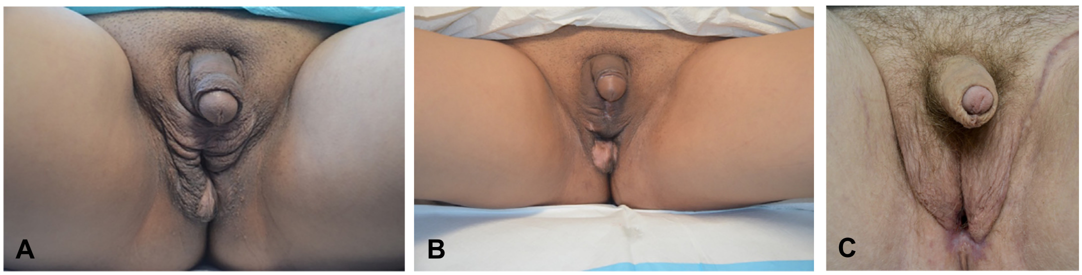

FIGURE 23.4 **Phallus-preserving vaginoplasty—postoperative results.** Postoperative results of phallus-preserving vaginoplasty postoperatively (a) and at 1-year follow-up (b). A separate patient who underwent phallus-preserving vaginoplasty (c). *(a–c) From Align Surgical Associates, San Francisco, CA.*

Pearls and pitfalls

PPV has unique technical concerns. While PIV is able to use inverted phallus and prepuce with scrotal skin grafts for vaginal lining [13,14], PPV inherently requires larger areas of full-thickness skin grafting from other sites, with a 15 cm long by 3.5 cm diameter canal requiring 175 cm^2 of grafting. Anatomic variability and testicular banking may limit potential donor sites. Intestinal vaginoplasty techniques may be used to obviate skin grafting, but come with additional morbidity [15], while peritoneal flaps can also provide self-lubricating neovaginal lining, but still require grafting and are also associated with surgical morbidity [16].

Patients undergoing PPV often desire to continue urinating through the phallus and/or to perform penetrative intercourse. During PIV, the bulbospongiosus muscle may be resected but should be preserved in PPV as the bulbospongiosus contributes to urinary control, ejaculatory function, and penile erection. While engorgement of the preserved erectile tissue may theoretically impinge on the neovagina, patients who have undergone PPV with the senior author report that this engorgement does not limit active neovaginal penetration while aroused.

Scrotoplasty or labiaplasty are variable in PPV. Patients may desire a genital configuration that maximally approaches natal vulva, while others may prefer a bifid scrotum with vaginal canal. Principles of adjacent tissue rearrangement can be used to create and define neolabia, or to separate and lateralize the scrotum while still allowing for surgical access for vaginoplasty.

Penectomy and nullification

Introduction

Historically, isolated penectomy has been used to treat penile cancer, with the type of resection guided by oncologic circumstance. In contrast, penectomies for gender affirmation typically completely remove all tissue associated with the phallus, including the corpora to the level of the symphysis pubis, the urethra pars pendulans, and typically the glans and dorsal neurovascular bundle. Some patients may experience dysphoria at the sensation of engorgement of the crura and bulb, and therefore desire total resection of all erectile tissue (e.g., radical penectomy), while others may seek subcutaneous preservation of the glans.

Patients who seek isolated penectomies typically experience dysphoria from the presence of a glans or phallus, but they may not experience dysphoria from the lack of a vulva or vaginal canal or the presence of testicles and scrotum. They may be comfortable with their endogenous hormone profile or the appearance of their scrotum, or they may aim to retain reproductive capacity. Some patients undergoing penectomy may seek to eliminate the phallus while preserving erogenous tissue.

Patients who seek nullification may experience severe dysphoria in relation to the presence of any genitals. Others may experience dysphoria related to erogenous sensation or erectile tissue and may seek complete denervation and extirpation, while others may desire the achievement of a flat perineum with preserved erogenous sensation. Patients undergoing nullification may identify as agender, agonadal, or eunuch. Qualitative research on nullification patients who specifically identify as eunuch indicates a desire for a flat smooth perineum, aligning their body with their identity, reducing sexual desire, and eliminating ability to engage in sexual activity [17]. However, individuals seeking nullification who hold other identities may have different priorities.

Clinical counseling for penectomy and nullification

Patients undergoing penectomy should be informed of significant limits on any further genital surgery, as in penectomy, the skin of the penis is no longer available for inversion should vaginoplasty be desired, and the dorsal neurovascular bundle is and glans are typically sacrificed, limiting the creation of a neoclitoris or other erogenous site. Patients should also be counseled about the loss of sexual function associated with penectomy, including inability to perform penetrative intercourse, and loss of standing micturition.

Patients seeking penectomy with preservation of the glans, and patients seeking radical resection of the corpora to the level of the bulb and crura, should be informed that there is no existing literature on these techniques, no data on long-term outcomes regarding residual erectile tissue for radical resection, on erogenous sensation for glans preservation, or for urinary function.

Patients undergoing nullification should receive similar counseling to penectomy, with the addition that no reproductive potential will remain. Extensive, nonjudgemental discussions should be had with patients to understand the reason for pursuing nullification as compared to other genital gender affirming procedures. Surgeons should describe the substantial impact of nullification on the ability to pursue any possible future genital surgeries, sexual function, and micturition. In addition, surgeons should explain that there is no literature on long-term clinical or patient-reported outcomes in nullification, and that lifelong hormone supplementation will be necessary.

Penectomy without orchiectomy/scrotectomy

Technique—Isolated penectomy

A urinary catheter is inserted for landmark preservation, and the patient is prepped and draped in lithotomy position. An elliptical incision is made at the base of the penis through skin. The fundiform and suspensory ligaments are divided, and the penis is distracted anteriorly. Electrocautery is used to dissect to the level of the corpora, and the corpora are dissected proximally into the adjacent subcutaneous fat. The urethra is dissected free of the corpora cavernosa and bulbospongiosus. A Satinsky clamp is applied across the shaft deep to the level of the skin, and the shaft is amputated with electrocautery. The dorsal neurovascular bundle is suture-ligated and #0 silk pursestring sutures are used to close the corporal stumps. If a perineal urethrostomy is not desired, then the remaining urethra is spatulated, the surrounding subcutaneous tissues are undermined and closed vertically, and the urethra is inset superior to the scrotum. If a perineal urethrostomy is desired, then it may be performed at this time. A Foley catheter is left in place for 7–9 days.

Technique—Penectomy variants

To perform a penectomy with glans preservation, an initial incision is made at the coronal sulcus and at the base of the penis. The skin and prepuce are discarded, and penile disassembly is performed, preserving the glans on its neurovascular pedicle. The remainder of the corporal resection and urethral reconstruction is carried out. Depending on patient preference, the glans may then be deepithelialized and buried under the pubic skin, may be inset in the defect without deepithelialization leaving an isolated glans emerging from the site, or may be trimmed and fashioned into a neoclitoris.

Nullification

Technique—Nullification

Nullification may be performed as a combination of any variation of scrotectomy, and any variation of penectomy. When performed in this fashion, the penectomy is completed, followed by orchiectomy (if desired) and scrotectomy, with subsequent fasciocutaneous flap advancement and recontouring to ensure a smooth perineum. Scrotal fat should be preserved and advanced medially and inferiorly to help ensure a smooth convex perineum, and to maintain a smooth transition from the mons to the buttocks. If desired, during scrotectomy, a deepithelialized scrotal flap may be fashioned and used to cover the corporal stumps, or inset across the defect to aid contour. A bolster with bacitracin and petrolatum gauze may be applied. Immediate and 1 year postoperative outcomes demonstrate persistence of the desired flat perineum (Figs. 23.5 and 23.6).

Pearls and pitfalls

During penectomy, the corpora may bleed substantially. We find that the combination of clamp application, electrocautery, purse string suture ligation, and coverage with scrotal fat and a scrotal flap has consistently prevented postoperative bleeding or hematoma formation.

The pedicled glans flap is rarely described. Given the long, thin pedicle and the very short distance of inset, kinking is a concern, and fasciocutaneous flaps may need to be elevated to allow for a space to lay the pedicle. The glans can be reshaped and buried after deepithelializing to provide an erogenous zone. In general, fat should be preserved. If fat is removed, it should be done conservatively to prevent a concave deformity.

Other procedures

Some patients experience isolated dysphoria at the presence of a glans. In these patients, an isolated glansplasty or glansectomy may be performed. This can be done with an incision at the coronal sulcus, preserving the penile frenulum and prepuce if present, followed by dissection of the glans free from the underlying corpora, preservation of the urethra, and purse-string suture to achieve hemostasis. Glansectomy is described in the body modification community but not as a form of gender affirmation surgery in the medical literature.

