Genital Gender-Affirming Surgery & Urologic Care Overview

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Transgender; Gender non-conforming; Gender dysphoria; Gender-affirming hormone therapy (GAHT); Gender-affirming genital surgery; Vaginoplasty; Vulvoplasty/Shallow/Zero-depth vaginoplasty; Phalloplasty with urethral lengthening; Phalloplasty without urethral lengthening; Metoidioplasty; Management of patient expectations; Erogenous sensation; Complications

Keypoints:

- General urologists can expect to see and care for transgender and gender non-binary patients
- Culturally sensitive, gender-affirming terminology is important for care-quality
- Historically, transgender and gender non-binary people have been subject to healthcare disparities. The trauma informed care and interdisciplinary care models are valuable tools and models for care delivery
- The World Professional Association for Transgender Health (WPATH) distributes care guidelines for care of transgender patients; these are endorsed by the majority of U.S. professional medical associations and health insurance companies
- Patients today have numerous genital gender-affirming surgery options. The challenge for providers is to help patients identify which specific surgery best balances risks and benefits for themselves, using an informed care model
- The general urologist can be especially helpful to transgender and gender non-binary patients, and significantly improve their care quality

1. Introduction

Transgender and gender diverse (TGD) people have historically been marginalized by society and the healthcare system. With growing awareness of TGD identities, and expanding coverage of gender-affirming care by private insurers and some state Medicaid plans, urologists will encounter an increasing number of TGD patients for both gender-affirming and general urologic care. The most common complications after genital gender-affirming surgery (gGAS) relate to the lower urinary tract

and sexual function. Thus, urologists are likely to see more TGD patients for management of urinary and sexual dysfunction.

This Core Curriculum section introduces the urologist to the transgender patient population to facilitate sensitive care, provide information on the process of gender transition, and provide insight on how gender transition affects the genitourinary system. We recommend that readers also refer to Lesson 5 of the 2017 **AUA Updates Series: Genital Gender Affirming Surgery for Transgender Patients** and the 2022 **AUA Update Series: A Urologist's Guide to Caring for Transgender Women** for additional and more detailed information about gender-affirming surgery.[1]

2. Terminology, Definitions, and Background

An individual's **sex assigned at birth (SAB)** is generally based on genital anatomy and genetics. By contrast, **gender** refers to behaviors, attributes and social roles that a given culture/society associates with being a woman or man in that culture/society.[2] An individual's **gender identity** is an internalized construct which refers to their "inner sense" of self as female, or male, a non-binary intermediate on a spectrum of gender, or other. Gender and gender identity are highly contextual in that they are defined by the individual's society and culture. Gender identity can be fixed, fluid (gender-fluid) or non-specific (agender).[3]

Cisgender is a term for individuals whose gender identity aligns with their sex assigned at birth.

Transgender is a term for individuals whose gender identity and/or gender expression does not align with their sex assigned at birth, and instead aligns with the sex opposite to what they were assigned at birth.[3]

A transgender woman is someone whose sex assigned at birth is male, who identifies as a woman. A transgender man is someone whose sex assigned at birth is female, who identifies as a man.

Gender non-conforming (GNC), gender non-binary (GNB) and **gender-queer** are terms for individuals whose gender identity lies somewhere on what is really a spectrum—between the traditional binary gender constructs of "man" and "woman." Some may use gender-neutral pronouns (e.g. they/them).[1,2]

Sexual orientation relays a person's sexual/romantic attractions and behaviors towards others.[3,4,5] A common misconception is that gender identity is equivalent to (or defines) a person's sexual orientation.[1]

Intersex and **Differences of Sexual Differentiation (DSD)** are terms designated for individuals born with ambiguous genitalia (phenotype not clearly male or female). Birth-sex designation commonly requires gene karyotyping. DSD/intersex do not predict gender identity.

Transsexual is an older term that may be seen in medical and public-health contexts to describe transgender individuals who have or wish to alter their body with gender-affirming hormones and/or surgery. This term is debated and disfavored in many settings; ***it is safer for clinicians not to use the term "transsexual" unless and until they are sure that it is a term their clients are***

comfortable with. [6] When in doubt, clinicians should ask their clients which terms they would like the clinicians to use.

Incongruence between the sexual characteristics of a transgender person's body and the gender they identify with may result in a psychological state known as gender dysphoria.[2] Gender dysphoria refers to the distress (anxiety, depression, despair) which can accompany the incongruence between an individual's experienced gender, and the gender that their society/culture associates with the sex they were assigned at birth.[7,8] In 2013, the American Psychiatric Association's fifth and newest edition of its Diagnostic and Statistics Manual of Mental Disorders (DSM-V) renamed the diagnosis associated with being transgender from "gender identity disorder" to "gender dysphoria," emphasizing distress from the incongruence between birth sex and gender identity, and recognizing that this incongruence may not necessarily be pathological if it does not cause the individual distress. [1] For many, gender dysphoria fosters a very negative perception of their own genitals (which can manifest as great unease with physical examination), and can preclude physical and/or emotional (romantic) intimacy.[1] By helping patients render the form and/or function of their body in alignment with their gender identity, gender-affirming surgery may help to treat gender dysphoria.

Gender-affirming surgeries (GAS), also known as **gender-confirming surgeries (GCS)**, are operations performed for the purpose of helping patients better align their bodies with their gender identities. Terms such as sex or gender reassignment surgery are considered by many to be disrespectful and have fallen out of favor; these should be avoided.[1,] GAS includes facial, neck, chest, gynecologic, genital and body contouring surgeries. Gender-affirming procedures, such as permanent hair removal from the face, genital and/or other areas of the body, may also be important for patients. Not all transgender patients seek GAS and/or gender-affirming procedures. [1,2] A patient's transition history should be documented and is relevant to many (though not necessarily all) clinical needs.

2.1. Terminology related to genital anatomy

Providers should attempt to use gender-congruent or gender-neutral language with patients regarding their pre-GAS anatomy. Use of anatomic terms related to the sex a patient was assigned at birth can induce dysphoria. Examples include referring to a trans-masculine patient's "clitoris" or "vagina." Instead, other names or phrasing can be used that avoids the implicit misgendering of these terms, such as referring to the virilized clitoris as "your current penis", and the vaginal canal space as "your front-hole space". Other unique gender incongruent structures (e.g. scrotum, labia) can be referred to as "what used to be your 'X'" or "what will be your 'Y'" (anatomic structure). While some of the terms described here may seem awkward, providers should also consider that, in addition to the fact that patients prefer gender-congruent over gender incongruent terminology, such terms also serve the purpose of conveying to patients that the provider is sensitive and aims to respect the patient's gender identity. Providers should consider *asking* patients what terms they prefer for their bodies, both before and after surgery. For example, while the term "neophallus" is a term surgeons may use to describe surgically constructed genitals, many patients appear to prefer the more

normative term “my penis” over “my neophallus.”

2.2 Insensitive terminology

Terminology is fluid and constantly evolving. However, use of objectifying terms, such as “transgendered”, or using the word “transgender” as a noun, should always be avoided. Even unnecessary use of “transgender-” as a prefix, particularly in casual contexts where a person’s gender is immaterial, can be experienced as pejorative. As our understanding of gender has advanced, some terms used in the past no longer make sense. “Gender reassignment”, for example, misses the point that gender is innate and cannot be assigned, or even chosen. Terms that rely on an action being done to patients, such as “reassignment”, are giving way to terminology that is more patient centered (e.g. “gender affirming” instead of “sex reassignment”).

