Urological Care for the Transgender Patient

A Comprehensive Guide

Dmitriy Nikolavsky
Stephen A. Blakely
Editors

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Preface

in regione caecorum rex est luscus (in the land of the blind, one-eyed man is a king)
attributed to Desiderius Erasmus, 1500 AD

We must admit, when we encountered our first patient with post-phalloplasty complications in 2013, we panicked. Our lack of knowledge about transgender anatomy, care, and complications was a bit embarrassing. In an attempt to feign competence, we were frantically searching PubMed, Google, and UpToDate to figure out what kinds of questions to ask. This topic was omitted through our years of training in medical school, residency, and even reconstructive urology fellowship. At that point, the medical literature was outpaced by the growing public interest and, more importantly, growing population of transgender patients in need. We couldn't find helpful review papers, textbooks, or online courses. Our first thought, guided by the mantra "do no harm," was to admit our deficit and refer the patient to someone else with sound experience. Fortunately, the patient put the problem in perspective. "You ARE the reconstructive guys. That is why I am here." Thanks to this patient's trust and the infinite patience of our mentors and good friends in reconstructive community who taught us phalloplasty anatomy over the phone that day (trying to protect their identity, but Curtis Crane, you know who you are), we were able to identify the problem and eventually help this and many other patients. This book is intended to spare the reader the embarrassment that we suffered that day, and to significantly shorten the learning curve of the trial-and-error learning. We hope it will help physicians to run transgender-friendly general urology clinics, even without specialized reconstructive training. We hope it will help transgender patients to get established with a urologist for long-term care, even if there are no urological complications after gender affirmation.

The aim of this book, with the general urologist as the audience, is to provide a comprehensive guide on a variety of topics related to the care of transgender and gender nonconforming individuals. Furthermore, we aim to help providers understand the medical needs of transgender patients, clarify surgical steps and changes after gender affirmation, and educate and counsel patients regarding available medical and surgical treatments options. We will also discuss the importance of a multidisciplinary approach in providing these services for transgender patients via a multispecialist, team care program.

Further chapters will describe urologically relevant surgical anatomy of both feminizing and masculinizing gender-affirming procedures, including vaginoplasty, orchiectomy, hysterectomy, vaginectomy, phalloplasty, metoidioplasty, and prosthetics. We will also explore diagnosis and management of common complications of genital-related gender-affirming surgery in addition to a separate discussion on postsurgical incontinence.

We provide detailed discussions of endocrinological care and options for fertility preservation. Surgical, endourologic, and oncologic considerations with respect to reconstructed genitourinary anatomy and physiologic changes related to hormone therapy— a vital knowledge for the practicing general urologist—will be discussed. Future directions, including the use of robotics in gender-affirming surgery and the history of transgender healthcare, will be discussed in the last two chapters.

We hope this first book on the urological care for transgender patients will be a helpful resource for our general and reconstructive urology colleagues alike. We also hope that this is just one of the initial steps on a path toward making a care for transgender patients a part of routine urological practice.

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Part I

Overview, Decision Making, Endocrinological Care, and Pre-operative Considerations

The Current State of Transgender Care

1

Michael Hughes, Stephen Blakely, and Dmitriy Nikolavsky

A Changing Landscape for Patients and Physicians

At the time of creating this text, attitudes toward lesbian, gay, bisexual, transgender, and queer (LGBTQ) issues have shifted dramatically in the United States in recent years. Highly publicized media attention given to transgender figures has helped raise awareness of societal and political issues effecting the transgender population. The Public Religion Research Institute (PRRI), an American nonprofit and nonpartisan research organization which examines the intersection of political issues and religious values, conducted a population survey to assess how Americans view transgender issues. The survey uncovered that 62% of Americans reported they had become more supportive of transgender rights compared to their views five years previous. Sixty-three percent of Americans also reported they would be comfortable having a close friend come out to them as transgender [1].

According to survey data published by the Williams Institute in 2016, an estimated 1.4 million adults (0.6%) in the United States identify as transgender. This study conducted a phone survey, in 19 anonymous states, asking subjects if they identified as transgender "male-to-female, female-to-male, or gender nonconforming." When compared to the same group's 2011 findings, this figure had doubled. The authors explain that the increasing visibility and acceptance of transgender people may contribute to the increase in self-reporting. State-level estimates of transgender-identifying adults ranged from 0.3% in North Dakota to 0.8% in Hawaii. The survey also found that young adults (18–24 years of age; 0.7%) were more likely than older adults (65+; 0.5%) to identify as transgender [2]. Furthermore, in the largest population-based survey, including ten states and nine urban school districts, the Centers for Disease Control (CDC) reported 1.8% of high school students identified as transgender [1]. This is significantly higher than any other age group. If this is accurate, we can expect to see a much greater number of transgender patients throughout our healthcare system for years to come as this group ages.

The healthcare industry has already seen a significant uptick in the number of transgender patients seeking care. A recently published study evaluating national temporal trends in gender-affirming surgery for transgender patients in the United States found a threefold increase in Medicare and Medicaid coverage of gender-affirming surgery from 25% in 2012–2013 to 70% in 2014. The proportion of genital surgery in

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gender-affirming procedures was also noted to increase from 72% in 2000–2005 to 83.9% in 2006–2011. The study also found an increasing trend in reporting gender identity information in electronic health records [3].

We have noted an increase in patients presenting to the clinic seeking care and advice in preparation for gender-affirming surgeries or postsurgical patients with a variety of urologic needs from treatment of complications, catheter management, hormone therapy, incontinence, nephrolithiasis, and beyond. In speaking to our colleagues, we have found that this is not unique to our practice or region. These trends underscore the importance of physician education and familiarity with health issues afflicting this population.