All of the aforementioned procedures typically leave the prostate intact, as prostatectomy can result in urethral complications including stricture and incontinence [18]. Depending on the patient's hormonal status, they may still produce and/or ejaculate seminal fluid and may achieve prostate orgasm in the case of PPV, penectomy, and nullification. This may be perceived as a positive for patients with PPV, as transneovaginal stimulation of the prostate

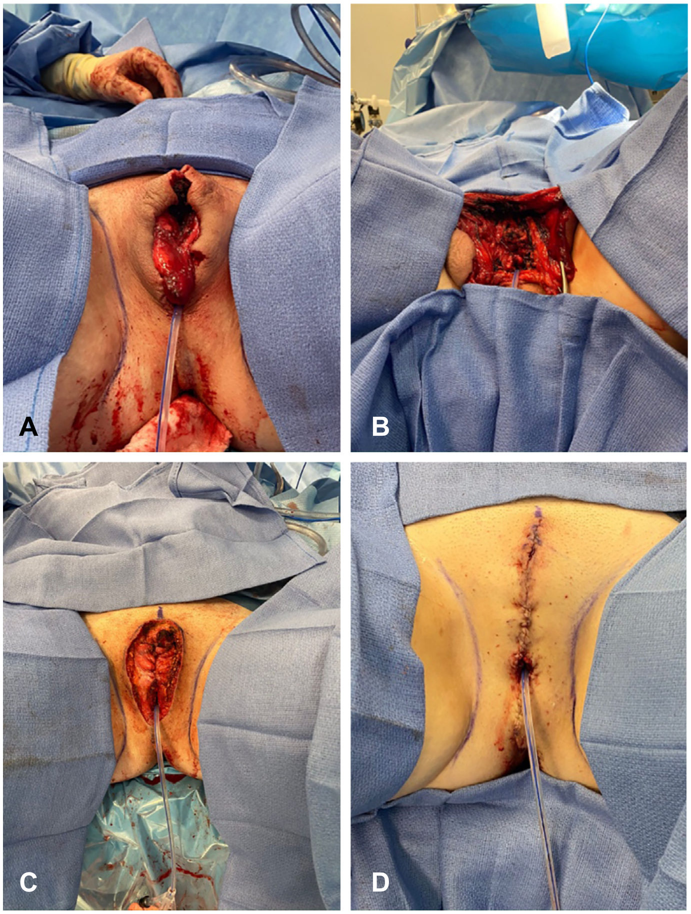

FIGURE 23.5 **Nullification—technique (intraoperative).** Completion of penectomy, orchiectomy, and partial scrotectomy with flaps overlaid (a) and flaps retracted to expose urethra (b). After inset of scrotal fat flaps and imbrication of the pelvic floor (c), fasciocutaneous flaps were elevated and closed in midline with perineal urethrostomy (d). *(a–d) From Align Surgical Associates, San Francisco, CA.*

may be result in orgasm, while in patients with dysphoria associated with erogenous sensation, this may trigger further dysphoria [19].

Some patients undergoing standard vaginoplasty techniques may desire testicular preservation. For these patients, a vaginoplasty is performed as previously described in this volume. However, high-ligation orchiectomy is not performed. The testicles may be immediately banked in the medial thigh or may instead be wrapped in moist gauze during the procedure, then inset into the neolabia majora during vulvar design. Patients may note contour defects or testicular discomfort with this approach. For patients who may be concerned about cancer risk and do not desire endogenous testosterone, orchiectomy can be performed, and testicular implants can be subsequently placed to maintain the look and feel of testes.

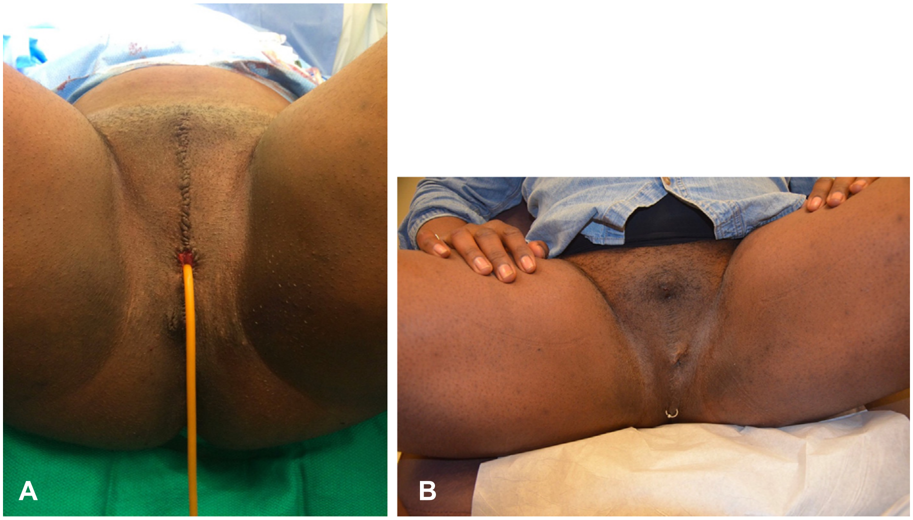

FIGURE 23.6 **Nullification—postoperative results.** (a) Immediate postoperative results. (b) 1-year follow-up results. *(a,b) From Align Surgical Associates, San Francisco, CA.*

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CHAPTER

24

Reversal surgery: Vaginoplasty after phalloplasty; phalloplasty after vaginoplasty

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Abbreviations

AFAB Assigned female at birth
ALT Anterolateral thigh
AMAB Assigned male at birth
BMI Body mass index
csHT Cross-sex hormone therapy
DSD Differences of sexual development
DSM Diagnostic and Statistical Manual
Fr French
GAS Gender-affirming surgery
GD Gender dysphoria
GNC Gender nonconforming
HCP Healthcare practitioner
IC Informed consent
MHP Mental health professional
MLD Musculocutaneous latissimus dorsi
mm Millimeter

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00024-8

RFFF Radial forearm free flap
SoC Standards of Care
WPATH World Professional Association for Transgender Health

Introduction

Gender dysphoria

Gender identity is related to deep, innate feelings of psychological identification as a female, male, or nonbinary, and it may be congruent or incongruent with the sex assigned at birth. Gender dysphoria (GD) can be defined as discomfort or distress caused by gender incongruence. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), about 1.4% of world population are estimated to have been diagnosed with gender dysphoria [1,2].

Comprehensive healthcare of individuals with GD and gender nonconforming (GNC) individuals must be multidisciplinary, based on beneficence and nonmaleficence, to ease the transition of these individuals to the gender with which they identify. The approach should include evaluation and psychotherapy provided by mental health professionals (MHPs), appropriate hormonal therapy under supervision of an endocrinologist, continuous real-life experience, and surgical treatment that may include genital and nongenital surgical procedures, as well as postoperative follow-up by a multidisciplinary team [3,4].

Gender affirmation surgeries (GAS), as the last step in an individual's gender transition, are irreversible, and therefore, the patients must consider their desired postoperative results and the surgical options available to them. The patients must undergo a detailed preoperative consultation and examination by the surgeon as well as preoperative evaluation and discussion with an MHP about the surgical options and outcomes, to prevent disappointment and regret following surgical treatment. An individualized approach should be considered for the nonbinary patients who do not always require all steps of treatment. Individuals seeking irreversible surgical procedures should have the capacity to make fully informed decisions and consent, and any significant medical or mental health issues should be documented and reasonably well controlled before the surgery is contemplated [5].

Belgrade center for treatment of people with gender dysphoria and gender incongruence consists of a multidisciplinary team (psychiatrists, psychologists, endocrinologists, urologists, gynecologists, anesthesiologists, social worker, and lawyer) that follows the patients throughout their transition and provides support to both patients and their families. The team meets once a month and discusses the patients who may require psychological, hormonal, and/or surgical treatment.

Evidence-based data suggests that gender affirmation is associated with an improved sense of well-being in most cases and indicates a correlation between satisfaction and regret [6]. The published consensus of the World Professional Association for Transgender Health (WPATH) states that hormonal and surgical gender affirmation treatment have been proven to provide rehabilitation and qualified experience for well-selected candidates [7]. Previous consensus is supported by international research related to transition outcome satisfaction in most individuals with gender dysphoria who had undergone GAS [8–11].

The regret phenomenon

The number of transgender and gender nonconforming individuals seeking GAS is rising worldwide, with a prevalence of 9%–54% in the past 5 years [12,13]. Genital GAS is somewhat less common than chest surgery, with rates of almost 25%–50% for transgender men and 5%–10% for transgender women [13]. Gender affirmation surgeries aim to alleviate the gender dysphoria and to increase the quality of life of people with gender dysphoria and gender incongruence by decreasing the level of psychological distress [14]. There are numerous studies documenting and confirming the improvement in the quality of life, body image, satisfaction, and psychological functioning of the individuals undergoing GAS [14–19]. The rate of regret among people with GD following genital surgery and the number of those who revert to their original, biologically assigned gender role and sex assigned at birth is rare [20–23]. Several studies that analyzed candidates for reversal surgery reported surgical regret incidence as less than 1% in transgender men and less than 2% in transgender women [24]. Landen et al. [20] reported the incidence for reversal surgery of 3.8% in their analyzed population. On the other side of the spectrum, Lindemalm et al. [25] found that 30% of patients in their sample regretted having undergone feminizing GAS, which is so far the highest recorded percentage of patients reporting GAS regret. Lawrence [21] found 6% of the participants in her study to be sometimes regretful, out of which only 1% reported reversion to living as a man after GAS.

Blanchard et al. [26] were the first to define postoperative regret as GD in the new gender role after GAS visible in behavior (repeated adoption of the person's previous gender role and/or application for legal change of name/gender mark and/or request for reversal GAS). The authors also found a strong positive correlation between heterosexual preference and postoperative regret, while no correlation was found between the patient's education, age at surgery, and gender assigned at birth [14,26].

Pfafflin [27] introduced two categories of regret: minor regret, related to surgical complications and social problems, and major regret ("real regret") as a feeling of GD after the performed GAS, or desire and request for surgical detransition.

Kuiper and Cohen-Kettenis [28] defined postoperative regrets primarily as a desire to totally undo GAS results, stressing the complexity of regret phenomena since it included: regret statements (verbal expression) and overt behavior (not necessarily concordant). Moreover, these authors presented a subtle categorization of regret as follows: clear regret, regret uncertain, regret, and regret assumed by others. Particular attention should be paid in identifying and recognizing the prevalence and factors associated with regret and, even more importantly, regret followed by a reversal request [14].