Terms such as ‘‘cross dresser’’ and ‘‘transvestite’’, and even increasingly dated term “transsexual” are often used incorrectly and perceived by gender non-conforming people as pejorative. When referring to a patient’s anatomy or features, use of terms such as “real”, “normal”, “natural”, “chromosomal female” (or male), or similar qualifiers, relay that the speaker does not accept the patient as she/he/they identify and present themselves to the world. Such terms are often hurtful, dysphoria inducing, and can undermine a patient’s trust in their provider.

3. Epidemiology

Most past epidemiologic studies of gender dysphoria have been limited by methodologic challenges and/or selection bias.[1,2,3] Successively newer studies demonstrate a clear trend: each report describes greater incidence and prevalence. This trend likely reflects changing social mores and greater accessibility to healthcare, which allow greater numbers of transgender people to be accounted for. [1] The most current data for the U.S. by Flores et al. finds that 0.6% of U.S. adults (approximately 1.4 million people) and 0.7% of U.S. adolescents, self-identify as transgender.[9] This data shows that there are sizable populations of transgender people in *every* U.S. state, and that no state has a transgender population below 0.2%.

4. Transgender Health Disparities

Transgender people are a marginalized and vulnerable population. Findings from the National Transgender Discrimination Survey[10] show that transgender people are at *significantly greater* risk of severe depression, substance abuse, sexual and violent physical assault, discrimination, and suicide attempt than cisgender people. Healthcare professionals receive limited and variable education regarding the care of transgender patients, and many providers are uncomfortable providing care for such patients. [11,12,13,14] Marginalization and lack of (or deferred) access to treatment increase risk for poor health outcomes such a higher risk for HIV and other STIs, and suicide.[15]

5. Cultural Competence: How Do We Provide Affirming Care for Transgender and Gender Diverse Patients in Our Institutions?

A trauma-informed care (TIC) approach is guided by the recognition of trauma and its impact on an individual. TGD people experience a disproportionate burden of trauma on individual, interpersonal, institutional, and societal levels.[16] The TIC lens is valuable in caring for the TGD population in healthcare settings, where many TGD individuals have experienced prior trauma and may fear possible repeat traumatization. Adopting a trauma-informed approach requires attention, caring awareness, sensitivity and cultural change at an organizational level, and engagement with community stakeholders is critical to this process.

Substance Abuse and Mental Health Services Administration (SAMHSA)'s six key principles of trauma-informed approach include:

1. Safety
2. Trustworthiness & transparency
3. Peer support
4. Collaboration & mutuality
5. Empowerment, voice & choice
6. Cultural, historical & gender issues

Providers should ask all patients which pronouns they use, avoiding any assumptions. Providers should use these pronouns in clinical encounters and all documentation. Misgendering (when a transgender person is addressed or referred to by a gender with which they do not identify) may be experienced as a rejection of their identity, leading to a sense of alienation and disrespect. Patients also relate that being misgendered can make them feel unsafe in their care environment.

In the medical setting, misgendering can occur from medical records. For example, if a transgender person has not yet undergone legal name change, the name and gender designation from their medical records will reflect only their sex assigned at birth rather than how they identify. Intake forms and other records should ideally allow patients to enter their preferred name, the gender they identify with, and their preferred pronouns.

6. Interdisciplinary Care Model

Gender transition can utilize expertise from multiple domains: mental health, medical, surgical, and social work. An interdisciplinary care model, wherein multiple care providers can each provide direct care to patients *in parallel and in communication with one another*, has been shown to be effective in countries with established transgender care programs.[1]

Medical and allied healthcare domains integral to an interdisciplinary transgender care team, including:

1. Primary care
2. Endocrinology
3. Urology
4. Plastic surgery

5. Speech therapy
6. Otolaryngology, including voice surgery
7. Gynecology
8. Reproductive endocrinology/infertility
9. Colorectal surgery
10. Dermatology
11. Nursing
12. Mental health (psychiatrists, psychologists, therapists)
13. Social work
14. Medical informatics
15. Electronic medical record specialists / information technology (IT)
16. A bioethicist and/or bioethics review committee

7. Gender Transition and Treatment of Gender Dysphoria

While many transgender people experience gender dysphoria, not all do. There is unequivocal evidence that gender dysphoria *can* be alleviated through treatment.[2] Treatment of gender dysphoria improves quality of life and, by extension, health.[17] Interventions to facilitate gender transition, and for the treatment of gender dysphoria, are highly individualized, and focus on helping the individual explore the gender role that is most comfortable for them.

The World Professional Association for Transgender Health (WPATH) is the leading international professional association that focuses on transgender health, surgery, and evidence-based research and education. WPATH publishes evidence-based care guidelines called the Standards of Care (SOC), which outline a proposed stepwise approach to transition and the core elements of treatment of gender dysphoria. These include: counseling/behavioral therapy, social transition (living life full-time in the identified with gender), and use of cross-sex hormones, and, for some, body modification with gender affirming surgery.

With its *Standards of Care*, WPATH is clear that there is *implicit flexibility* in how treatment may be best provided for individuals, as social norms and resources vary throughout the world. Some patients may defer social transition until after beginning cross-sex hormone therapy. These patients report that starting hormone therapy first decreased their gender dysphoria sufficiently to allow them to commence social transition.

A common theme of the SOC is to recommend that that patients experience the *reversible* aspects of transition (e.g. social transition; cross-sex hormone use) to the fullest extent *before* initiating *irreversible* treatment approaches (e.g. gonadal and genital surgeries). The SOC are endorsed by U.S. Federal health agencies and by most commercial healthcare insurance companies. Gender affirming surgery is a covered benefit under Medicare, and in 27 states under Medicaid and commercial health insurance plans, provided that the ICD-10 diagnostic coding system classifies gender dysphoria and transsexualism under category F64 (*Gender Identity Disorders*) as ICD-10 F64.0.[18]

It should be noted that an update to the SOC 7 is in process. Version 8 of the SOC Guidelines is expected to be released in 2022.[19]

8. Treatment: Gender-Affirming Hormone Therapy

Gender-affirming hormone therapy (GAHT) (sometimes referred to as “cross-sex hormone therapy”) is therapeutic during gender transition in two important ways. First and foremost, for most transgender individuals, estrogen and testosterone help to decrease gender dysphoria and dysphoria-related anxiety. Second, GAHT helps promote desired and reduce some undesired secondary sex-characteristics. This effect is variable. Before commencing GAHT, patients should be counseled about the likely adverse effects on fertility and should be offered sperm or oocyte-banking. GAHT is typically managed by a primary care provider or an endocrinologist with specialized training in cross-sex hormone therapy. Dosage is typically titrated to satisfactory reduction/control of gender dysphoria, and not necessarily to maximize desired physical effects, which can require unsafely high dosages (especially for transgender women).