Disparities and the Road to Healthcare Equality

Despite progress in the twenty-first century, our transgender patients are members of a vulnerable population. The 2015 US Transgender Survey conducted by the National Center for Transgender Equality collected 27,715 respondents from all 50 states. The study, using an online questionnaire (>300 items), reported on adults aiming to shed light on the transgender experience on a variety of topics ranging from education, healthcare, family life, and interactions with the criminal justice system. The findings illustrated the disparities effecting the transgender community particularly in regard to access to healthcare and health insurance. The survey found 25% of respondents experienced an issue with health insurance coverage including denial of coverage for gender transition care and upward of 55% of respondents had been denied coverage for transition-related surgery. A significant proportion (25%) of respondents was unwilling to seek medical treatment for fear of mistreatment. A third of respondents reported having at least one negative experience related to gender including refusal of treatment, harassment, and assault [4]. Transgender patients are also at increased risk for self-prescription of hormonal therapy. Mepham et al. reported a quarter of patients referred to a gender clinic over a one-year period had self-prescribed hormonal therapy, 70% of which were obtained from the internet [5]. Similarly, a study by De Haan et al. reported ~50% of 215 transgender women had taken hormones not prescribed by a physician. This behavior was seen more frequently in patients who had previously experienced verbal abuse due to their gender identity [6].

Transgender minors face an uphill healthcare battle as well. A 2018 population-based study reports that transgender and gender-nonconforming students reported significantly poorer health, lower rates of preventive health checkups, and more nurse office visits than cisgender youth.

A study published in 2007 reported more than a fourth of self-identifying transgender adolescents had attempted suicide, all of which cited reasons related to being transgender [7]. Data collected from the National Violent Death Reporting System between 2013 and 2015 revealed that LGBT minors are overwhelmingly more likely to die from violent causes than their non-LGBT classmates. LGBT minors accounted for twenty-five percent of violence-related deaths between the ages of 12 and 14 [8]. Another study demonstrated transgender youth report significant discrimination compared to their cisgender peers, with higher rates of suicidal ideation and self-harm than their heterosexual and cisgender peers [9]. The CDC survey also found transgender youths were at increased risk for violence victimization, substance abuse, and suicide risk. They were also more likely to report having been tested for human immunodeficiency virus [10].

There have been recent legislative efforts to improve transgender persons' access to healthcare. The Affordable Care Act (ACA) introduced under President Obama in 2014 has prohibited discrimination by healthcare providers based on gender in addition to preventing insurance companies from denying coverage on basis of gender identity [11]. Since 1981, gender-affirming surgery was excluded to Centers for Medicare and Medicaid beneficiaries citing "surgical procedures and attendant therapies for transsexualism" as "experimental" with "high rates of serious complications." However, in 2014, the US

Department of Health and Human Services ended this policy citing consensus medical literature demonstrating the efficacy and safety of gender affirmation care, effectively leaving the decision to local coverage determinations on case-specific basis [12]. Despite this progress, private insurance coverage is often regulated at a state level, resulting in variations in coverage by both state and employer [13]. In June of 2016, the Department of Defense lifted a preexisting ban which prohibited transgender individuals from joining the armed services. In September of 2016, TRICARE, the health benefit program for active-duty military personnel, their dependents, and retirees, released a new policy allowing for the nonsurgical treatment of gender dysphoria. Although the policy covers hormone therapy and psychological counseling for gender dysphoric patients, surgical treatment remains uncovered except in cases where an active-duty service member is granted a waiver by a medical provider deeming the surgery necessary [14].

Medical Education

The World Professional Association for Transgender Health (WPATH), formerly known as the Harry Benjamin International Gender Dysphoria Association, is a nonprofit interdisciplinary organization which endorses high standards of healthcare for the transsexual, transgender, and gender-nonconforming individuals through evidence-based medicine. WPATH has published the standards of care (SOC) and ethical guidelines which provide a comprehensive multidisciplinary overview of the SOC in the realm of psychiatric, medical, and surgical treatment for transgender and gender-nonconforming patients. The original SOC were published in 1979; the most recent seventh edition was published in 2011.

The SOC have not made it into medical education uniformly. Exposure to transgender and gender-nonconforming patients during urologic residency and fellowship training varies by institution. In a 2016 survey of 289 urology residents, only 54% of trainees reported any experience with transgender patient care. Education regarding the psychological, medical, and surgical care of these patients was also limited ranging from 6% to 11% of respondents reporting having didactic teaching on these topics. Significantly more female respondents placed greater priority on gender-affirming surgical training than did their male colleagues (91% vs 70%); however, the majority of residents agreed transgender-related surgical training should be offered as a fellowship focus [15]. Even small efforts to integrate transgender health topics into medical school curriculum, e.g., didactic lectures and small group discussions, have been shown to improve medical students' attitudes and knowledge of health issues affecting transgender patients as evidenced by pre- and post-educational surveys [16].

With the increasing visibility of the transgender and gender-nonconforming population and these patients appropriately having increasing access to care, it is vital that the practicing urologist is well-acquainted with the appropriate and sensitive management of these individuals. As many care pathways and genital-affirming procedures were developed by gynecologists and plastic surgeons, urologists were not extensively involved in this field. However, urologic organizations are beginning to recognize the importance of the inclusion of transgender-oriented care in urologic education. The American Urological Association first offered an update series on genital gender-affirming surgery for transgender patients in 2017 with the goal of teaching appropriate terminology, surgical options, complications, and care pathways of surgical patients. Today, a variety of courses, lectures, and workshops on these topics including genital-affirming surgery and transgender care exist in the *AUA University* Core Curriculum. The American Urogynecologic Society (AUGS), European Association of Urology (EAU), Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction (SUFU), and Société Internationale d'Urologie (SIU) have followed suit in their inclusion of educational courses and material regarding transgender health topics.

In summary, all healthcare workers are likely to experience an increase in interactions with transgender patients. This is due to a growing and aging transgender population as well as

improved access to healthcare for this patient population. It is critical that we all keep in mind that there are disparities and challenges faced by our transgender patients. One aspect of this disparity that we can all improve is the care we provide when given the opportunity. We can create and utilize educational material to ensure that we are most suitably equipped to be healthcare providers to all.

Take-Home Points

- Visibility and recognition of the transgender population are growing, as well as the societal and cultural adversity the transgender community faces.
- Transgender patients commonly meet adversity in access to proper healthcare, including issues with medical insurance coverage and mistreatment from providers.
- Formal medical education regarding transgender health is currently limited; however, there are ongoing movements within medical education and various medical societies worldwide to address this gap.
- It is important that all healthcare providers, particularly the practicing urologist, have a well-rounded knowledge of common medical issues and treatments unique to the transgender patient population.