This chapter aims to share clinical experience related to patients with gender dysphoria experiencing regret, i.e., who had undergone GAS and expressed a reversal request and to show the surgical approaches that can be used in reversal surgeries.

The intention of this chapter is not to pathologize the topic but to point out the need for comprehensive assessment, support, and treatment of persons with gender dysphoria and gender incongruence to improve their complete healthcare. An individual approach is of critical importance to achieve the goals related to the quality of life and well-being, which, in turn, prevents regrets and reversal requests.

Preoperative evaluation of patients with reversal requests—General points

According to the last version of WPATH SOC for surgical treatment, a recommendation letter from a healthcare professional with competencies in the assessment of transgender and gender diverse people is required, with a minimum of 6 months of hormonal therapy, except if the hormonal therapy is not clinically indicated for the patient or not desired by the patient [7]. While examining their gender identity and contemplating transition choices, some transgender adults may take into account a variety of identities and aspects of gender presentation. As such, individuals may adopt a gender identity or presentation for a while before finding it uncomfortable, at which point they may modify it or return to a previous identity or presentation [7,29]. According to the latest WPATH SOC version, this process of identity discovery should not always be associated with regret, uncertainty, or poor decision-making, but irreversible gender-affirming treatments should be avoided until clarity about long-term goals and outcomes is achieved [7].

All patients demanding reversal surgery should be required to be assessed by a multidisciplinary team; this includes MHP evaluation with a recommendation letter for the new cycle of hormonal therapy (if needed and desired) and new gender affirmation surgery. As reported by Coleman et al., "the multidisciplinary team is encouraged to thoroughly understand the motivations for the original treatment and for the decision to detransition. Any concerns with the previous physical changes should be carefully explored and a significant effort made to ensure similar concerns are not replicated by the reversal [7]." Hormonal therapy should be conducted under endocrinologist supervision, and the individuals should be supported to go through a social transition. Also, thorough consultation with the surgeon is needed to explore the patient's wishes and expectations, to provide information about the surgical approach, limitations of the surgical procedure, possible complications, and potential risks related to the planned GAS.

It is of utmost importance that people who detransition (socially, hormonally, and/or surgically) are supported both by healthcare providers from the multidisciplinary team and by their family member and peers, so they can feel secure during the detransition process.

Our center's preoperative evaluation of patients seeking reversal GAS

Regretting patients assigned male at birth (AMAB) that approached our Center asking for reversal GAS before the eighth version of SOC WPATH was available were requested to provide two recommendation letters from their MHPs, and they were additionally evaluated by the mental health professionals from our team. Other patients (AMAB and AFAB-assigned female at birth) provided one recommendation letter according to the latest version of WPATH SOC and were evaluated additionally by MHPs from our Center (Table 24.1).

This evaluation included the use of standardized questionnaires: semistructured clinical interview, the Gender Identity Questionnaire, Mini-International Neuropsychiatric Interview (M.I.N.I.), Structured Clinical Interview (SCID-II), and Utrecht scale for gender dysphoria [30–33]. In addition, all patients had a consultation with the surgeon regarding preoperative

TABLE 24.1 Requirements for reversal masculinizing/feminizing gender affirmation surgery.

SOC WPATH	Belgrade center
One recommendation letter from HCP	One detailed recommendation letter from treating HCP + additional evaluation from the MHP of our team[a]
Preoperative hormonal therapy 6 months	Preoperative hormonal therapy 12 months (unless contraindicated)
Support presurgical social transition	Encourage and support presurgical social transition
Advised follow-up by multidisciplinary team	Necessary postsurgical follow-up by HCP or MHP as well as urologist/gynecologist

[a]*Before 8th version of SOC WPATH was available, all patients treated in Belgrade Center were required to provide two recommendation letters from two different MHPs.*

preparation for the new GAS, detailed presentation of the surgical approach, limitations of the surgical approach, as well as possible intraoperative and postoperative complications and course of postoperative recovery.

Semistructured clinical interview was specifically designed to obtain demographic and clinical data for each individual. This interview covered the following variables: (1) Sociodemographic details (age, nationality, race, gender, civil status, educational level, employment); (2) history of gender identity and gender role development, as well as gender dysphoria throughout the patient's life; (3) initial motivation for applying for GAS and detailed analysis of the postoperative period (including important life events, psychosocial adaptation and motivation and the decision process that led them to apply for reversal surgery); (4) clinical data (previous psychiatric evaluation and/or treatment, past and present psychiatric history); (5) detailed assessment of any important trauma during early development and later, assessment of the hormonal transition period; (6) data on family history (psychiatric heredity, family deprivation, neglect, or abuse).

The Gender Identity Questionnaire was used to retrospectively evaluate the details on gender identity development. This questionnaire has 22 items and four scales (male gender identity, female gender identity, "certainty of belonging to a gender," and transgender identity) [30].

Mini-International Neuropsychiatric Interview (M.I.N.I.) is a brief structured interview for major Axis I psychiatric disorders in DSM IV and ICD-10 [31].

Structured Clinical Interview (SCID-II) was used to assess personality disorders for DSM-IV on Axis II [32].

The Utrecht Gender Dysphoria Scale (UGDS) is a validated, 12-item instrument for the assessment of gender dysphoria used in adults and adolescents [33].

After analyzing the patients from our sample, the MHP from our team concluded that all of them had some of the factors that could contribute to their gender self-identification and consequent transition and detransition requests: dysfunctional families and somewhat traumatic events in their early childhood, such as parental psychological abuse, emotional deprivation or later sexual trauma during adolescence, loss of one parent, separation from family or confused family relations and gender roles, cross-dressing behavior related to sexual arousal, prolonged identity confusion, high level of impulsivity, depression, and suicidal ideas and/or attempts.

The initial diagnoses of gender dysphoria in the patients were reassessed based on the available data. This took into account biographical data, development of gender identity and gender role, family history, cross-dressing onset, psychosexual development, present and past psychiatric history, reasons to undergo feminizing/masculinizing GAS, as well as their expectations following GAS.

It was observed that most of the patients in this population had been suffering from different psychological symptoms and identity conflicts at the time they applied for the initial transfeminine/transmasculine GAS. For majority of patients from this sample, it could be said that they had not suffered from significant gender dysphoria associated with the desire of opposite gender role development and irreversible gender affirmation surgery. This could be one explanation of not feeling relief and improvement of quality of life after feminizing/masculinizing GAS.

Reversal surgery: Phalloplasty following vaginoplasty

Male genitalia creation in a patient experiencing regret after feminizing genitoplasty is one of the most demanding tasks for a reconstructive surgeon. There are different techniques described for phallic reconstruction in transmen, but none is ideal and none can restore the appearance and function of the real penis.

Neophallic reconstruction for patients AMAB

The most commonly used techniques for neophallic reconstruction in transmen are radial forearm free flap, anterolateral thigh flap, musculocutaneous latissimus dorsi free flap, and abdominal flap phalloplasty, as well as metoidioplasty, as a form of phalloplasty where neophallus is created out of hypertrophied clitoris [5].

Radial forearm free flap (RFFF) phalloplasty encompasses the creation of a neophallus with the urethra using a “tube within a tube” approach. The inner side of the forearm along the ulnar side is tubularized around a Foley catheter, creating the neourethral channel (pars pendulans of the urethra), while the remaining part of the flap is wrapped around, creating the neophallus. The neurovascular pedicle of this flap relies on the radial artery, cephalic vein, and cutaneous nerves that have to be dissected carefully and in adequate length to allow for anastomosis in the recipient area. In primary neophallic reconstruction in transmen, the anastomosis of neophallic blood vessels is performed as an end-to-side anastomosis between radial and femoral arteries and end-to-end anastomosis between the cephalic and saphenous veins, while the cutaneous nerves are anastomosed with ilioinguinal and dorsal clitoral nerves to provide erotic sensation. The neourethral tube is anastomosed to the lengthened fixed part of the neourethra created from labia minora and urethral plate, while the clitoris is left at the base of the neophallus [34]. The advantage of this approach is the creation of a sensitive neophallus with complete urethral lengthening during the first stage of surgery [5,34]. The disadvantages of this approach include a visible scar at the donor site, as well as smaller length and circumference of the neophallus that depend on the size of the patient's forearm. Complications following RFFF phalloplasty include general complications associated with any surgical procedure, such as bleeding, prolonged healing, and wound infection. Ghent, as a world known Center for RFFF phalloplasty, reported very low complication rate in terms of flap failure (<1%, 2/287), revision of vascular anastomosis (12%, 34/287), and about 7.3% of the patients from their series experienced some issues with neophallic skin (partial necrosis or skin slough). These authors also reported a relatively high rate of urological complications (41%, 119/287), but the majority of the urethral fistulas in their series closed spontaneously and patients were able to void while standing [35]. So far, there are no published data regarding the use of RFFF phalloplasty in the treatment of patients requesting reversal masculinizing GAS.

The anterolateral thigh (ALT) flap phalloplasty can be performed either as a free or pedicled flap phalloplasty depending on the patient's anatomy. The ALT flap relies on perforator blood vessels and branches of the femoral nerve. It is also anastomosed with the clitoral nerve, though the ALT flap is considered to be inferior in sensation compared with radial forearm flap [34]. The advantage of this flap is that microsurgical blood vessel anastomosis can be avoided, which decreases the chances for blood clotting and emergency surgery. The disadvantages include hair bearing skin, lower sensitivity, need to use a free skin graft to cover the defect at the donor area and, in patients with a thicker layer of fat tissue, a wider neophallus that can be considered an undesired cosmetic result [36]. The urethral reconstruction is usually done as staged urethroplasty, though several authors have published their modifications for tube-within-a-tube urethroplasty with various success rates [37–39]. In a review study of Morrison et al. [40], authors reported that all patients from their analyzed studies reported satisfaction with the ALT phalloplasty, despite 22% of patients reporting urethroplasty-related complications (fistula and/or stricture).