9. Treatment with Gender Affirming Surgery: Criteria and Patient Selection

WPATH SOC v7.0 provide **clinical care** guidelines for adults undergoing genital gender-affirming surgery (vaginoplasty and gonadectomy in trans-masculine patients, and metoidioplasty or phalloplasty and gonadectomy in trans-feminine patients).[2]

The WPATH SOC outline the following 7 guideline criteria that patients should meet in order to undergo gGAS. These same criteria should be addressed in the two surgery referral letters for genital gender-affirming surgery which the SOC guidelines dictate that patients must receive from two different mental health providers, and share with their surgeon:

1. Persistent, well documented gender dysphoria;
2. Capacity to make a fully informed decision and to consent for treatment;
3. If significant medical or mental health concerns are present, they must be well controlled;
4. 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);
5. 12 continuous months of living in a gender role that is congruent with their gender identity* (**not required* for bilateral orchiectomy & hysterectomy-ovariectomy alone)
6. Two referral letters from two different mental health professionals, which attest that the patient meets each of the above criteria. Referral letters should ideally also comment on whether the patient has access to the resources and support services (including a stable and safe living situation) they may need immediately after surgery.
7. Age of majority in a given country.

Providers must always consider that there is implicit flexibility with implementation of the standards of

care (SOC) guidelines in the care of individual patients. Indeed, the SOC were drafted for a global audience of providers. While the guidelines should be followed whenever possible, WPATH acknowledges that there are circumstances that require flexibility. The overarching goal is to serve the patient.

These criteria do not apply to individuals undergoing these procedures for medical indications other than for gender dysphoria. WPATH explicitly acknowledges that the aforementioned guidelines may be modified to address the individual needs of a patient (e.g. anatomic, social, mental health factors, and adolescent age) or situation (e.g. absence of resources; need for a specific harm-reduction strategy; an experienced health professional's evolving method of handling a common situation). Such *clinical departures* from the SOC should, however, be explained to the patient *and* documented through informed consent.

Gender-affirming surgery (GAS) is *not* performed on young children or preadolescents. Surgery for adolescents is controversial but a potentially acceptable clinical departure from the SOC guideline that patients should be of age of majority in a given country. For carefully selected adolescent patients, gender-affirming surgery can provide significant benefit. The timing of surgery vis-à-vis other life plans (e.g. commencing college studies) can be very important, and, for patients who are ready for surgery, favor GAS close to- but before, age 18. Patients must provide assent and their parents/guardians (as applicable) must provide consent. [2] For such cases, whenever possible, a plan of care should include close communication between the patient's parents or guardians, medical, mental health and surgery providers.

Lastly, it should be mentioned that a new version of the WPATH SOC (v. 8.0) is in the process of being drafted and will be available to the public in 2022. Providers should check the WPATH website (wpath.org) for the latest version of the SOC. The SOC are available for free download in 19 languages (including English).

10. Genital Gender Affirming Surgery

10.1 Genital gender affirming surgery categories

(See Reference 1)

Feminizing:

1. Facial feminization surgery, including hyoid-bone ("Adam's apple") reduction
2. Vocal cord surgery to complement speech therapy
3. Breast augmentation
4. Injection of fillers for body contouring
5. Genital surgeries (gonadectomy with or without vaginoplasty)

Masculinizing:

1. Facial masculinization (uncommon)

2. Bilateral mastectomy
3. Genital surgeries (gonadectomy with or without metoidioplasty or phalloplasty; patients may also elect placement of genital prosthetics: testicular prostheses; penile prosthesis after phalloplasty)

10.2 Feminizing genital gender affirming surgeries

Gender-affirming priorities for transfeminine patients typically include elimination of male-appearing genitalia and replacement with feminine-appearing genitalia capable of erogenous sensation and normal urinary function. Some patients (though not all) seek creation of a neovaginal cavity that affords them the ability to have receptive vaginal intercourse. Detailed discussion of pre-operative preparation, surgical techniques (including penile inversion, peritoneal, and intestinal vaginoplasty), outcomes, complications, and post-operative care are discussed in the section: “Feminizing Genital Gender Affirming Surgery: Techniques, Hospital Pathways, and Management of Complications.” A brief overview is provided below.

Bilateral orchiectomy can be performed as a stand-alone procedure, before or in lieu of additional genital surgeries. Bilateral orchiectomy offers patients several health and transition-related benefits:

1. May discontinue anti-androgens (e.g. spironolactone): eliminates diuretic negative side-effects
2. May lower their dose of estrogen: decreases dose-related adverse cardiovascular effects of exogenous estrogen
3. Reduced gender dysphoria associated with the presence of testicles
4. Reduces/eliminates physical discomfort associated with “tucking” the testicles (if the patient desires to “tuck”)

Before bilateral orchiectomy, the option to pursue fertility preservation should always be discussed. If patients wish to preserve future fertility, sperm banking should be done, ideally prior to starting hormone therapy, but must be done prior to bilateral orchiectomy. Patients may experience increased risk of osteoporosis after gonadectomy and should maintain a cross-sex hormone regimen. As a stand-alone procedure, bilateral orchiectomy can be performed via a vertical midline scrotal incision to minimize risk of compromising tissues necessary at time of vaginoplasty, with or without creation of a vaginal canal.

For those who also desire excision of scrotal skin, orchiectomy with scrotectomy may be offered; patients who choose this approach must understand that this impacts their options for future vaginoplasty.

Vaginoplasty and Vulvoplasty

“Penile inversion vaginoplasty” is the most common approach for feminizing genital reconstruction, and generally refers to the technique where at least part of the vaginal canal is made by advancing penile skin into the neovaginal space. (**Figure 1**) Excess scrotal and perineal skin is used as a graft

to help line the neovaginal space. While vaginoplasty in total is a complex genitourinary reconstructive procedure, it is a collection of smaller procedures familiar to urologists, in addition to other reconstructive procedures: (**Figure 2**)

1. Bilateral simple orchiectomy
2. Penile disassembly (the corpora cavernosa opened or resected to the level where individual crura join to form the penile shaft);
3. Perineal urethrostomy (the bulbar urethra and bulbospongiosus tissue is spatulated ventrally and used to create a neomeatus between the neoclitoris and the opening to the neovagina
4. Perineal exposure of the prostate and canal dissection (located posterior to the bladder and prostate, and anterior to rectum)
5. Vaginal canal construction with skin grafts, peritoneal flaps, and/or intestinal tissue
6. Clitoroplasty (a small portion of the glans penis is dissected from the penis, together with the penis' dorsal neurovascular bundle, to create a sensate neoclitoris);
7. Labiaplasty (a portion of scrotal skin is used to create the labia majora; penile skin can be used to create labia minora.)

Neovaginal canal creation is not performed for individuals who are not interested in using or maintaining a neovaginal canal or are not candidates for neovaginal canal dissection due to medical comorbidities or past surgeries. Vulvoplasty may be the preferred option (also referred to as "shallow-depth" or "zero-depth" vaginoplasty), for creation of the external feminine appearing genitals without a neovaginal canal. The vaginal canal of a cisgender vagina is not externally visible. Hence, the presence or absence of a neovaginal canal deep to the invaginated "dimpled" introitus should not affect external appearance with vaginoplasty (**Figure 3**). Surgeons should counsel patients on their options based on their surgical risk factors to help patients make decisions based on their goals.

Individuals who undergo vaginoplasty with neovaginal canal creation must be prepared for lifelong vaginal dilation, use of lubrication during intercourse and dilation, and vaginal hygiene maintenance.

Preparation for these surgeries includes social, medical and mental health evaluation and readiness, and often genital hair removal and pelvic floor physical therapy. Patients must be nicotine-free and be counseled for appropriate expectations of surgical results. Vaginoplasty and vulvoplasty has potential to impact an individual's overall and health-related quality of life, gender congruence, mental health, urinary function, and sexual function.