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2 Decision-Making in Masculinizing Surgery and Feminizing Surgery

Maurice M. Garcia

The goal of genital gender affirming surgery (gGAS) is to create genitalia that align with the gender that the given patient identifies with [1]. For most transgender people, and to varying degrees for patients whose gender is non-binary, this includes elimination of the presence and/or visibility of their *birth-sex* genitalia *and* creation of the *feminine* or *masculine* genitalia that align with their gender. Different patients may have very different attitudes toward the multitude of surgical options available to them [2, 3]. Surgical risks and risk of postsurgery complications (short and long-term) should always be discussed when surgical options are reviewed with patients.

If the care goal of a gender affirming reconstructive *surgeon* is to help the patient identify what surgical option(s) best meet their needs (whatever these may be), then it is clear that what would serve patients *best* is to be able to grasp *all* available options, and what each of these "costs" with respect to risks, advantages, and disadvantages to (specifically) them. (Here, "surgical options" encompass all options available to patients in general and not only what the particular surgeon offers.) [2] The gGAS surgeon should be sufficiently *familiar with* all available reconstructive genital surgery options to be able to describe them (even if only in general terms) and discuss the risks and benefits of each. For those options that the surgeon *does not* offer, she/he should give patients the option to be referred to a provider *who does* offer what the patient identifies as what best meets their needs, goals, and tolerance for the risk of short- and long-term complications or to accept what options the given surgeon *does* offer which might also meet some of their needs and goals. However, for the surgeon to not inform patients about the spectrum of surgical options available to them is out of line with key aspects of gender affirming care as described by the WPATH Standards of Care guidelines – that care should be based on the *individual* and that it should be *patient-centered* [1, 4, 5]. To approach discussion about surgery based on *assumptions* about what the patient wants is not in line with care-quality goals and does not serve patients. The recommended approach of covering all options with patients is based on the perspective that every transgender and gender non-binary patient is an individual whose needs and goals may differ from other patients [1, 3, 6].

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Masculinizing Genital Gender Affirming Surgery

Transgender men and patients who identify as gender non-binary who seek masculinizing genital gender affirming surgery have a wide variety of surgical options.

For the purposes of initiating the process of review and discussion of options, the discussion can perhaps most easily be framed around the two phallus options patients can choose from: *metoidioplasty* – creation of a "small penis" using the patient's own *current* penis (the virilized clitoris) [7–9], or alternatively, *phalloplasty* – creation of a *full (adult)-sized* penis using skin harvested from elsewhere on the patient's body (forearm: radial artery forearm free flap phalloplasty (RAP); anterior thigh: anterior lateral thigh (ALT) pedicle or free flap phalloplasty; groin or suprapubic skin: groin or suprapubic (SP) pedicle flaps) [3, 10–14]. Both of these options include, separately, the option to undergo urethral lengthening, such that the patient can void from the tip of their penis [11, 15–17]. We emphasize to patients that the principal source of complications related to masculinizing surgery is associated with urethral lengthening (urethral strictures and their sequelae including fistulae, obstructive lower urinary tract symptoms) and the relatively high risk for need for additional future surgeries and interventions associated with choice for urethral lengthening [18–23].

Both metoidioplasty and phalloplasty *can* be combined with additional gender affirming surgical procedures, including urethral lengthening, vaginectomy, creation of a scrotum, and implant of testicle prostheses [3, 14].

Both options can also be performed with the option to preserve the uterus and vaginal canal. Patients who elect preservation of the vaginal canal should be advised that, while it is possible to undergo urethral lengthening *with* preservation of the vaginal canal, doing so is associated with a significantly higher rate of urethral related complications (neo-urethral stricture and fistulae) [24].

Only phalloplasty affords the option to achieve erection by implant of an erectile device [3].

Metoidioplasty has the following potential *advantages and disadvantages* [3].

Advantages include the following:

1. Creation of a penis of normal shape and appearance.
2. Maximal preservation of erogenous sensation localized to their phallus.
3. Absence of a non-local surgical donor site scar (such as for the skin flaps needed to create the phallus or urethral lengthening with phalloplasty).
4. Decreased to no risk of loss of phallus viability, in contrast to phalloplasty, where part or all of the phallus can potentially become nonviable if blood supply is compromised.
5. Patients who undergo metoidioplasty *can* undergo *phalloplasty* later if they wish.

Disadvantages include the following:

1. Phallus length that is below the mean length of an adult male phallus – a metoidioplasty phallus typically has a dorsal length of only 2–5 cm.
2. Lack of commercially available implantable penile prosthetic devices to allow rigid erection .

Phalloplasty has the following potential *advantages and disadvantages* [3]:

Advantages include the following:

1. Affords creation of a phallus whose dimensions and appearance are more in alignment with a cis-gender adult penis.
2. Erogenous sensation of a phallus made from either a radial-artery forearm flap or an anterior lateral thigh flap (ALT) *can* be achieved.
3. Erection is possible after implant of a penile prosthesis (inflatable 2 or 3-piece penile prosthesis or malleable penile prosthesis).
4. It is possible to *eliminate the visibility* of the native clitoris while preserving its function to yield erogenous sensation capable of producing orgasm. The clitoris glans and shaft are de-epithelized and then transposed to the base of the phallus, thereby preserving the

erogenous sensation of the clitoris while eliminating the clitoris from view.
5. Glansplasty of the distal phallus affords the appearance of a natural glans shape.
6. Testicle and penile prosthetics are an option with any phalloplasty approach.

Disadvantages include the following:

1. Phalloplasty, in comparison to metoidioplasty, is a more extensive, and thereby potentially morbid, surgery.
2. Presence of a scar at the tissue donor site and the possibility of decreased function of the donor site. The most common concern patients who consider phalloplasty report is the presence of a donor site scar and fear of losing or developing limited function at their donor site, particularly of the arm with RAP. Many patients also report concern that scarring at the donor site reveals that they have undergone phalloplasty.
3. Risk of loss of viability of some (focal necrosis) or all of the phalluses, resulting in compromised cosmesis and/or function.