The musculocutaneous latissimus dorsi (MLD) flap phalloplasty relies on a donor site that includes skin, fat tissue, and a small portion of the latissimus dorsi muscle from the nondominant side of the body. The flap is vascularized by the thoracodorsal artery and vein. Anastomosis with the recipient blood vessels is performed as an end-to-side anastomosis between the thoracodorsal and femoral artery, while thoracodorsal and saphenous veins are joined using an end-to-end anastomosis [41,42]. This flap does not include a nerve anastomosis, as the thoracodorsal nerve is a motoric nerve with very few sensitive fibers that would not result in an adequate sensitive response. The sensation comes from the clitoris that is lengthened and fixed at the base of the neophallus. The urethra is created during the first stage of the surgery, creating the pars fixa of the neourethra using the urethral plate and the inner side of labia minora, while the pars pendulans is created using the outer flaps from labia minora and clitoral skin that are rolled and tubularized over a silicone catheter [42,43]. The advantage of this approach is the least visible scar at the donor area, as it can be hidden under the arm, the possibility to provide a larger neophallus according to the patient's wishes, and the stability of the flap as it also includes a muscle. In some cases, the insertion of an erectile device is not needed as penetration is possible even without it. The disadvantage of this flap is the need for microsurgery, inferior sensitivity compared with RFFF and ALT flap phalloplasty, and the need for an additional stage in cases where the patient wants to pursue a complete urethral reconstruction. The complications of MLD phalloplasty are similar to those of RFFF phalloplasty in terms of vascular anastomosis, partial or total necrosis, and seroma formation. In terms of urologic complications, urethral fistulas and strictures are among the most common postoperative complications, and some may require surgical repair. Bencic, Stojanovic, Bizic, and Djordjevic [42] reported mean neophallus length of 15.2 cm (ranging from 11 to 21 cm) in 160 treated transmen. The authors also reported complications in their patients treated by MLD phalloplasty that included 2 total flap necroses, 1 partial flap necrosis, and 30 patients with urethral fistula, of which 20 required surgical intervention. In addition, penile prostheses were inserted in 82 patients, of which 6 developed complications (infection/rejection/protrusion) that required removal of the penile prostheses.

Abdominal flap phalloplasty is another procedure that can be offered to the transmen who wish to have a neophallus but not that much visible donor site scar, and who wish to avoid vascular anastomosis-related complications of free flap techniques [44,45]. The flap is created from a site on the lower abdomen and relies on the epigastric blood vessels without the need for anastomosis. The mobilized flap is rolled and fixed in the pubic area. Clitoris is left at the base of the neophallus for sensation. The urethra is created using the urethral plate, anterior vaginal wall, and labia minora flaps. Bettocchi, Ralph, and Pryor [45] published their approach to abdominal flap phalloplasty with simultaneous urethral reconstruction using hairless clitoral skin and labia minora skin, with a 75% complications rate related to urethral reconstruction, wherein 65% experienced urethral strictures and 55% urethral fistulas. In cases where the patient requires an erectile device, it can be placed in a stand-alone procedure. The advantage of this approach is the localization of the donor site, as it is very close to the genital area. The disadvantages include smaller size of the neophallus in length and circumference, hair bearing skin, as well as low or no sensitivity.

Metoidioplasty represents the technique in which neophallus is created out of the hypertrophied clitoris, together with urethroplasty, scrotoplasty, and testicular prostheses implantation as a one-stage procedure. This technique can be combined with total hysterectomy with bilateral salpingo-oophorectomy and vaginectomy, as well as bilateral mastectomy [46]. Metoidioplasty is usually chosen by those individuals who do not seek an adult size neophallus with ability for penetration, but fully sensitive neophallus with the possibility of stand-up micturition. The procedure is performed with the patient in lithotomy position. In case where vaginectomy is being performed at the same time, it is achieved by colpocleisis and closure of the vaginal vault. After clitoral degloving, clitoris is maximally lengthened and straightened by dissection of clitoral ligaments and in cases where the urethral plate is short and not elastic, by division of the urethral plate. Urethral reconstruction is performed by previously described techniques for urethral reconstruction [47–49]. Scrotoplasty is performed using labia majora; silicone testicular prostheses are placed into the pockets previously created in labia majora. Some surgeons offer the VY scrotoplasty with delayed testicular prostheses implantation. In postoperative follow-up, patients are advised to use the vacuum pump for a period of at least 6 months to prevent retraction of the neophallus. Complications are mostly related to the urethra, encompassing urethral fistulas and strictures. About 80% of urethral fistulas heal spontaneously, and just some require surgical repair with urethroplasty [50]. Metoidioplasty provides the advantages of a fully sensitive neophallus, one-stage surgery, shorter healing and recovery time, and possibility of stand-up micturition in majority of cases. The disadvantages include a neophallus that is too small for penetrative sexual intercourse, as well as no visible bulking in genital area in clothes/underwear/swimsuit. Up to 24% of patients who underwent metoidioplasty as their chosen GAS decided to pursue some phalloplasty technique in the period of 1–5 years [50,51].

Belgrade experience in the treatment of regretting AMAB patients

Due to our Center's experience in genital reconstruction in various cases of patients with differences of sexual development (DSD) and gender affirmation surgeries, our choice for masculinizing surgery for patients regretting having undergone feminizing GAS and requesting restoration of male genitalia is MLD flap phalloplasty [52]. So far, ours is the only center that published primary results of reversal phalloplasty in 2016 where seven patients underwent neophallic reconstruction using the MLD method [53]. Since that time, six additional patients approached our Center pursuing a reversal masculinizing surgery. In all but one patient, MLD phalloplasty was performed, while the remaining patient underwent abdominal flap phalloplasty. In this patient, free flap phalloplasty with microvascular anastomosis was unsuitable due to concomitant health issues; the patient was happy to obtain male genitals with the ability of stand-up voiding.

Preoperative workup of patients seeking masculinizing reversal GAS in the Belgrade center

MLD phalloplasty in regretting patients requiring masculinizing surgery involves three to four separate steps. In the preoperative workup, the patients seeking masculinizing GAS are instructed on how to perform the massage of the donor site 3 months prior to the surgery to improve the elasticity of the skin. This facilitates harvesting of the flap and closure of the donor area avoiding the need of a free skin transplant [5]. The patients are also asked to make sure to keep their BMI at 25 or below and to stop smoking at least 6–12 months before the planned surgery.

Extensive medical history is taken from each patient, paying special attention to the presence of diabetes, high blood pressure, blood clotting, thrombophilia, or autoimmune diseases in the patient or close family members.

Each patient is admitted to the hospital 24 h before the surgery and Doppler sonography of the recipient blood vessels and flap blood vessels are performed. The patients are administered anticoagulant prophylaxis, as well as antibiotic IV therapy (vancomycin, metronidazole and ceftriaxone, unless any were contraindicated) and were placed in antiembolism stockings.

Surgical technique

First stage of MLD neophallic reconstruction

In the first step, the previously created neovagina is removed and the vaginal vault is closed, together with the first stage of urethral reconstruction. Urethral reconstruction uses the available hairless tissue of the vulva and one part of the anterior vaginal wall close to the urethral orifice to create the pars fixa of the neourethra, which is extended maximally in line with the availability of the patient's tissue [5,53] (Figs. 24.1 and 24.2a).

FIGURE 24.1 Appearance of the external female genitalia in a patient AMAB with regret and reversal request.

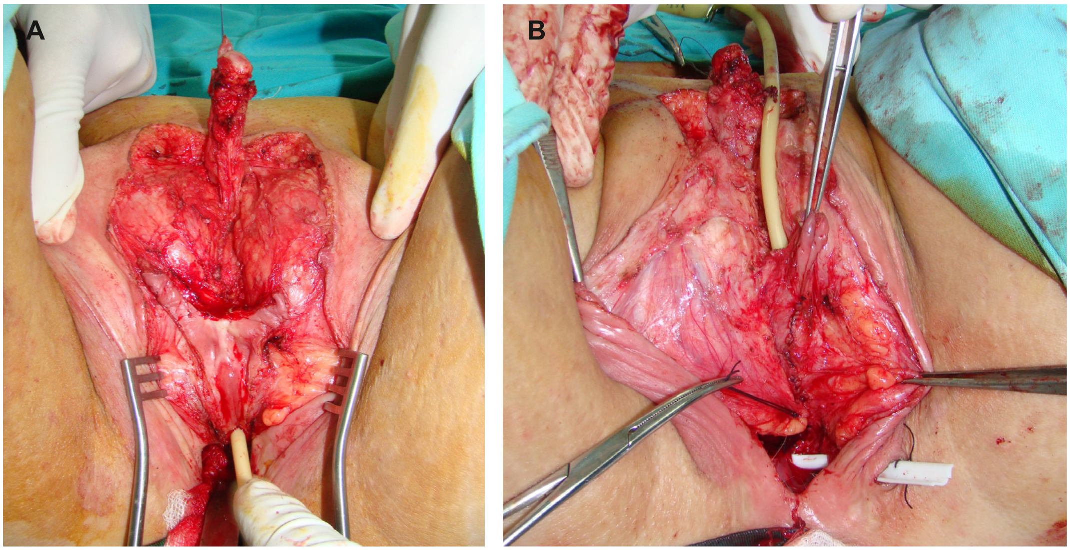

FIGURE 24.2 (a) Mobilization of the clitoris and dissection of the urethral plate. (b) First stage of urethral reconstruction. Vascularized tissue to cover the suture lines and prevent urethral fistula formation.