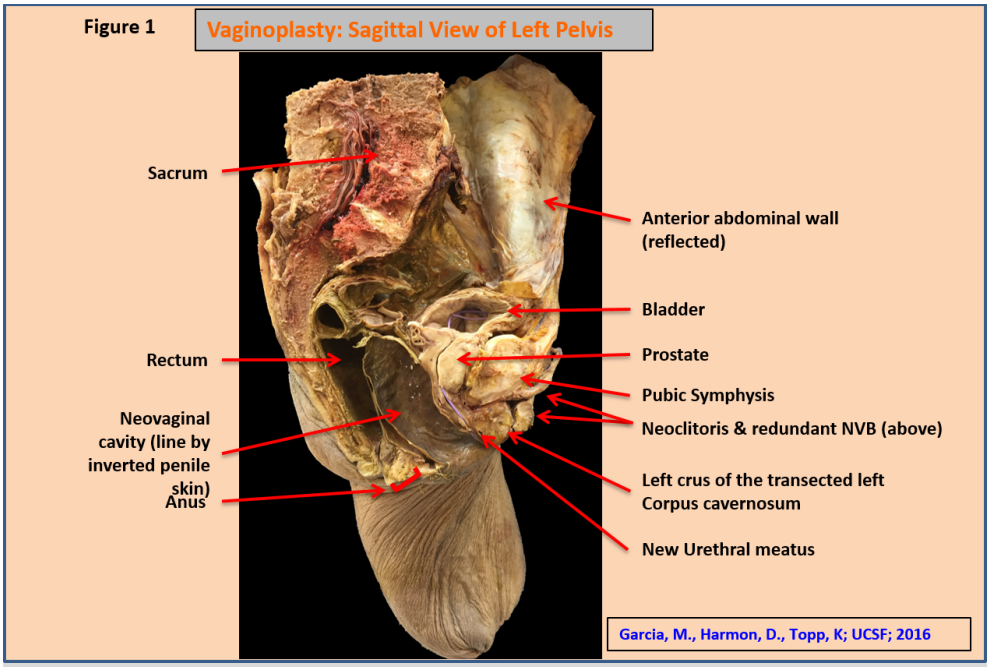


Figure 1: Vaginoplasty: Sagittal View of Left Pelvis

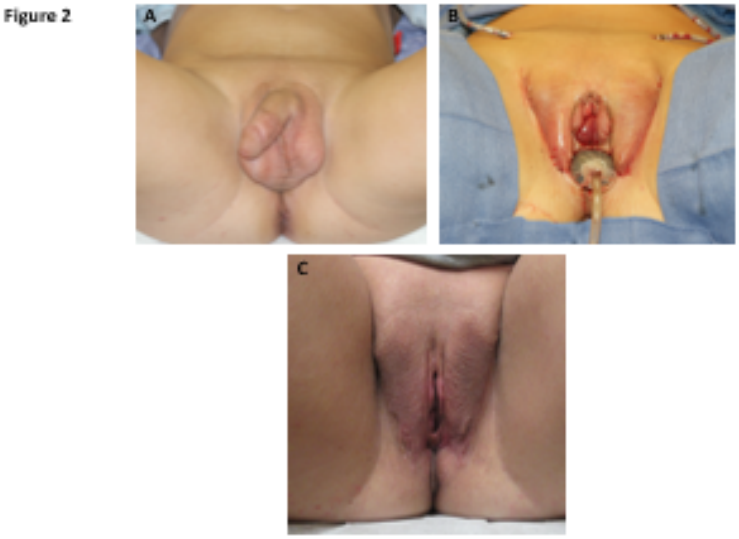
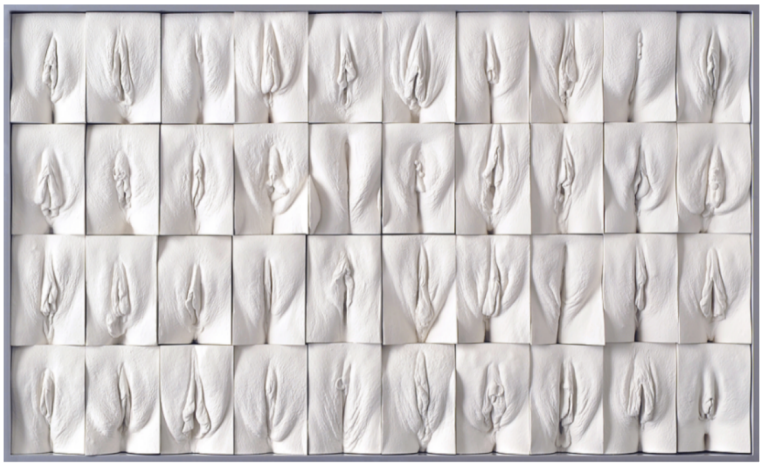


Figure 2: Example patient before and after gender-affirming vaginoplasty. (**A**) Patient prior to surgery. The level of the perineal body is marked first; (**B**) Vulvar appearance at conclusion of surgery; (**C**) Vulvar appearance 6 months after surgery.

Figure 2: Example patient before and after gender-affirming vaginoplasty. (A) Patient prior to surgery. The level of the perineal body is marked first. (B) Vulvar appearance at conclusion of surgery; (C) Vulvar appearance 6 months after surgery.

Figure 3:

Vaginoplasty: Pre-Surgery Teaching & Discussion Aid



Forty plaster casts of cis-gender women's vaginas. These are among a series of more than 400 casts (that include a handful of trans-women) called "The Great Wall of Vagina," by UK artist Jamie McCartney

1. **All vaginas are different** → No gold standard; as the panel shows, 'normal' is a wide spectrum
2. **Limited tissue available for reconstruction** → Expect *normal*- b*ut less prominent* Labia
3. **The vaginal canal and vaginal depth are <u>not</u> visible** → With or without a canal, *one* is *indistinguishable* from the other; we still call what we see a "*vagina*" (just as this artist has)

Figure 3: Vaginoplasty: Pre-Surgery Teaching & Discussion Aid

10.3 Masculinizing genital gender affirming surgeries for transgender men and gender diverse individuals

Common priorities for transgender patients can include some or all the following factors that can contribute to the patient's gender dysphoria: elimination of feminine-appearing external genitalia, removal of female gonadal structures, replacement with natural appearing masculine genitalia, standing to void, achieve erection for penetrative intercourse, and preservation of erogenous sensation and orgasm.

10.3.1 Hysterectomy and oophorectomy

Patients can undergo removal of the uterus and ovaries earlier than genitourinary reconstruction. Gonadectomy both improves masculinizing hormone therapy, and with hysterectomy, eliminates menses, which for many serves as a regular aggravating factor for gender dysphoria. Patients should be counseled regarding fertility preservation options and referred to an appropriate fertility specialist as needed.

10.3.2 Masculinizing genital surgery options

Transmasculine individuals seeking gGAS have a significant number of options to choose from. Transmasculine individuals already on testosterone therapy develop hormone-mediated clitoral hypertrophy. (In direct discussions with patients, many appreciate the term "small penis" in lieu of "clitoris", and "penis" in lieu of "phallus", as these are more normalizing and less dysphoria-inducing terms. In purely medical discussions such as this, we use the terms "clitoris" and "phallus" for clarity).