Choice for Phalloplasty Donor Site

In our experience, the radial artery forearm flap is superior to the ALT and suprapubic and groin skin donor sites for the following reasons:

1. Suprapubic and groin-flap donor sites do not yield flaps that have sensory innervation along the shaft of the phallus [25].
2. The *sensory innervation* of the arm is, anatomically, more extensive than for the skin of the anterior lateral thigh. The medial and lateral antebrachial cutaneous nerves of the forearm provide sensory innervation to all areas of the flap, and when these nerve ends are anastomosed to the proximal end of the clitoral nerve, the result is erogenous sensation to the phallus that is on average *superior to what*, in our experience, is achieved with an ALT flap. The sensory innervation of an ALT flap is based on the *lateral femoral cutaneous* nerve, which can vary in size and location (and hence the nerve itself may not be included within the flap, which would preclude anastomosis to the clitoral nerve to achieve erogenous sensory sensation directly from the flap's sensory nerves) [3, 25].
3. A radial artery forearm flap yields a flap whose final tubularized girth is generally 10–12 cm. This size is height/size appropriate for an average man. With an ALT flap, it is often a challenge to make the final flap girth *less than* 13–15 cm *maximum* because the thickness of an ALT flap is significantly greater than the thickness of a radial artery forearm flap. During surgery, it is clear that an ALT flap will yield an overly thick phallus; the surgeon is faced with the decision to either attempt to thin the flap (i.e., cut away excess adipose tissue within Scarpa's fascia, which risks injury to important perforator vessels and, if interrupted, results in loss of viability of some or all of the flap) or, to proceed and then risk the patient being dissatisfied with the resulting excess girth. As Isaacson et al. reported previously [26, 27], phallus girth greater than 13–15 cm is likely to cause discomfort with insertion into the receptive partner (Fig. 2.1).
4. Anatomic variability of the vessels and nerves is much more constant and their location/anatomy is more reliable with a forearm flap as compared to an ALT flap. The net *number of* perforator vessels and the exact location of their take off from the femoral vessels, which the ALT flap depends on, can vary. Such variability makes it possible that at the time of surgery, it may not be possible to utilize the ALT flap. Alternatively, if the perforator vessels of an ALT flap are located aberrantly, it may be necessary to alter the location of the flap on the patient's thigh, which necessitates that a larger-than-needed area of the anterior thigh be permanently cleared of hair growth in anticipation of possibly needing to relocate the flap harvest site. This is not a challenge faced with radial artery forearm flaps.

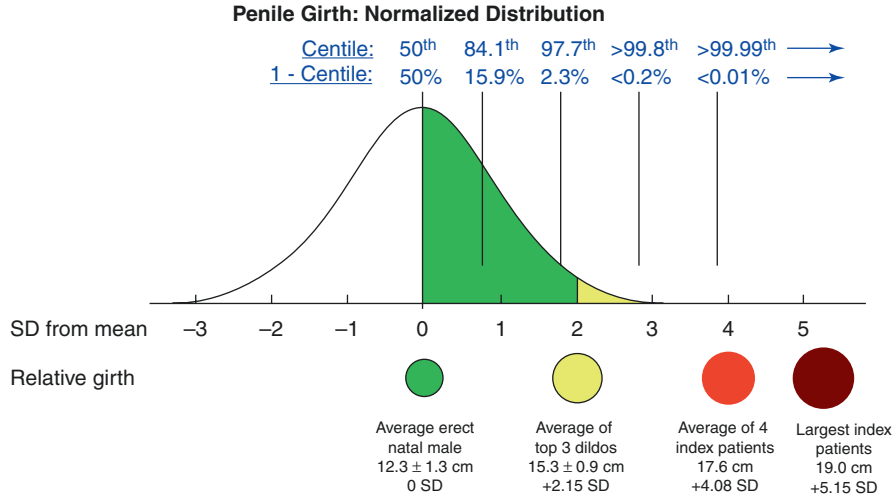

Fig. 2.1 Graphic showing data from *How big is too big? The girth of bestselling insertive sex toys to guide maximal neophallus dimensions*, by Isaacson & Garcia et al (*Journal of Sexual Medicine*, Vol. 14, Issue 11, November 2014). In this work, we compared the mean girth of four index patients who had undergone phalloplasty at an outside hospital, and complained that their phallus girth exceeded what they could insert into their partners during intercourse. This work sought to estimate the upper limit of acceptable penis girth by using the girth of the largest best-selling dildos as a proxy. The average erect penis girth among adult men of all ages was reported to be 12.3 cm, while the average girth of the three largest top-selling dildos was found by our group to be 15.1 cm. (± 0.9 cm) (equals +2.15 standard deviations (SD), which is >95% of all men). The mean girth of the four index patients in this series was 17.6 cm, which is just over 4 SD. We concluded that to help ensure that a phallus a surgeon creates is insertable into patient's partners, final phallus length should likely not exceed 13–15 cm

Phallus Length

Decision-making related to phallus length is very important, as the desired length of the phallus defines the final length of the urethral and phallus portions of the flap, and satisfaction regarding the final dimensions of the phallus is an important driver of overall satisfaction [2, 28]. Effective management of patient expectations in this context is especially important.

Desired Length and Appearance

Beginning during discussions in clinic, we suggest that patients consider what phallus length they desire. We explain that the average *erect* penile length for cis-gender men is 12.89 ± 2.91 cm (i.e., 5.01 inches) [29], while flaccid mean flaccid length is only 8.85 ± 2.38 cm (i.e., ~3.5 inches), which is significantly shorter. We also address a common assumption by patients that if they undergo insertion of an erectile device, their phallus will become longer and thicker: it will not [28]. Hence, the length that the patient ultimately chooses will be the length that their phallus exists in continuously. We suggest that patients consider day to day comfort when choosing what size phallus to request. We encourage patients to initiate discussion about phallus size goals with their surgeon, as well to ensure not only that the end result is as close to their goal as is feasible and safe but also to help ensure that it is not significantly longer or shorter than they desire.

Desired Length and Surgical Outcomes

Other phallus size-related considerations include *excess* length risks compromising perfusion to the distal and proximal ends of the phallus (as these areas are furthest from the pedicle's vessels).

Desired Length and Future Penile Prosthesis Placement

An excessively long phallus will be especially *heavy* and that excess weight could possibly cause it to migrate more posteriorly on the patient's pelvis, resulting in an overly posteriorly located phallus, which can result in discomfort and can make implant of the penile prosthesis technically challenging [2].

Decision-Making Aids

We *show* patients penis models of 3.5–6 inches to help them consider which length they most prefer in light of all of the aforementioned considerations. Use of penis models in clinic is especially useful, as many patients have reported to us that, for example, 5 ¼ inches when viewed as a penis model is substantially "larger appearing" than when considered using just a ruler, where proportional width and girth are not visualized.