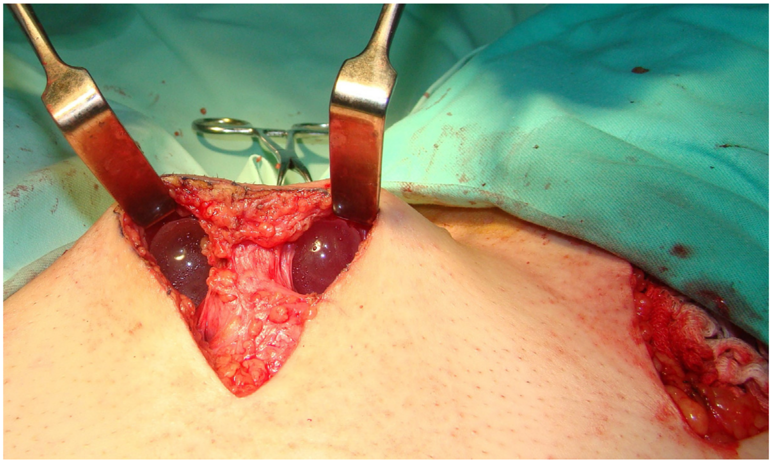

FIGURE 24.3 Insertion of bilateral testicular implants into the pockets created inside the labia majora. Blood vessels of the right leg are prepared for vascular anastomosis with blood vessels of the MLD flap.

Using the previously described technique, the neourethra can be extended to the base of the neophallus [42]. All suture lines are covered with available vascularized subcutaneous tissue to prevent fistula formation (Fig. 24.2b).

The clitoris is mobilized together with its neurovascular bundle and fixed at the ventral side of the neophallic base. Creation of the scrotum, with the implantation of bilateral silicone testicular implants, is performed using the former labia majora, while the perineum is closed so as to be male-like in appearance (Fig. 24.3).

The neophallus is created with the patient placed in lateral position to harvest the flap from their nondominant side. The harvesting begins with an incision of the skin on the anterior margin downward to the deep fascia, between the latissimus dorsi and anterior serratus muscles using sharp and blunt dissection [42,54]. The flap is divided inferiorly and medially, and then lifted to expose the flap's pedicle. When the pedicle is exposed and identified, it is dissected proximally to the axilla. The flap is completely elevated and tubularized while still attached to the axillary blood vessels [5]. When recipient blood vessels are prepared for anastomosis, the neophallus is detached after clamping the blood vessels of the pedicle and then prepared for anastomosis. The donor site is approximated and closed, either directly if the skin is elastic enough not to compromise breathing and create too much tension, or in cases where it is necessary, small free split thickness skin grafts are inserted to close the donor site region [5]. The recipient blood vessels—femoral artery and saphenous vein—are prepared for anastomosis as described earlier. The neophallus is fixed with interrupted stitches, and a subcutaneous tunnel is created to pass the vascular bundle and to perform the anastomosis (Fig. 24.4).

FIGURE 24.4 MLD flap is transposed to the genital area and fixed with interrupted stitches.

Second stage of MLD neophallic reconstruction

The second stage involves glansplasty applying the Norfolk technique together with free skin graft and urethroplasty using mucosal or skin grafts, depending on tissue availability; staged urethroplasty is performed after a break of at least 6 months between the stages [5,53].

Third stage of MLD neophallic reconstruction

In the last, third stage, an erectile device is placed according to the patient's preference (semirigid or inflatable). These devices are specifically designed for transmen and implanted at least 9–12 months after the completion of urethral reconstruction. The device is fixed to the pubic bone at four points. The approach for the placement of both types of penile prostheses is suprapubic, because of the neophallic pedicle (Fig. 24.5a).

In cases where inflatable penile prosthesis is implanted, the pump is placed into the left hemiscrotum after the left testicular prosthesis is removed, while the reservoir is placed paravesically under the muscles and prefilled with sterile saline. In this way, a fully functional neophallus is created with the ability of stand-up voiding and penetrative sexual intercourse capability (Fig. 24.5b).

Evaluation of the regretting patients who underwent reversal MLD phalloplasty in the Belgrade Center includes self-reports regarding the surgical outcome as well as International Index of Erectile Function to collect information regarding sexual functioning, satisfaction, and psychological status after reversal surgery, as there are no specific questionnaires at this time that could be used for evaluation of this group of patients [5].

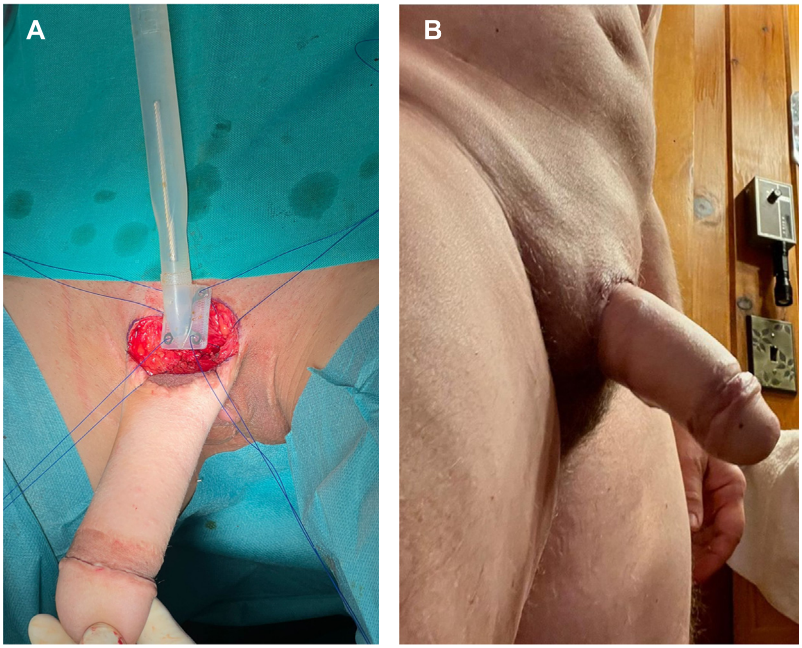

FIGURE 24.5 (a) Dorsal approach for the penile prosthesis implantation. Four monofilament nonabsorbable stitches placed to the pubic bone for prosthesis fixation. (b) Outcome 9 months after completed masculinizing reversal surgery.

Reversal surgery: Vaginoplasty following phalloplasty

Up to date, there are no published reports regarding requests for reversal surgery in patients who underwent masculinizing GAS, but literature data show that regret does occur in this group of patients as well. However, compared with patients who underwent feminizing GAS, it is significantly rarer [12]. So far, there are no published literature data on vaginoplasty procedures in regretting patients seeking a feminizing GAS. Since these patients had been on testosterone hormonal therapy during their initial transitioning process, their clitoris is hypertrophied, and in cases where the clitoris is not buried under the neophallus, its reduction may be both needed and requested by the patient.

Vaginal reconstruction for patients AFAB

Vaginal reconstruction in transgender patients dates back to 1930s. Essential surgical approaches were developed shortly after and still represent the basics of feminizing genitoplasty in GAS. As defined by Karim et al. in [55], the neovagina and external genital organs should be as feminine as possible in appearance, with no scars or traumatic postoperative neuromas. The urethra should be shortened, so that the urinary stream points downward in the sitting position. In addition, an ideal neovagina should be moist, elastic, and hairless, no less than 10 cm in depth and about 3–4 cm in diameter, with no introital stenosis.

Its innervation should provide adequate sensation to achieve a satisfactory level of erogenous stimulation during sexual intercourse.

There are a variety of procedures for primary vaginal reconstruction in transgender and gender nonconforming people, and only the most commonly used will be mentioned in this chapter.

Penile inversion vaginoplasty is the most commonly used technique for primary vaginal reconstruction in transwomen. The technique dates back to 1957, when Sir Harold Gilles performed a penile inversion vaginoplasty for a female transgender patient [56]. The irreversible procedure involves bilateral orchiectomy, corpora cavernosa removal, glans reduction, and clitoris formation with the preservation of the neurovascular bundle, shortening of the urethra, creation of the vaginal cavity within the Denonvilliers' fascia between the rectum and bladder and lining with inverted penile skin solely or in combination with scrotal skin flap/graft, labia minora, and labia majora reconstruction. A 16/18Fr indwelling urinary catheter is placed inside the bladder while neovaginal packing is placed inside the neovagina for a period of 5–7 days (depending on the surgeon and Center) and one/two drains are placed paravaginally. After the neovaginal packing is removed, the patients are instructed on regular neovaginal dilations always using a lubricant gel and advised to refrain from penetrative sexual intercourse, including anal sexual intercourse, for 3 months postoperatively. The penile inversion vaginoplasty is considered the "gold standard" in genital reconstruction for female transgender patients with a very high success rate regarding functionality, appearance, depth, and sexual satisfaction according to available literature [57–60]. In case the penile skin is insufficient and the patient would like to avoid abdominal surgery, skin graft vaginoplasty using split thickness skin graft originating from the inguinal crest or lower abdomen can be offered as a vaginoplasty procedure. Alternatively, if the patient does not want to have a vaginal canal, simple vulvoplasty can be offered. In systematic review of surgical techniques of vaginoplasty, Horbach et al. [59] reported introital stricture as the most commonly present postoperative complication in penile inversion vaginoplasty with an incidence of 12%. Other complications reported in the same study included stricture of the neovagina in 7% of patients, partial neovaginal necrosis (range 2.7%–4.2%), clitoral necrosis (range 1%–3%), genital pain in 9% of patients, rectovaginal fistula in 1%, neovaginal prolapse (range 1%–2%), meatal stenosis in 5%, change in voiding function in 32% of patients, urinary incontinence in 19%, wound dehiscence, abscesses in 5%, and hematoma in 3% of surgically treated patients from different studies.