Overview of options: The surgical options available to patients today afford, by various means, creation of a neophallus using either their enlarged clitoris as the starting point or by using tissue

flaps mobilized from elsewhere on the body). This can be completed with elimination (or preservation) of the vaginal canal, urethral lengthening (UL) to allow the patient to void from the tip of their phallus, and creation of a scrotum. Patients may also choose to undergo testicle and/or penile prosthesis placement if anatomy allows.

10.3.3 Masculinizing gGAS techniques

With **metoidioplasty** surgery, the enlarged (virilized) clitoris is the basis for the phallus that is created. Different surgical techniques serve to lengthen the clitoris. The suspensory ligament attachments that normally tether the clitoris to the pubic symphysis at midline can be divided. This achieves a 1-3 cm increase in clitoris length. Another surgery that lengthens the clitoris is to correct the natural chordee by incising the mucosa of the ventral aspect of the clitoris and then placing the clitoris shaft to stretch. The labia majora are the natural homologue to the scrotum, [20] and these tissues can be used to create the scrotum. Any bulky labia majora skin anterior to the base of the phallus can be transposed posteriorly to render the phallus more visible.

Metoidioplasty can be performed either with or without UL.[21] When performed with UL, local hairless skin flaps and/or or buccal mucosa grafts are used to create the neourethra,[1,22] which allows the patient to urinate from the tip of the phallus.[23,24,25] Metoidioplasty seldom gives the ability to achieve erection and penetration due to the limited clitoris-derived phallus length, and the absence of an intrinsic erection-prolonging mechanism within the corpora of the clitoris. Unfortunately, there currently are no inflatable or malleable erectile prosthetics designed for a clitoris-based phallus approved by the FDA for use in the USA.[sh1]

Phalloplasty refers to construction of a neophallus using pedicled or free skin-flaps. Phalloplasty is able to yield a larger-size phallus (consistent with the expected size for a typical adult cisgender man). The skin-flap includes only skin, subcutaneous adipose tissue, and nerves and vessels. Flaps can be raised from various donor sites, including but not limited to the radial forearm (RF), anterolateral thigh (ALT), midline abdomen, lateral abdomen (groins), and Latissimus dorsi muscle and skin of the flank. The most common donor sites are RF (**Figure 4A**), and ALT (**Figure 4B**).

Blood supply: For the free flap options, the flap's artery and veins can be microsurgically anastomosed to either the deep inferior epigastric artery/veins or the femoral/saphenous vessels of the groin. [1,26,27,28,29] (**Figure 5**)

Tactile and erogenous sensation of most of the phallus is afforded only by the RAF and ALT flaps by microsurgical nerve coaptation of the flap's sensory nerves to one of the two clitoral nerves. Another source of erogenous sensation comes from the clitoris, which can be buried beneath the skin at the base of the phallus or buried near the center of the base of the phallus. To ensure preservation of erogenous sensation of the clitoris, some surgeons may choose to leave the glans clitoris exposed externally to allow direct stimulation. Because the visibility of genitalia present at birth aggravates gender dysphoria for many patients, the decision to leave any portion of the genitalia present at birth exposed should always be discussed with patients before surgery. [21] By all of these techniques, some groups have reported that over 90% of patients have some degree of tactile and erogenous

sensation after RAF flap phalloplasty. [30]

Urethral lengthening:

Phalloplasty with urethral lengthening (P+UL):

A portion of the flap can be dedicated to construction of a full-length neourethra, which resides within the center of the neophallus ("tube within a tube" design) and spans the entire length of the phallus, to ultimately afford the ability to stand to urinate. Creation of a full-length neourethra is feasible with most RAF flaps, and ALT flaps where the leg is especially thin and the subcutaneous adipose tissue layer is thin and not bulky. These flaps will ultimately have a robust, dedicated blood supply. Local tissue pedicle flaps other than the RAF and ALT (i.e. suprapubic and groin flaps) rely solely on local blood supply and can never provide sufficient blood supply to sustain a neourethra.

Phalloplasty can also be offered without urethral lengthening (P-UL).

A "one size fits all" approach to gGAS surgery options is insufficient and will not serve many patients. Providers must consider that patients "don't know what they don't know" about short- and long-term surgery risks and benefits, and surgeons "don't know what they don't know" about what each individual patient most wants to gain from surgery, and what specific outcomes each wants to avoid. Ultimately, different patients will prioritize potential gains and potential risks, differently. The surgeon should articulate all potential "gains" and "costs" of each surgery to help patients arrive at an informed choice.

Most complications with phalloplasty (and metoidioplasty) come from the urethral lengthening (+UL) portion of the surgery, which allows the patient to urinate from the tip of their penis. Complications include strictures, fistulae, obstructive LUTS, and UTI's. These often require urgent management, followed by single and multi-stage (and often, repeat) repairs. [31,32]

Previous descriptions of phalloplasty without urethral lengthening did not include creation of a natural appearing distal urethra, and these described the urethral opening entirely separate from the neoscrotum and visible within the perineum. [33]

A technique was developed that aimed to create as normal a neophallus and scrotum as possible, where these structures are identical in external appearance to those achieved with P+UL. (See Editorial Comment: **Figure 5b**).[34] By this technique, a smaller portion of the flap can be dedicated to creating a very short (~2cm) distal urethra purely for aesthetic appearance (i.e. to give the tip of the phallus a normal appearance with a normal urethral opening). The patient's true urethral meatus is left in-situ in the perineum.

Vaginectomy can be offered only after hysterectomy has been completed, though it should be noted that a small subset of patients may elect to preserve this part of their body for use with sex, or other reasons. Surgical techniques include excision (associated with a risk of significant blood loss), or ablative vaporization of the mucosa lining the vaginal walls by electrocautery (Bovie, set to 70-CUT mode), or a combination of the two. [1] After excision or ablation, the vaginal canal walls are sutured together to obliterate the entire canal.

Clitoris transposition: Many transmasculine patients wish to have the clitoris disappear from view, as the visibility of the native clitoris and other female genital birth anatomy is often a significant source of gender dysphoria. For those interested in eliminating the visibility of the clitoris, this is accomplished by removing the skin of the entire clitoris glans and shaft and burying the latter beneath surrounding tissues. This preserves the clitoris' important functions (tactile and erogenous sensation) but eliminates it from view.

Scrotoplasty: Once the vaginal cavity has been obliterated, skin tissue from the labia majora can be mobilized to create a scrotum.[1]

Glansplasty: Also known as glans-sculpting, is a surgical procedure wherein small skin flaps are raised at the distal end of a full-size phallus to create a more natural appearance of a glans penis by creating a well-defined coronal ridge.[1] (**Figure 7**)

Penile and testicle prostheses: Prosthetics are typically placed only after complete wound healing and when it is clear that the patient has no ongoing infections and requires no foreseeable surgeries. This is because the principal risk to prosthetics is infection. Hence, implant of prosthetics is typically the last surgery patients undergo. Implant of a penile prothesis for erection function is challenging as the phallus anatomy lacks a natural Tunica-lined space (homologous to the corpora cavernosa) into which to secure the penile prosthesis. Also, unlike a cisgender penis, the phallus created with phalloplasty is anchored only to the skin, and not to the bony pelvis. Hence, a prosthesis must be anchored and fixed to local bone. [1,35] (**Figure 8**)