Erogenous Sensation

Erogenous sensation of a phallus made from either a radial-artery forearm flap ***or*** an anterior lateral thigh flap (ALT) *can* be achieved by one or both of the following two methods [3, 10, 11, 28]: (1) the sensory nerves of the flap (medial and lateral antebrachial cutaneous nerves of the radial artery forearm flap and the lateral femoral cutaneous nerves of the ALT flap) will be anastomosed to the proximal transected end of one of the two clitoral nerves (2) the sensory nerve distribution of the *lateral* antebrachial cutaneous nerve will be corresponded to the portion of the flap that is destined to be the phallus *shaft* skin, whereas the portion of the flap innervated by the *medial* antebrachial cutaneous nerve is destined to be the *urethra* portion of the phallus (Fig. 2.2) and (3) transposition of the native clitoris glans and shaft to a sub-cutaneous location at the ventral base of the phallus, where the clitoral structures can be easily stimulated with either masturbation or with insertive intercourse. Previous work by our group found that patients who underwent transposition of the clitoris to the base of the phallus reported *no decrease* in sensation from the native clitoris at its new location [28]. By these two strategies, it is possible for patients who have undergone phalloplasty to achieve orgasm from their penis with insertive intercourse.

Genitourinary Prosthetics

Decision-making about genitourinary (GU) prosthetics is important because complications regarding these are especially morbid [2, 23, 30]. The most feared adverse event regarding prosthetics is infection of the prosthetic, which invariably requires explant of the prosthetic. Salvage surgeries, wherein a new, sterile device is used, are *not* recommended, as the host tissue prosthesis site does not have compartmentalized anatomy that might otherwise help protect the device from collaterally located infection (e.g., a neophallus does not have the tunica-defined compartment of the corpora cavernosa as in a cis-gender penis or the protective tunica and dartos layers of a cis-gender scrotum). Also, in a phallus, there is no anatomic barrier from the neourethra, which means that any fistula or local infection stemming from the urinary tract risks infection of the penile prosthesis [2, 3, 30].

Furthermore, the tissues of a neophallus or neoscrotum are not as well perfused (and thereby protected by the immune system or presumably by systemic antibiotics) as a cis-gender penis.

Testicle Prosthesis Size

We advise patients to elect implant of testicle prostheses of a size *small enough* that allows for a competent three-layer wound closure. Not uncommonly, the neoscrotum is not sufficiently capacious to allow for implant of one or two large-size (20 cc) testicle prostheses. In such cases, we advise implant of the largest testicle prosthesis that will *easily* fit, with a plan to

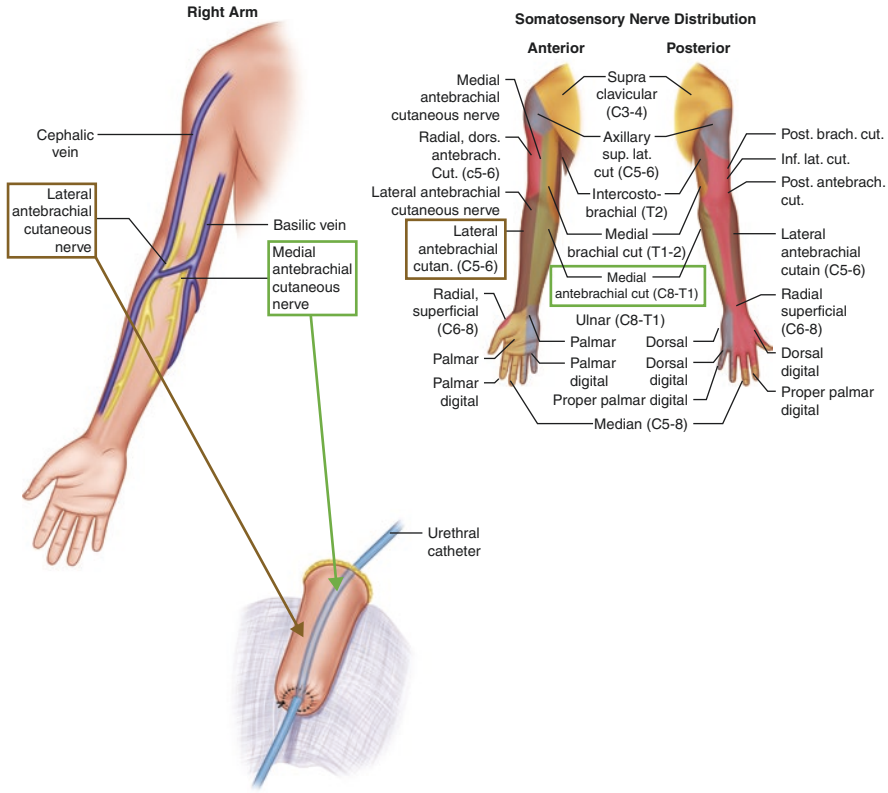

Fig. 2.2 (*Top-left*) Tactile and erogenous sensation of the phallus are achieved by anastomosing the sensory nerves from the radial artery forearm flap (medial and lateral antebrachial cutaneous nerves) to one of the two clitoral nerves. Only one clitoral nerve (in our practice, the clitoral nerve ipsilateral to the phallus deep inferior epigastric artery/veins vascular pedicle) is dissected and *partially* transected so that the flaps' sensory nerves can be anastomosed to the proximal end of the clitoral nerve in an end-to-side anastomosis using three single 9-0 nylon sutures. (*Top-right*) The *medial antebrachial cutaneous nerve* provides sensory innervation to the skin of the ventral medial forearm (green), which will be used to construct the neo-urethra. The *lateral antebrachial cutaneous nerve* provides sensory innervation to the forearm skin of the ventral lateral (and dorsal) forearm, which will constitute the phallus shaft skin. (*Bottom figure*) Ultimately, the *medial antebrachial cutaneous nerve* provides tactile and erogenous sensation to the neo-urethra, while the *lateral antebrachial cutaneous nerve* provides tactile and erogenous sensation to the phallus shaft and glans (i.e., all externally located flap skin)

allow the operative site to heal adequately before upsizing the testicle prostheses (typically at least 3–4 months later) with larger testicle prosthesis [2].

Inflatable Penile Prosthesis Type and Size

Current penile prosthesis options for transgender men are limited to devices designed and manufactured for cis-gender male anatomy. These include inflatable penile prosthesis (IPP) devices (2-piece and 3-piece devices) and malleable devices.