Bowel vaginoplasty was first introduced in the treatment of vaginal agenesis in cis women, with the first attempts of vaginal reconstruction in transgender patients published in the 1970s [61,62]. Several bowel vaginoplasty techniques have been described in literature using different intestinal segments, but nowadays the two most commonly used segments are the ileum and the sigmoid. In earlier times, bowel vaginoplasty was considered a salvage procedure, but now it can be offered as a primary procedure for neovaginal reconstruction in patients with penoscrotal hypoplasia, after radical circumcision or as a patient preference. The approaches vary from an open surgery through the Pfannenstiel or midline incision to minimally invasive laparoscopic or robotic approach. If performed as a salvage procedure, it is important to remove the scar tissue, which is done using the perineal approach. When bowel vaginoplasty is performed as a primary vaginoplasty procedure, the first part that consists of male genitalia removal, shortening of the urethra, and creation of the neoclitoris as well as labiaplasty and vaginal cavity creation is performed using the perineal approach. After this stage, the abdominal team is responsible for the bowel segment harvesting and opening of the peritoneum and creation of the deep part of the vaginal canal. When ileal vaginoplasty is performed, a segment of 15–20 cm is usually harvested at about 20–70 cm from the ileocecal valve on its vascular pedicle [63]. Before it is transferred to the genital region, the elasticity of the pedicle is checked, and when tension-free transfer is confirmed, the segment is isolated using a linear stapler. To obtain an adequate width of the neovagina, the ileal segment can be opened on the antimesenteric side and reshaped using "U" or "J" pouch and retubularized, creating the neovagina. Anastomosis between the bowel and skin flaps is usually performed using the perineal approach, and the anastomosis is placed inside the neovaginal canal. Ileum continuity is restored in an end-to-end or side-to-side fashion using a linear stapler or manual suturing [64]. The indwelling urinary catheter is placed inside the bladder for urine derivation for 2–7 days, depending on the center. Neovaginal packing is placed inside the neovagina for 5 days, and neovaginal dilation is started 5–14 days after the surgery, also depending on the center where the surgery took place. In the study of van der Sluis et al. [64], the mean ileal neovaginal depth was 13.2 ± 3.1 cm. When it comes to postoperative complications, introital stenosis occurred in four patients (12.5%) and rectovaginal fistula occurred in one patient. Excessive mucous discharge was reported in the study of Wu et al. [63] for the first postoperative month. Out of 86 surgically treated patients, 6 patients had complications that were solved either conservatively or surgically. The same authors reported satisfactory cosmetic, functional, and anatomic results. The use of the sigmoid colon has found many promoters among reconstructive transgender surgeons because of its proximity to the genital region, diameter of the bowel, thickness of the sigmoid colon wall, and its resistance to trauma during dilation and penetrative sexual intercourse. According to the literature, the length of the sigmoid colon segment may vary from 8 to 20 cm, providing a satisfying result in terms of neovaginal dimensions (width and depth), lubrication, and length and frequency of postoperative dilation [65–68]. Maximal mobilization of the sigmoid colon is performed to guarantee a tension-free transfer down to the genital region and anastomosis with either inverted penile skin flap or genital skin flaps using interrupted monofilament absorbable sutures to prevent purse string scarring. Continuity of the colon is restored using a 29-mm circular stapler. One abdominal drain is placed in the Douglas space. A Foley 16Fr urinary catheter is placed inside the bladder for urine derivation. Vaginal packing is placed inside the neovagina just behind the anastomosis to prevent stenosis of the anastomosis for 5–7 days postoperatively. Vaginal dilation under the supervision of a physician or pelvic floor physiotherapist is started 7–14 days after the surgery and is performed twice daily. Vaginal flushing with saline solution and mucous removal is advised for neovaginal cleaning until mucus discharge is diminished. The patients are advised to refrain from penetrative sexual intercourse including anal sexual intercourse for a period of 6 months. Complications of bowel vaginoplasty may be related to both abdominal and genital part of the surgery and may include ileus, dehiscence of the intestinal anastomosis, need for emergency surgery, injury to the rectum, bladder and ureter, constipation, diversion colitis, dehiscence between the bowel and skin flaps, prolonged mucus production, and malodor [68]. Morrison et al. [69] performed sigmoid vaginoplasty in 83 transgender patients, with a mean follow-up of 26 months. During the follow-up period, the authors reported complications in 48 (58%) of their patients: short-term complications occurred in 23 patients in their series and included anastomotic stenosis in 16 patients and corpus spongiosum protrusion in 5 patients, rectoneovaginal fistula occurred in 2 patients, and urethral fistula in 1 patient. Regarding long-term complications, they were reported in 27 of their patients and included anastomotic stenosis in 18 patients and corpus spongiosum protrusion in 13 patients, bowel obstruction in 3, urinary obstruction in 1, and urethroneovaginal fistula in one patient. Almost all of their patients (97.7%) reported being able to achieve an orgasm during sexual intercourse, and all of the contacted patients (21 patients) reported high satisfaction with their outcomes on a five-point Likert scale. In a study of Bouman et al. [70], the short-term complications occurred in 9 out of 42 treated patients, while long-term complications occurred in 7 patients. The same authors reported mean depth of the neovagina after 1 year of 16.3 ± 1.5 cm. Study of van der Sluis et al. [65] included 24 transgender patients in whom bowel vaginoplasty was performed as a revision vaginoplasty after failed penile inversion vaginoplasty (23 patients underwent sigmoid, 1 patient underwent ileal vaginoplasty). In 83% of the patients, an open surgery was performed, while laparoscopy-assisted approach was used in the remaining 4 patients. No intraoperative complications were reported in the study. The median neovaginal depth, determined in a group of 14 patients, was 14.5 cm (range 12–20 cm). In total, 79% of their patients underwent secondary surgery, which most commonly included introitoplasty followed by labioplasty. Only 9 patients responded to questionnaires regarding quality of life and happiness and scored 5.9 of 7 on a subjective happiness scale, while neovaginal functionality was rated as 7.3 and appearance as 7.4 out of 10.

Peritoneal pull-through vaginoplasty gained popularity in recent years, even though it is an old procedure popularized by Davydov in the treatment of patients with vaginal agenesis [71]. Peritoneal flaps can be created using a laparoscopy-assisted or robotic approach, by mobilization of two vascularized flaps that are sewn together from the inside and then anastomosed with skin flaps using the perineal approach. In a study of Dy et al. [72], robotic approach for peritoneal vaginoplasty was used in 24 patients as a revision surgery after previously failed penile inversion. The mobilized peritoneal flaps are 8–12 cm wide by 8–12 cm long originating anteriorly from the posterior aspect of the bladder, while the posterior peritoneal flap is raised from the anterior aspect of the rectum. The flaps are sewn together using barbed 3.0 monofilament absorbable suture and also anastomosed with genital skin flaps. No intraoperative or immediate complications related to the peritoneal flap harvest were reported by the authors. Complications that occurred in this patient series: two patients developed a small amount of granulation tissue at the junction of the neovaginal skin and peritoneal flap and one patient developed stress incontinence. During the follow-up period, neovaginal depth was measured at 13.6 cm (range 10.9–14.5) and width at 3.6 cm (range 2.9–3.8). Our Center uses laparoscopy-assisted approach, and 10-mm trocars are placed umbilically, while two 5-mm trocars are placed in the inguinal area to mobilize peritoneal flaps from anterior rectal wall and from posterior bladder wall [73]. The advantages of this approach come from the use of hairless well-vascularized peritoneal tissue, which is to some extent self-lubricating [71]. The procedure generally provides patients with good postoperative results; however, there are still no long-term follow-up studies published [74].

Our center's preoperative workup of patients seeking feminizing reversal GAS

As mentioned, penile inversion vaginoplasty represents the "gold standard" for transfeminine vaginoplasty, but this procedure cannot be performed in the reversal cases. If a regretting patient would prefer not to have abdominal surgery, a skin graft vaginoplasty employing split thickness skin graft from the lower abdomen or inguinal crest can be provided. If the regretting patient does not want to have a vaginal reconstruction, no-depth vaginoplasty (vulvoplasty) can be offered as a stand-alone procedure. The feminizing genitoplasty–vaginoplasty in regretting patients requiring reversal surgery involved three separate steps in our Center. Our Center had two cases of regretting patients assigned female at birth (AFAB) who had undergone masculinizing surgery during their transition and now required restoration of female genitalia. One patient completed full reevaluation and obtained all necessary medical files to pursue the feminizing GAS.

In preoperative workup for the regretting patients seeking a feminizing GAS, extensive medical history is taken and a preoperative colonoscopy exam is performed (patients older than 45 years). The patients are asked to stop smoking 6–12 months before the planned surgery and to stop hormonal therapy 2 weeks before the surgery date. As the vaginoplasty is performed as the third stage, preoperative bowel preparation is undertaken 24 h before the surgery at the hospital, with the use of an osmotic laxative (Macrogol) and a deep enema administered by a nurse. No food intake is allowed one day before the surgery, only clear liquids. Anticoagulant prophylaxis and antibiotic IV therapy (metronidazole and ceftriaxone, unless contraindicated) are administered before the surgery, and the patient is instructed to wear antiembolism stockings.