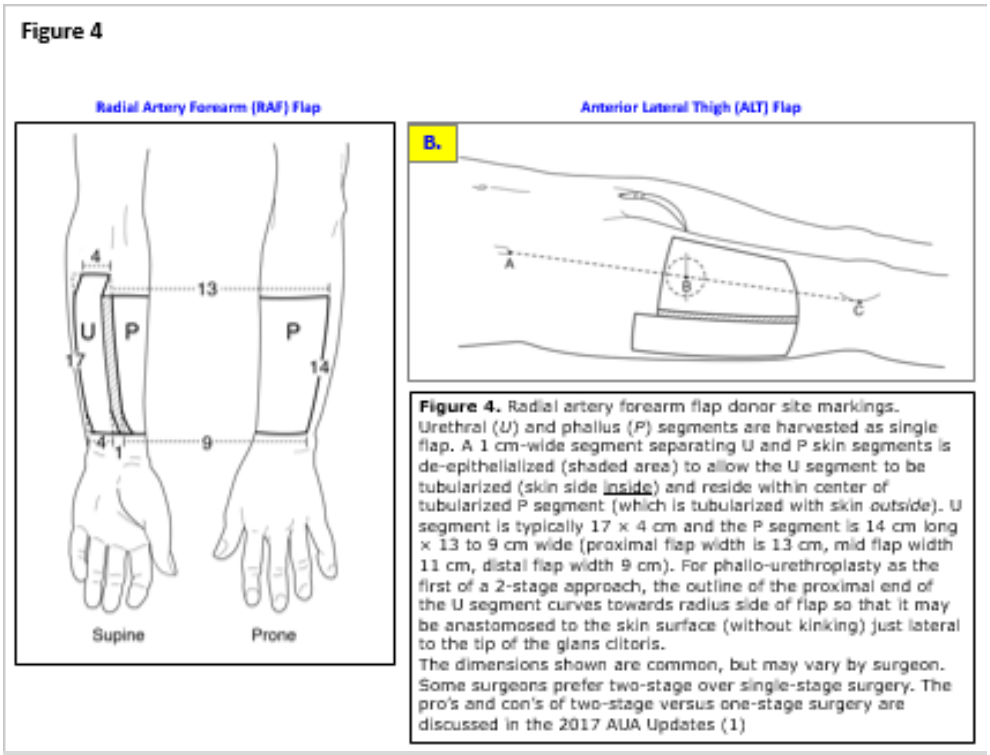


Figure 4: Radial Artery Forearm (RAF) Flap and Anterior Lateral thigh (ALT) Flap templates. Radial artery forearm flap donor site markings. Urethral (U) and phallus (P) segments are harvested as single flap. A 1 cm-wide segment separating U and P skin

segments is de-epithelialized (shaded area) to allow the U segment to be tubularized (skin side inside) and reside within center of tubularized P segment (which is tubularized with skin outside). U segment is typically 17 × 4 cm and the P segment is 14 cm long × 13 to 9 cm wide (proximal flap width is 13 cm, mid flap width 11 cm, distal flap width 9 cm). For phallo-urethroplasty as the first of a 2-stage approach, the outline of the proximal end of the U segment curves towards radius side of flap so that it may be anastomosed to the skin surface (without kinking) just lateral to the tip of the glans clitoris. The dimensions shown are common, but may vary by surgeon. Some surgeons prefer two-stage over single-stage surgery. The pro's and con's of two-stage versus one-stage surgery are discussed in the 2017 AUA Updates

Figure 5

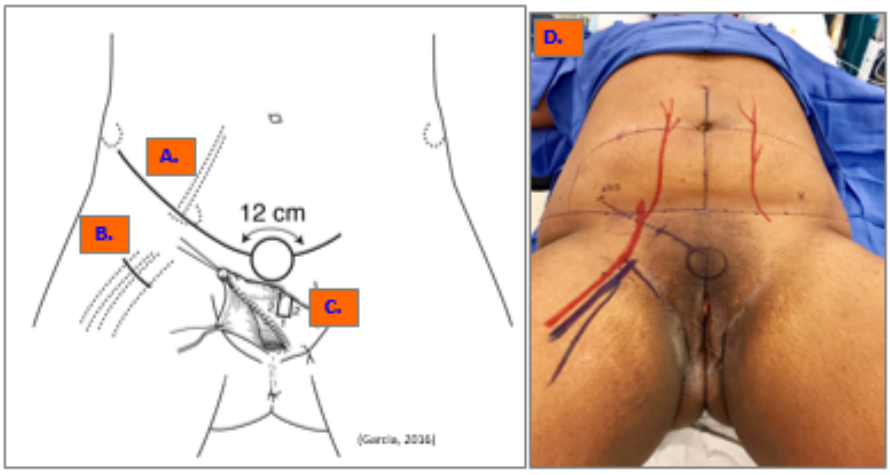


Figure 5: Neophallus and neourethra recipient site markings for *2-stage* free-flap phalloplasty. Incision (bold lines) is made between the antero-superior iliac spine and pubic tubercle, and joins a circular incision of 12 to 13 cm circumference at the neophallus implant site.
The inferior epigastric artery/veins (venae comitans) **(A)** are dissected and passeded to the recipient site via th external inguinal ring to provide arterial supply to radial artery of neophallus.
Alternatively, saphenous artery and vein branches can be mobilized via a horizontal incision in the sub-inguinal region over the femoral vessels. **(B)**
In stage 1 of a 2-stage phalloplasty, the Labia Minora ipsilateral to the site where the neourethra will be implanted is resected, and a 2 × 1 cm skin flap of hairless Labia Minora skin (shown on left) is incised. **(C)** The inferior end of this small flap is spatulated to the proximal end of the neourethra. **(D)** Illustrated markings on patient.

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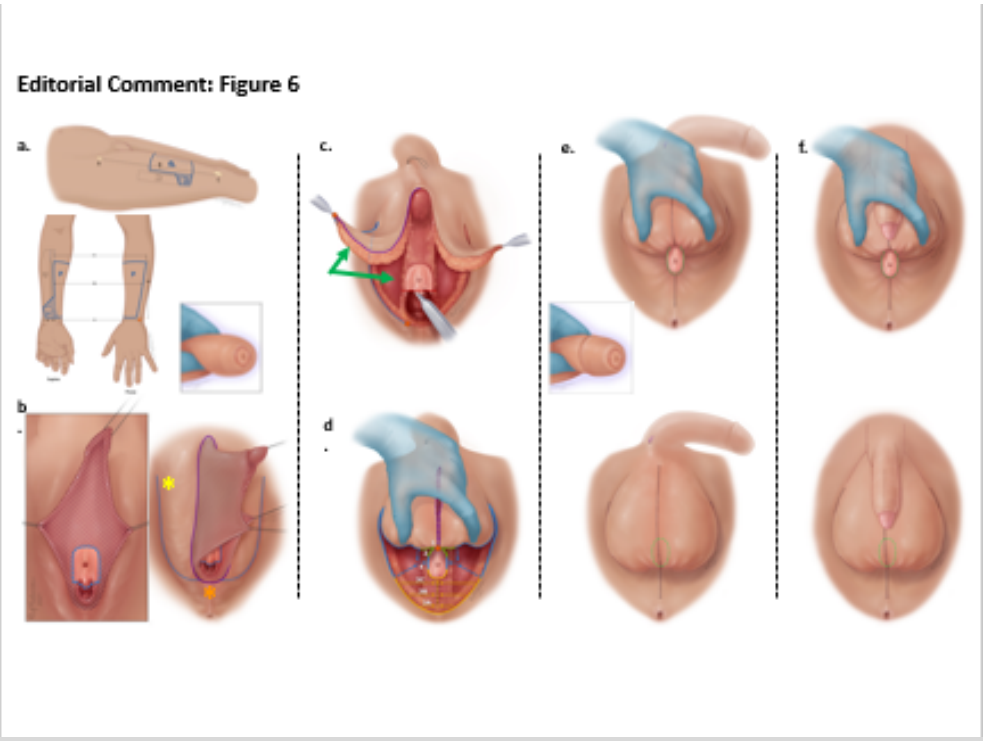