Regardless of what penile prosthesis type is used, any implanted penile prosthesis must be anchored to the patient's body to prevent the device from migrating and eroding through the walls of the phallus or into the neourethra [23, 30, 31]. We use inflatable devices exclusively (almost always only *single* cylinder) and we anchor the cylinder to the anteromedial aspect of the obturator ramus (just medial and posterior to the insertion of the *adductor longus* tendon) by securing the proximal end of the cylinder within

a Dacron "boot" and then suturing this boot to the flat surface of the bone of the obturator ramus using non-absorbable Ethibond suture or bone screws connected to non-absorbable monofilament suture.

We believe that use of inflatable penile prostheses is superior to use of malleable devices and affords better clinical long-term outcomes. This is so for two important reasons [2, 3]:

1. An inflatable device is in the flaccid state (which means that majority of the time the device remains inside the patient), is softer, and occupies significantly less volume than a malleable cylinder, thereby reducing local pressure-related ischemic necrosis of the adipose tissue that comprises nearly all of the interior of the phallus. With semi-rigid malleable devices, any position that the patient assumes in the awake or sleeping state compresses the phallus tissues against the cylinder, thereby accelerating ischemic pressure necrosis of the interior of the phallus. Over time such ischemic necrosis results in a flabby phallus. The more "flabby" the phallus is, the less tissue support there is for the cylinder, and, therefore, the more likely it is that the end of the semi-rigid cylinder will erode through the (typically distal end) phallus.
2. However, a malleable penile prosthesis is anchored to the patient's body, and the net vector force of the device *onto* the phallus is directed to the dorsal aspect of the phallus. This, combined with the fact that the phallus "hangs" on the penile prosthesis cylinder, results in *increased risk of erosion of the cylinder* through the *dorsal aspect* of the phallus, most especially where the tip of the cylinder is located – at the distal end of the phallus.

Number of Cylinders

Penile prosthesis placement in a cis-gender penis always includes implant of two cylinders into the interior of each corpora cavernosa, which is defined and enveloped by the thick tunica of the corpora, which not only eliminate lateral-wise movement and sheer-stress of the device but also serve to protect the urethra from the cylinders by excluding the dorsally located cylinders from the ventrally located urethra. With any neophallus, the interior of the phallus has *no* internal compartments, and the cylinder will directly abut the somewhat centrally located neourethra and its pedicle. Unless the girth of a phallus is especially great, there is relatively little room for two cylinders, and implant of two cylinders risks impingement of the cylinders upon the urethra and its vascular pedicle. Furthermore, the presence of two cylinders versus one amplifies the effect of phallus adipose tissue ischemic necrosis as described above.

We have found that use of a single inflatable cylinder yields sufficient on-demand rigidity to afford penetration while minimizing risk of injury/compression to the urethra and adipose tissue necrosis-related loss of girth/fullness.

Feminizing Genital Gender Affirming Surgery

Vaginoplasty

With *vaginoplasty* surgery, a female vulva (the *medical* term for the external female genitalia) is created by a combination of removal of male structures (testes, penile shaft and penile urethra, a majority of the glans penis, and nearly all of the scrotum) and reconstruction of the residual genital tissues to create the key structures of a vulva and vagina.

Vaginoplasty surgery can be offered either *with creation of a vaginal canal* (to afford vaginal-receptive intercourse, referred to as "*full depth vaginoplasty*"/"*vaginoplasty with a vaginal canal*") or ***without*** *a vaginal canal* (which *we* term *shallow-depth vaginoplasty* and also sometimes referred to as "*zero-depth vaginoplasty,*" "*vaginoplasty without canal,*" and "*vulvoplasty*") [14].

Vaginoplasty with creation of a vaginal canal *absolutely requires* that the patient regularly perform vaginal dilation and douching on a regular basis for variable duration in order to maintain patency and hygiene of the vaginal canal. Unfortunately, there is no evidence-based data to

guide recommendations for *how long* and *how frequently* patients should dilate and douche. Interruption of the vaginal dilation regimen likely significantly increases the risk of vaginal stenosis and loss of vaginal function. This is also especially so during the first 1–2 years postsurgery. If vaginal stenosis occurs, it may result in the inability to engage in vaginal-receptive intercourse and severe stenosis may also result in retention of vaginal epithelial discharge (dead skin cell debris, sweat, skin oils, and other debris colonized with bacteria). When local infection develops, it results in inflammation, pain, foul discharge, and foul smell [3]. It is certainly possible that the stenosis may *not* always result in the aforementioned symptoms, but it is our opinion that this is likely the exception rather than the rule. In our experience, cessation of dilation is more likely to result in stenosis sufficient to cause infection and pain when it occurs during the first 1–2 years after surgery.

Patients should be discouraged from deciding to undergo creation of a vaginal canal based on the assumption that they have the option, whenever they wish, to simply stop dilation and douching activities, without consequence. Rather, patients should be encouraged to proceed with the creation of a vaginal canal *only* if they feel that they can commit to the dilation and douching schedule that their surgeon recommends. We relay that they should consider this a lifelong process [2]. During the decision-making process it is helpful for the surgeon to provide clear information about what vaginoplasty with, and vaginoplasty without creation of a vaginal canal requires re. post-operative care and maintenance. In our experience, the patients most likely to cease dilating their vaginal canal regularly are those that did not anticipate using it for intercourse even before surgery.