Surgical technique

First stage of feminizing reversal GAS

The first stage of reversal feminizing GAS is comprised of the removal of the inflatable penile implant as well as testicular implant. During the surgery, it is confirmed that the penile implant was functional. Also, explorative urethrocystoscopy is performed to check the neourethra for the presence of internal fistulas or strictures.

Second stage of feminizing reversal GAS

The second stage is performed 3 months after the first stage and includes the removal of the neophallus, mobilization of the clitoris, and its fixation in its anatomical position and shortening of the urethra creating the perineal urethrostomy, to enable voiding in sitting position, before complete genital reconstruction is accomplished.

Third stage of feminizing reversal GAS

At the beginning of the use of sigmoid vaginoplasty in our Center, first in vaginal agenesis cases and then as a revision surgery for transwomen, it was performed as an open surgery, but in the past decade, this approach was replaced by the laparoscopic approach [66]. In the laparoscopic approach, four trocars are used: one is placed umbilically (10 mm), two in the right abdomen (5 mm), and one in the left abdomen (5 mm). The Center opted for the sigmoid vaginoplasty in this patient because of her anatomy, abandoning the idea of skin graft vaginoplasty because of a scar on her lower abdomen from a prior caesarian section.

To mobilize the sigmoid colon all the way to the splenic flexure, dissection starts lateral to medial along the white line of Toldt. The colon is mediatized once sufficient mobility is obtained. The section of the distal sigmoid colon with the longest mesentery is chosen to be harvested for neovaginal construction. An opening in the mesentery is then created, and a linear stapler is used to transect the sigmoid colon. While maintaining the blood supply to the transected end, the mesentery is further split along the pedicle. A 15-cm sigmoidal segment is marked and transected with the linear stapler to serve as the future neovagina (Fig. 24.6a–c).

The left paraumbilical incision is extended so the proximal part of the sigmoid is extracorporealized and the anvil of a 29-mm circular stapler is placed inside and secured with a purse string suture. The end-to-end bowel anastomosis is then made with the circular stapler inside the abdomen under camera control, with care not to injure or twist the bowel mesentery. The anastomosis is checked, and after opening the circular stapler, the presence of two staple donuts is confirmed. To allow for triangular perineal skin flaps mobilization for anastomosis with the sigmoid colon, which prevents a purse string stenosis and to place the anastomosis inside the neovaginal canal, the patient is placed in lithotomy position (Fig. 24.7).

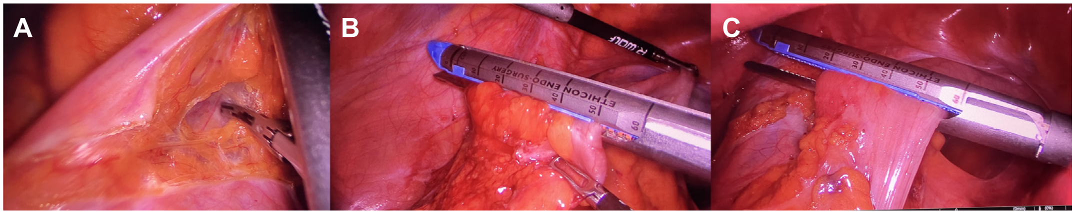

FIGURE 24.6 (a) Mobilization of the sigmoid colon and its pedicle. (b) Closure of the proximal part of the sigmoid colon with a linear stapler. (c) Closure of the distal part of the sigmoid colon with the linear stapler.

FIGURE 24.7 Design of the perineal flaps for anastomosis with sigmoid colon.

At the same time, a space between the rectum and urethra and bladder is created using sharp and blunt dissection to reach the peritoneum. The peritoneum is opened, and the sigmoid segment is anastomosed with genital skin flaps in the peristaltic direction using interrupted 3.0 monofilament resorbable stitches by placing the anastomosis inside the neovaginal cavity for the better esthetic appearance (Fig. 24.8) [66].

Vaginal packing is placed inside the neovagina. The urethra is spatulated, and a 16Fr silicone Foley catheter is placed inside the bladder. Meatus is positioned above the neovaginal entrance. Labia majora are created out of the scrotum.

In the postoperative recovery period, the patient is advised to dilate the neovagina twice a day to prevent the stenosis at the introitus, as well as to perform vaginal douching to empty any excessive mucus. The postoperative follow-up of this patient was relatively short, though according to self-report, her functioning in the female gender role with female bodily attributes (breasts), long hair, and makeup was resulting in positive self-esteem and overall satisfaction. Regarding the functionality of the neovagina, she was able to engage in penetrative sexual intercourse with her new partner and able to reach orgasm (Fig. 24.9).

FIGURE 24.8 Anastomosis of the perineal skin flaps with the sigmoid colon using perineal approach.

FIGURE 24.9 Outcome 1 year after the reversal surgery. Patient is self-dilating with the biggest vaginal dilator. Visible scars on the pubic area from neophallus removal.

Discussion

Evaluation

The number of persons undergoing GAS has considerably increased in recent years, which is well documented in numerous studies on improved quality of life, body image, and overall satisfaction after hormonal and surgical treatment completion [14]. Although individuals undergoing GAS are generally satisfied with their decision, sometimes some of them express postsurgical regret and revert to sex assigned at birth. According to the literature data, but also from our Center's experience, regret and request for reversal surgery are more common in patients assigned male at birth (AMAB) who underwent feminizing GAS, but it is still consistently low.

Typically, Pfafflin's study is used as a landmark reference of regret prevalence among transgender patients who underwent GAS [27]. Recent studies reported an overall incidence of surgical regret of <1% for transmen and <2% for transwomen [12].

According to Kuiper and Cohen-Kettenis [28], more than 20 possible risk factors that may lead to regret after GAS are listed throughout the literature. Nevertheless, none of them have proven to be an absolute contraindication for GAS.

Risks encountered by authors

There are several important observations in the cases reversely treated in our Center that are seen as risk factors for previous and future regrets. The first is related to the fact that many of the presenting subjects had not asked for psychiatric or psychological help related to the underlying problem (identity problems, depression, addictive behaviors, sexually related problems, or self-destructive behavioral patterns). It is of paramount importance to be aware that some patients face fears and hesitate to start their medical transition during the evaluation period. MHPs should evaluate the impact of long-term negative life events and experiences, especially related to experiences of trauma. Establishing a patient–doctor relationship and confidence requires time, but this relationship forms the basis of good therapeutic compliance, which in turn allows the appropriate medical treatment to be proposed. Treatment of the underlying psychological problems should have been the main goal during evaluation prior to the GAS [3,75]. Hesitation to ask for reversal treatment seems to be the main component of the regret process in presenting subjects (duration of regret prior to reversal in our patients varied from 11 to 144 months). Uncertainty and ambiguity are other factors. We must agree that these facts should have been discussed with the MHP who had performed the initial evaluation prior to GAS, or during the long-term follow-up period after GAS. But the fact is that the presenting subjects were not followed by an MHP in this period. Therefore, we do not have the full picture of the impact of hormonal transition on each of the patients, which is perhaps the most important guideline in introducing patients to GAS. In addition, the absence of support, detailed information, and preparation for the treatment could also have a great impact on future regrets.

Moreover, use of hormonal therapy without medical approval in transgender individuals is well documented, as is absence of medical monitoring of overall health [76,77]. These risks are also recognized by the WPATH Standards of Care [7]. Some clinics have developed models for initiation of cross-sex hormone therapy (csHT) without an in-depth mental health evaluation and referral. Deutsch [78] investigated such clinical practice from 12 unique US sites, referred to as the informed consent (IC) model. Only one-third of sites required any contact with a mental health provider prior to initiation of csHT, while less than a half of the clinics required a minimum number of visits prior to beginning treatment. This practice excludes MHPs from comprehensive pretransition and transition-related clinical care of individuals with gender dysphoria, including the assessment and preparation process. Clinical decisions regarding indications, readiness, and eligibility for hormonal treatment are made by other medical professionals. Perhaps we should ask ourselves where does this practice lead and would it have any risks for the transition outcome? This clinical practice helps to destigmatize gender dysphoria, moving this syndrome exclusively into the somatic field. In one way it is useful, but on the other hand this practice could lead to important predictive factors for possible regret in the mental health domain being overlooked. Our position is that a long-term monitoring of comprehensive transgender healthcare is needed, which is in accordance with some previous studies [3,12,28]. In addition to psychiatric/psychological evaluation, both preparation for medical treatment and follow-up seem to be necessary components to ensure comprehensive trans healthcare, which includes all multidisciplinary team members in each of the stages.

Recommendation letter should be more inclusive, with detailed information regarding duration of evaluation, presented comorbid psychopathology, if any, duration of transition and description of this period in terms of adaptation and impact on mental health. Additional risk factors for negative treatment outcome should be considered, such as substance abuse, premorbid personality profile (sensitive, depressive traits, borderline organization, affective lability, emphasized impulsivity), lower level of gender dysphoria, absence of alleviation of gender dysphoria, and partial satisfaction with treatment effects.

The reversal cases treated in our Center remind us that the pathway of care for persons with GD, which ends in a recommendation for GAS, is standardized in the form of guidelines. One way to avoid regrets is to adhere to the SoC guidelines, with an individualized treatment plan according to individual history, psychological capacity of the client, and psychotherapy, if needed.