Figure 6: Neophallus and neourethra recipient site markings for 2-stage free-flap phalloplasty. *We create a novel 2 cm long distal urethra and normal appearing urethral meatus **(a)**, and we preserve a 1 cm-cuff of periurethral mucosa with the native urethral opening. **(b)** The scrotum is constructed to be longer in the center (opposite of the Ghent technique) by anchoring the posterior ends of the Labia majora to the anterior aspect of the native urethral meatus **(c,d)** so the posterior end of the scrotum hangs over and obscures the urethral opening **(e)***.[33] The final result is identical appearing to P+UL. The same techniques can also be applied to metoidioplasty-UL ***(f)***.

Figure 7

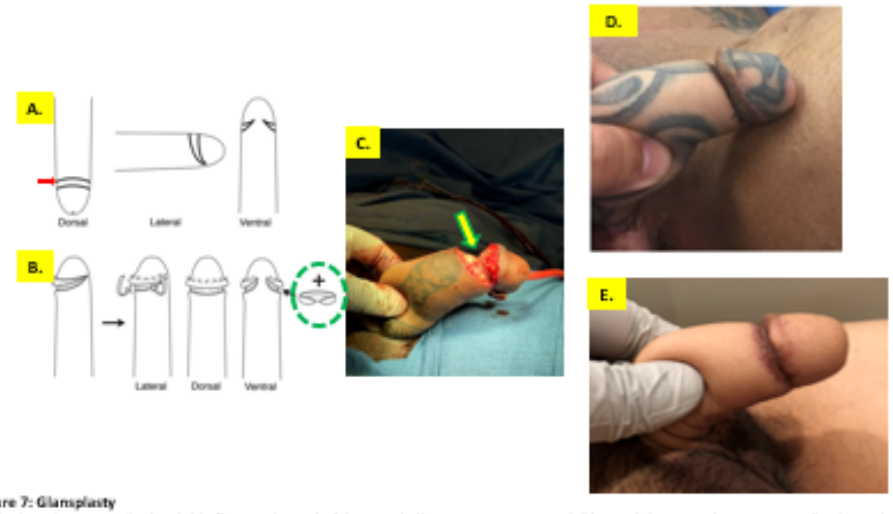

Figure 7: Glansplasty
With glansplasty, we raise local skin flaps at the end of the neophallus, to create a coronal ridge and the natural appearance of a glans, similar to the Norfolk technique described by Jordan et al. in 1996. Surgical site markings. **A.** Two curved ink lines, separated at midline by 1 cm., are made on the dorsum of glans site. The distal line should be ~ 3 cm from the tip of the phallus to ensure that the glans is 3 cm long at midline (~average male glans length). These are extended ventrally to fuse at the ventral-lateral aspect of glans (top panel). Only the proximal line (**red arrow**) is incised with a scalpel. **B.** The proximal skin edge is undermined (between the dermis and subcutaneous fat) distally, to the distal line (lower left panel). The distal edge of the skin incision is then sutured to dermis at its own underside (distal ink line marking). A one-cm strip of hairless skin is harvested (typically from thigh area) as a full-thickness skin graft (**green circle**). A key refinement of the Norfolk technique is that it is sutured into the glans groove, under mild tension (so that it fits somewhat tightly **(C)**. Its proximal edge is sutured to skin of the proximal edge of the original glans incision. The distal edge of this skin strip is sutured to the skin edge of the proximal glans ink marking (now located on underside of distal ink line; lower right panel). The result is a somewhat normal-appearing glans sulcus and coronal ridge **(D-E)**.

Figure 7: Glansplasty technique overview. With glansplasty, we raise local skin flaps at the end of the neophallus, to create a coronal ridge and the natural appearance of a glans, similar to the Norfolk technique described by Jordan et al. in 1996. Surgical site markings. A. Two curved ink lines, separated at midline by 1 cm., are made on the dorsum of glans site. The distal line should be ~ 3 cm from the tip of the phallus to ensure that the glans is 3 cm long at midline (~average male glans length). These are extended ventrally to fuse at the ventral-lateral aspect of glans (top panel). Only the proximal line (red arrow) is incised with a scalpel. B. The proximal skin edge is undermined (between the dermis and subcutaneous fat) distally, to the distal line (lower left panel). The distal edge of the skin incision is then sutured to dermis at its own underside (distal ink line marking). A one-cm strip of hairless skin is harvested (typically from thigh area) as a full-thickness skin graft (green circle). A key refinement of the Norfolk technique is that it is sutured into the glans groove, under mild tension (so that it fits somewhat tightly (C). Its proximal edge is sutured to skin of the proximal edge of the original glans incision. The distal edge of this skin strip is sutured to the skin edge of the proximal glans ink marking (now located on underside of distal ink line; lower right panel). The result is a somewhat normal-appearing glans sulcus and coronal ridge (D-E).

Figure 8

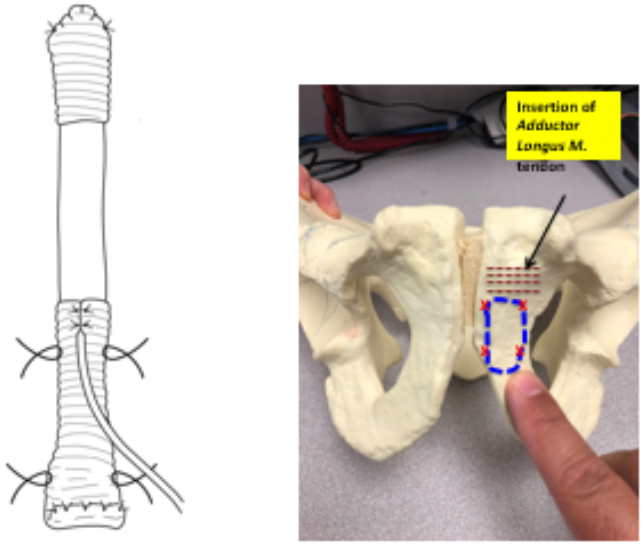

Figure 8: Inflatable penile prosthesis placement after phalloplasty. An inflatable (shown) or malleable penile prosthesis (usually only a single cylinder) is secured to the patient's Obturator ramus. To secure the prosthesis cylinder to the patient's body, the proximal and distal ends are wrapped in a "sock" and "cap" (respectively) made of Dacron (*Left*). The more proximal "sock" is sutured to a flat area of the Ischiopubic Ramus (*Right, outlined in blue*) in four locations (*marked by RED X's*), located just posterior to the insertion site of the Adductor Longus muscle tendon, using permanent (e.g. 2-0 Ethibond) sutures