Weighing the Relative Advantages and Disadvantages Associated with a Vaginal Canal

Both full-depth and shallow-depth options should *always* be reviewed when discussing surgery options, as each has important potential advantages and disadvantages depending on the patient's needs with respect to the following five important domains:

1. *Option to have vaginal-receptive intercourse*. For patients who are or who plan to be sexually active and engage in vaginal-receptive intercourse (with men ***or*** women), a vaginal canal is necessary. For patients whose partners are exclusively female, having a vaginal canal *may* play a less important role with sexual intimacy, though this cannot be assumed and should be discussed with each patient. Some patients, regardless of their sexuality preferences, may find it very unlikely that they will be sexually active after genital surgery (e.g., personal preference, lack of partner, advancing age) and, therefore, have no reason to maintaining a vaginal canal that they will not use.
2. *Ability and commitment to perform vaginal dilation and douching*. Some patients may have physical limitations (e.g., obesity, limited neck and back range of motion, neuromuscular disorders that compromise manual dexterity, and blindness) that prevent them from being able to perform vaginal dilation and douching. Other patients may not be able to commit to being sufficiently *reliable* to perform essential vaginal dilation and douching tasks on a regular basis. Mental health conditions that may render a patient unable to care for themselves can also limit a patient's ability to perform dilation and douching.
3. *Access to necessary supplies (vaginal dilators and a douche) and a safe environment in which to perform vaginal dilation and douching*. Patients with very marginal income may not be able to afford (or replace) their essential self-care supplies (vaginal dilators and douche kit). Patients who are marginally housed or homeless will not be able to reliably perform vaginal dilation and douching tasks owing to lack of space (douching should ideally be done in a tub, in a recumbent or supine position) or a safe and private environment in which to perform these activities. Patients who are incarcerated or institutionalized are

especially vulnerable to these challenges, as they may not be given access to the necessary supplies and/or environment.

4. *Tolerance for risk of complications*: Vaginoplasty *with* creation of a vaginal canal is associated with a larger number of potential complications, and thereby higher overall risk of postoperative complications, as compared to vaginoplasty without creation of a vaginal canal. For example, creation of a vaginal canal carries the added risk of a rectal and/or urethral injury during creation of the vaginal canal space. A vaginal canal is subject to risk of prolapse, loss of viability of the epithelial lining of the canal, stenosis (loss of canal girth and depth), granulation tissue, pain associated with dilation, and infection. Management of these complications almost always necessitates close contact with, ideally, the surgeon who performed the surgery or another surgeon with vaginoplasty surgery experience, and, at a minimum, a provider with specialized knowledge about care and management of post-vaginoplasty complications – to provide care to the patient in the event that they suffer such complications.

   For some patients, *access to care* in the event of complications may be a mitigating factor in their decision to elect to undergo creation of a vaginal canal. Access to care can be a limiting factor based on availability of providers close to where the patient lives, affordability of care, and/or transportation to providers. Incarcerated or institutionalized patients, and patients who live especially far from comprehensive healthcare services, are especially vulnerable to these limitations.

   Some patients may simply have a lower (or higher) "risk-tolerance" than others and make their decision regarding surgery options without due consideration of the nature of the risks. A thorough discussion about perioperative and postoperative risks is helpful to patients to decide what surgery options best suit their expectations, abilities, resources, and risk-tolerance [2].

5. *Perceptions of appearance of the vagina and the importance of a vaginal canal:* Patients who elect vaginoplasty *without* creation of a vaginal canal (what we refer to as "shallow-depth vaginoplasty") can be divided into two groups: (1) those who are familiar with this surgical option, have had time to consider it, and are confident that this is the most suitable option for them, and (2) patients who have never heard of this option, but who, during surgery discussion, find that it could well meet their needs. In other words, patients often "do not know what they do not know," and simply learning about shallow-depth vaginoplasty and the requirements associated with full-depth vaginoplasty makes it easy for them to choose the best option for themselves. For these reasons, we believe that all patients should be offered vaginoplasty with and without canal.

Underlying reasons for why many patients choose shallow-depth vaginoplasty and to forego creation of a vaginal canal include the following: no plan to be sexually active (at all or specifically with vaginal-receptive intercourse) after surgery; no interest in intercourse with men (e.g., partners are exclusively female), vaginal-receptive intercourse is not sufficiently "important" for them to warrant the lifelong commitment to dilation and douching, physical inability to perform dilation (e.g., limited manual dexterity, back pain that precludes arching back to insert the dilators), and simply finding the need to dilate/douche too burdensome to do reliably.

General Concerns Related to Feminizing gGAS that Many Patients Share

Some of our patients who present for vaginoplasty (with or without creation of a vaginal canal) have the following three concerns:

1. To be "correct" or "real," their vagina should have a particular appearance. Patients considering vaginoplasty *without* creation of a vaginal canal have also reported struggling with doubts about:

2. Whether the absence of a vaginal canal will be visible and obvious to others.
3. Whether or not a vagina without a canal is a "real vagina," and therefore within the context of the *gender affirming* nature of their surgery, whether a vagina without a canal would make them less "female."

Development of a Feminizing gGAS Discussion Aid

We developed a teaching/discussion aid to use with patients when discussing the options of vaginoplasty *with* and *without* a vaginal canal (Fig. 2.3) [32]. This teaching aid speaks to 3 common concerns that patients considering vaginoplasty without creation of a vaginal canal might struggle with.

In this figure we show a panel of 40 plaster casts of cis-gender women's vaginas. These casts are from a series of 400 plaster casts made by a UK artist Jamie McCartney (https://jamiemccartney.com/portfolio/the-great-wall-of-vagina/).

The *first* of the three common concerns patients sometimes struggle with concerns is the feeling that their vagina must look a certain way to be "normal". This concern is addressed by explaining to patients that all vaginas are different from one another in appearance and that no two are identical. In our experience, the majority of patients mostly want anatomy that is *n*ormal. We emphasize that *normal* is a *spectrum* and that therefore there is no "gold standard" appearance for a vagina. Anyone used to seeing vaginas knows that each different one will be at a minimum slightly different from the next. Labia, for example, may be *more* or *less* prominent from person to person, and while both are well within the spectrum of normal, we explain that with vaginoplasty the final appearance of the vagina is, to a large degree, a function of what tissues are available locally for the construction of the vagina. Hence, for example, exaggerated long and thin pendulous labia, as