Surgery

Reversal surgeries represent very complex and multistage procedures that can be done only after an in-depth MHP assessment and hormonal treatment (if not contraindicated or not desired). The possibilities, advantages, and disadvantages of each procedure must be presented and discussed with the patients so they could understand the limitations of current medicine in terms of restoration of former genitalia appearance and functionality.

From our Center's experience, the majority of transmen seeking phalloplasty undergo MLD phalloplasty. As previously said, the main advantages of this approach are the possibility to create a neophallus of an adequate size to satisfy the patient's wishes but also to allow for the staged urethroplasty and placement of an erectile device. This is why this approach was used in most regretting patients from our Center's sample. Good results and overall satisfaction in our patient group were obtained, despite the postoperative complications that needed surgical revision (urethral fistula, urethral stricture, wound dehiscence). Even though our Center has the largest series of regretting patients who requested reversal masculinizing surgery, it is still a small sample that actually limits the possibilities of an in-depth statistical analysis of this group of patients.

On the other hand, the percentage of patients regretting masculinizing surgeries and requesting reversal feminizing surgeries are significantly smaller in both literature and practice [14]. Our experience relies on one selected case in whom, after a new cycle of evaluation by MHPs, as well as discussion with surgeon and presentation of all possibilities for vaginal reconstruction, the choice to use the sigmoid colon was made jointly by the patient and the surgeon. According to our experience in the treatment of patients with various forms of DSD where reconstruction of the vagina is needed and cases of feminizing GAS where bowel vaginoplasty is indicated, satisfactory results can be obtained using the sigmoid colon, due to its characteristics, proximity to the perineum, and relatively low morbidity. As far as we know, this case is the sole case of a regretting patient who, after initially having undergone masculinizing GAS, reverted completely to female gender assigned at birth and completed all reversal surgical procedures.

Future perspectives

There is ample literature on tissue engineering, scaffold designs as well as 3D printing, especially in animal models, which can be beneficial also for the transgender patient population [40]. Selvaggi et al. [79] were the first to introduce the idea of penile epithesis for transgender male patients. The surgical approach consists of a two-stage procedure: during the first stage, two titanium implants are placed into the pubic bones, while the second stage consists of pubic soft tissue reduction and placement of the epithesis. Possible advantages for the penile epithesis approach can include the possibility of penetration during the sexual intercourse, stand-up voiding, transmission of vibratory stimulation as well as the esthetic appearance [80]. Nevertheless, reports on long-term results and patient satisfaction are still lacking.

Transplantation of genital organs is a topic generating a lot of interest in recent years, both among the professionals and in the public. In scientific papers published so far, penile transplantation was performed only in cis males in trauma cases and after partial/complete penectomy due to malignant disease [81,82]. Theoretically, it could also be performed in transgender patients, though there are many technical, logistical, and ethical considerations that should be addressed [80,83]. To date, no attempts of penile transplantation for transmen have been performed or reported, though several centers reported on cadaveric studies related to this topic [84,85]. The major drawback of this type of allotransplantation is lifelong immunosuppression therapy that must be considered when selecting the potential patients for this type of procedure [80].

Cis women with severe congenital anomalies such as bladder and cloacal exstrophy, vaginal agenesis (Mayer−Rokitansky−Küster−Hauser syndrome (MRKH)), or patients with malignant diseases of the rectum, vagina, or bladder, who may require partial or complete resection of the vagina, currently have nonsurgical and surgical options available for the restoration of the vagina. Also, there have been several attempts of tissue engineering utilizing cellular and acellular matrices of natural or synthetic origin to create the vagina in animal but also in human models. These approaches may also be applied in the vaginal reconstruction for transwomen in the future. Still, further studies are needed due to small samples in these studies as well as long-term follow-up regarding success of the procedure [86−88].

Conclusions

Mental health professionals involved in transgender healthcare are faced with a unique request to prescribe somatic treatment (hormonal and/or surgical). To prevent postoperative regrets and requests for reversal surgeries, persons with gender dysphoria should be referred to specialized multidisciplinary centers for pretransitional evaluation, follow-up during hormonal transition, and assessment of readiness and eligibility for surgical treatment.

Detailed psychiatric assessment regarding the origin of gender identity diffusion, incongruence, or dysphoria is of extreme importance. Having in mind the complexity of regret phenomenon, lack of literature data about reversal requests and need for postreversal follow-up in terms of satisfaction, functionality, and quality of life, we believe that there is a need for new postoperative follow-up studies with strong methodology from different centers to better understand the etiology of regret and relationship between regret and reversal request.

Our proposal is that SOC should be followed and that future additional evidence might help to select patients that may better benefit from nonbinary surgery or no surgery at all, rather than undergoing a full surgical transition, and then detransitioning. One of the strategies could include a mental health professional's appraisal of individuals requesting GAS to exclude or treat any psychological issues, which could lead to future regrets and/or reversal requests.

Genital creation using currently available surgical techniques, both for transmen and transwomen, despite different rates of associated complications, offers high patient satisfaction with low percentage of regret. Patients who underwent reversal surgeries in our Center were provided the multidisciplinary approach and support to meet their expectations concerning their detransition and the restoration of their genitals, but with obvious limitations.

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Conclusion

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Conclusions

As we reach the end of our exploration into gender-affirming genital surgery for persons assigned male at birth (AMAB), it is essential to reflect on the journey we have undertaken and the critical insights gained. This book has aimed to provide a comprehensive understanding of the procedures, challenges, and triumphs associated with all sets of procedures currently performed for genital gender-affirming surgery. Vaginoplasty is the most common one, followed by orchidectomy, vulvoplasty, and other procedures addressed specifically for nonbinary individuals.

The book is serving as a guide for healthcare providers and allies; specifically, it can result useful to both providers who are involved in the direct care of transgender and gender diverse persons, as well as to all providers and allies who are interested to get the most updated knowledge on pre-op and post-op approaches, and surgical procedures related to the care of individuals undergoing, or sampling reflecting on receiving this surgical treatment.

Summary of key points

Gender-affirming vaginoplasty (as well as the other genital gender-affirming surgeries for AMAB persons) is more than a surgical procedure; it is a vital step toward aligning one's physical self with their gender identity. Throughout this book, we have delved into the intricacies of history and social perspectives, preoperative preparations (including perioperative support), surgical techniques, postoperative care, surgical complications (prevention and solutions), and sexual health and wellbeing. The various surgical approaches, from penile inversion, use of skin grafts, bowel segments, peritoneum, and robotic surgery, have been discussed in detail, highlighting the advancements and innovations that have improved patient outcomes. Finally, for the first time ever we shade light, to the best expertise available, on genital surgery for AMAB persons asking for the so-called "nonbinary" genital surgery, as well as we shade light on reversal surgery such as phalloplasty following vaginoplasty and vaginoplasty following phalloplasty for those patients who regret the primary genital surgery.

Gender Affirming Vaginoplasty
https://doi.org/10.1016/B978-0-443-21776-0.00025-X

Expertise perspectives

Indeed, this book is built upon the best evidence available from scientific journals; contributors are all worldwide experts, and very well published for the specific subject they have been asked to share; therefore, whenever surgical details and approaches described were not based on available scientific literature, same contributors were opening and shed lights on their unique expertise perspectives, and all-rounded approaches.

In fact, these expertise perspectives are based on the direct care that contributors of this book adopted for persons who—each one—required a customized care. Thus, with the customized case transpiring from the many chapters of this book, authors are actually highlighting and providing a human dimension to the technical aspects, reminding us that at the heart of every procedure is allowing an individual to fulfill what they have been seeking, i.e., to live authentically.

Medical and psychological outcomes

The medical and psychological benefits of vaginoplasty, orchidectomy, and vulvoplasty procedures have been well documented, with many patients reporting improved quality of life, sexual health, and psychological wellbeing. However, we have also acknowledged the challenges and complications that can arise, emphasizing the need for comprehensive care and support, and specifically addressing that each patient is living a unique care journey, regardless the surgical approach chosen, the uneventful surgery, the postoperative period, the complications encountered, or the expectations met and the stress perceived.

Ethical and societal implications

The ethical considerations surrounding gender-affirming surgeries are complex and multifaceted. This book has discussed the importance of informed consent, patient autonomy, and the ongoing struggle for societal acceptance and understanding. As society progresses, it is crucial to continue advocating for the rights and dignity of transgender individuals.

Future directions

Looking ahead, the future of gender-affirming genital surgery for AMAB persons is promising, meaning that efforts are taken worldwide to spread the knowledge and educate a larger number of providers to offer best care. Continued advancements in surgical techniques, as well as preoperative preparation and postoperative care, and psychological support, will undoubtedly enhance patient experiences and outcomes. Ongoing research and continuous education are vital in ensuring that healthcare providers can customize and offer the best possible care to their patients.

Final reflections

In conclusion, gender-affirming vaginoplasty represents a profound and life-changing journey for many transgender and gender diverse individuals. It is a testament to the resilience and courage of those who undergo this process and to the dedication of the medical professionals who support them. This book has aimed to shed light on this journey, providing up-to-date, state of the art, valuable insights; also, it is fostering greater understanding.

Call to action

As we close, let us commit to supporting and advocating for transgender and gender diverse individuals seeking gender-affirming care. Let us strive for a future where every person can access the healthcare they need without fear of discrimination or prejudice. Together, we can create a world that embraces diversity and champions the rights of all individuals to live authentically and with dignity.

Funding

No external funding was received or used to facilitate the performance of this study. The authors declare no conflicts of interest.

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'*Note:* Page numbers followed by "f" indicate figures and "t" indicate tables.'

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