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Editorial Comment: Figure 9

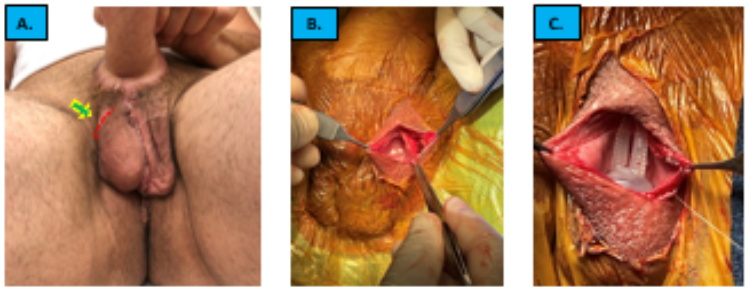

Figure 9: Pre-penile prosthesis placement of a testicle prosthesis. When a patient indicates that he plans to undergo penile prosthesis placement in the future, unless contraindicated, our practice is, at Stage I Phalloplasty surgery, to implant a testicle prosthesis ipsilateral to the anticipated side of future penile prosthesis placement.
We do this to allow the testicle prosthesis time to induce creation of a thick capsule within the scrotum. This spherical capsule space will serve as the future repository for the penile prosthesis cylinder. We use the same incision for both implant of the testicle and penile prosthesis: a 3 cm curvilinear incision along the superolateral edge of the scrotum (**A**, red hatched line). At time of penile prosthesis placement, we remove the testicle prosthesis, to expose the typically thick capsule that has formed around the testicle prosthesis (**B**). The penile prosthesis pump is laid to rest inside the capsule lined space where the testicle resided. The thickness of the capsule protects the pump, and, the smoothness of the capsule lining prevents the pump from becoming "fixed" within scar tissue, and thereby difficult for the patient to grasp. The wound is closed in 3 layers.

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10.3.4 Surgery staging and surgery complications

Staging: Some surgeons may create the phallus and phallic urethra in one stage and then connect the neourethra to the native urethral opening in a second stage surgery in an effort to lower risk of

urethral stricture and to improve cosmetic outcomes,[1] while others may perform this as a single stage surgery or create the perineal urethral in the first stage followed by the phallus in the second stage.[1,36] Randomized controlled clinical trials to compare single or two stage phalloplasty are lacking.

Complications: Urethral lengthening is the greatest single source of complications associated with any phalloplasty technique, as neourethral strictures and/or urethrocutaneous fistulae may develop as a result of tenuous local blood supply.[1,23,30,37,38,39,40,41,42,43,32,44,45,46]

Different surgical approaches offer different options for patients. No technique is recognized as a 'gold standard' for all patients.[1,35,43] Choice of flap requires shared decision-making and consideration of a patient's baseline anatomy (especially weight distribution), tolerance for donor site morbidity, and desire for additional reconstructive components such as urethral lengthening and prosthesis placement.

11. General Urologic Concerns of Transgender Patients

Gender-affirming orchiectomy: Simple orchiectomy has medical benefit for the transgender woman for gender affirmation and reduction of side effects from cross-sex hormone therapy.[1,47] Individuals may seek orchiectomy while awaiting additional gender-affirming procedures, or as a standalone procedure. This is a procedure can safely be offered by a urologist who does not specialize in gender-affirming surgery, using WPATH Criteria or an Informed Consent model as pre-operative criteria for surgery. A vertical midline scrotal incision provides access to both inguinal rings for simple orchiectomy while preserving vascular supply for future potential genital reconstruction. Patients should have pre-operative counseling on loss of fertility and potential fertility preservation options, as well as the need to remain on sex hormone replacement long-term to mitigate risks of osteoporosis. Patients should follow up with their hormone prescribers post-operatively to safely adjust their dosing.

Urinary catheter placement: Urologists may be called upon to place urinary catheters in transgender patients who have undergone gGAS. When the location of the urethral meatus (or a urinary fistula) is unclear, the patient may be able to point to where they pass urine from. In individuals who have had vaginoplasty and who are unable to identify their urethral meatus, the provider may start by attempting to palpate for the location of the neoclitoris, and then carefully probe inferiorly with the catheter-tip at midline to identify the urethral opening. Use of a Coude-tip catheter is useful for this. Alternatively, the round-tip of a disposable Lidoject (lidocaine jelly syringe) is also useful. If the urethral opening is not readily apparent, the urologist should consider using a flexible cystoscope to explore its location.

In individuals with urethral stricture, catheterization under anesthesia will allow for use of a flexible cystoscope (peds or adult) or ureteroscope, placement of a wire and careful balloon dilation. Patients who have undergone masculinizing gGAS typically require either a peds flexible cystoscope or a flexible ureteroscope, as rigid instruments cannot navigate the natural curved trajectory of the neourethra, and an adult-diameter flexible cystoscope is usually too wide to insert safely into a neourethra.

Meatal stenosis: Meatal stenosis after vaginoplasty can often be revised with a YV-plasty technique with ventral spatulation and reapproximation of the tissue at the 6:00 clockface position.[1] The meatal or even slightly longer urethral stenosis can be treated by excision of scarred segment and re-maturing the spatulated urethral meatus, if the patient has adequate urethral length. Management of urethral strictures after phalloplasty or metoidioplasty should be referred to reconstructive urologists with experience in gender-affirming surgery.

Urinary dysfunction: Patients who are preparing for gGAS should be evaluated for lower urinary tract symptoms (LUTS) and history of recurrent urinary tract infections, indicating voiding dysfunction or other urinary conditions, as these may complicate or be exacerbated by genital reconstruction. LUTS should be assessed as they would be in cisgender patients. In individuals who have undergone phalloplasty or metoidioplasty with urethral lengthening, retrograde urethrogram and voiding cystourethrogram with cystoscopy may delineate focal obstruction.

A mainstay of evaluation for voiding symptoms or UTI in any patient who has undergone gGAS is to check a post-void residual volume. As with cisgender patients, patients who have undergone gGAS should be instructed to wait to void until they have a normal urge, and they should refrain from "forcing" themselves to urinate. A post-void residual of under 20-30 cc is normal.

Cancer screening: The urologist should take a personal and family history of prostate and urinary tract cancers and discuss risks associated with cancer screening. The prostate is not removed with any genital gender-affirming surgery. While the absence of many reports of prostate cancer among transgender women in the literature suggests that those on feminizing hormones and/or those who have had bilateral orchiectomy are at lower risk for prostate cancer, their risk is not zero.[1,48,49] It is unclear at what age screening should begin for individuals with prostates on feminizing hormone therapy. The urologist should be sensitive to the fact that physical exam can aggravate gender dysphoria in some patients. Because the neovaginal canal is created in the space between the rectum and the bladder, for transgender women with a neovaginal canal, the prostate is examined transvaginally.[1] The prostate will be located on the anterior wall of the vaginal canal. See **Figure 1:** Vaginoplasty: Sagittal View of Left Pelvis.

Culturally sensitive care: Urologists can educate other health professionals about culturally sensitive terminology and important care related pitfalls to avoid (e.g. misgendering). One of the most important functions of the urologic surgeon in the care of transgender patients is to lead by example in treating transgender patients with the dignity and cultural sensitivity that all patients- cis and trans, deserve.

12. Additional Resources

AUA Updates Series 2017, Lesson 5, Vol. 36: ***Genital Gender Affirming Surgery for Transgender Patients***

World Professional Association for Transgender Health (WPATH) Standards of Care (SOC) v7.0 Guidelines

13. Illustrations

See **AUA Updates 2017, Lesson 5 for illustrations and more detailed discussion of complications**[1]

Videos

Simple Orchiectomy in Transgender Patients

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