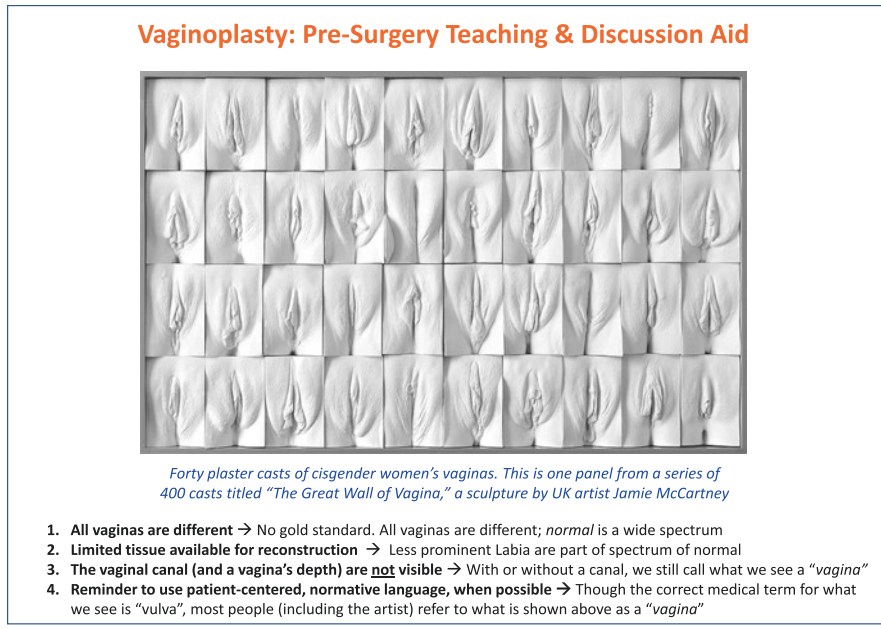

Fig. 2.3 Vaginoplasty: Pre-surgery teaching and discussion aid. (1) *All vaginas are different* → no gold standard. All vaginas are different; *normal* is a wide spectrum. (2) *Limited tissue available for reconstruction* → less prominent labia are part of spectrum of normal. (3) *The vaginal canal (and a vagina's depth) are not visible* → with or without a canal, we still call what we see a "*vagina.*" (4) *Reminder to use patient-centered, normative language, when possible* → though the correct medical term for what we see is "vulva," lay-people (like the artist and most of our patients) refer to what we see above as a "*vagina.*" (Forty plaster casts of cisgender women's vaginas. This is one panel from a series of 400 casts titled "The Great Wall of Vagina," a sculpture by UK artist Jamie McCartney)

some women have, are not possible to create (as tissues similar to this are not already present in this region of the patient's body), but their labia will instead be *less* exaggerated (labia majora less pendulous and labia minora slightly more fold-like) – but these features too are entirely *normal*.

The *second* of these concerns is that a vagina without a vaginal canal will look abnormal, and that other people will easily be able to tell if the patient either doesnt have a vaginal canal, or that they lack an especially deep vaginal canal. These concerns are addressed by explaining that the vaginal canal of any vagina is ***never*** visible by external view. A close look at the plaster casts of vaginas shown in Fig. 2.3 confirms that the vaginal canal is never visible by external view. It follows too that vaginal depth is not visible either.

The *third* of these concerns is that a vagina without a vaginal canal is "not a real vagina". We address this concern by *asking patients a series of questions* exactly as described below [32]. We start by asking the patient what word/term they use for what each of the casts displays in Fig. 2.3 shows. (In order to not bias patients, we do not show them the title of the artwork; we show them only the image of the plaster casts). Most patients refer to what is shown in Fig. 2.3 as "vaginas." Then, we ask patients whether or not they can *see* the vaginal canal in any of the casts (correct answer is no). We ask whether they can tell which vagina has the longer or shorter vaginal canal (correct answer is no). When patients respond that they cannot see the canal or tell how deep it is, we emphasize that because the canal is not visible, whether or not there is a vaginal canal does not determine whether what is shown is or is not a "vagina". What we see is still clearly a "vagina." We also point out that the artist who made the artwork also referred to them as "vaginas".

Decision-Making and Vaginal Depth

Patients who elect vaginoplasty *with* creation of a vaginal canal must have a suitable source of epithelium-lined tissue to line the canal. The depth of the vaginal canal space itself is generally not a limiting factor to achieve satisfactory depth, as the space can (barring an anatomic abnormality) be dissected to achieve a canal of up to ~6.5–7 inches.

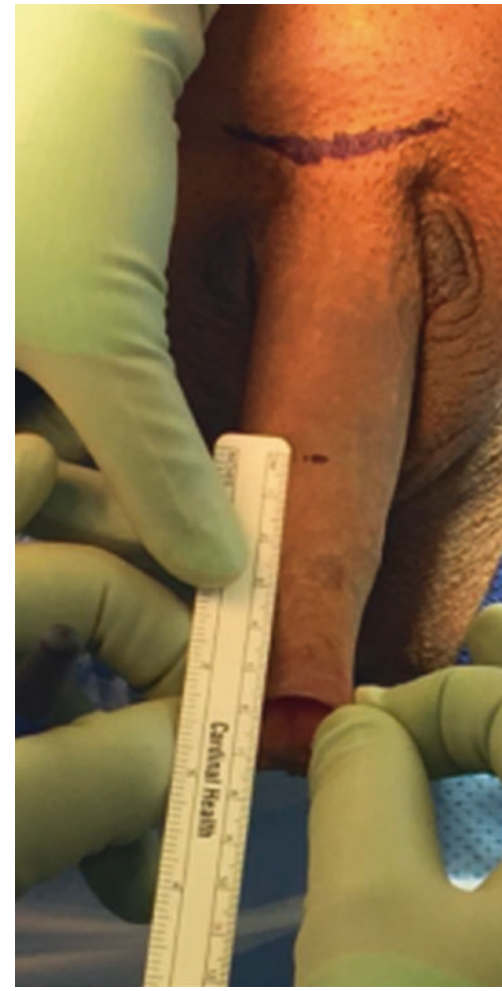

Fig. 2.4 The skin of the penile shaft, including the foreskin, is left intact in a tube-shape, and the distal end of the skin tube is over-sewn and then *inverted* so that, upon delivery into the vaginal canal space, the skin surface of the tube faces inward. This tube of penile shaft skin is a pedicle flap because it remains intact at what previously corresponded to the base of the penile shaft

For patients who are uncircumcised *and* have healthy penile skin[1], this generally poses little challenge because with the *penile inversion* technique (Fig. 2.4), the uncircumcised penis almost

[1] Penile foreskin that is tight owing to phimosis, or which is of poor quality due to chronic inflammation, is often unusable for use to line the vaginal canal space. In such cases, the surgeon should explain to the patient that, in order to achieve satisfactory vaginal depth, the surgeon will likely need to harvest skin or other epithelium from an additional source to line the vaginal canal (e.g., full-thickness or pedicled scrotal skin grafts or peritoneal local advancement or rotational flaps) and achieve satisfactory vaginal depth.