Current Urology Reports (2019) 20: 31
https://doi.org/10.1007/s11934-019-0894-4

FEMALE UROLOGY (L COX, SECTION EDITOR)

Genitourinary Complications of Gender-Affirming Surgery

Campbell Bryson[1] · Stanton C. Honig[2]

Published online: 30 April 2019

Abstract

Purpose of Review Gender-affirming surgery has become a more common procedure in the last 5 years. Feminizing genitoplasty typically involves inversion of penile skin as a neovagina, urethral shortening, and glans reduction to create a neoclitoris. Masculinizing genitoplasty is more complex, typically is performed in multiple stages, and has more inherent urologic risks.

Recent Findings The most common urologic complications involve voiding dysfunction, specifically meatal stenosis or fistula to the urinary tract. Urethral stricture, fistula, urinary retention, and voiding dysfunction are very common and require early recognition and intervention. This includes placement of catheter drainage, if necessary with the appropriate urologic instrumentation. Genital risks relating to phallus health are rare, but risks associated with placement of penile prosthesis for sexual function are common and require immediate attention.

Summary Urological complications after gender-affirming surgery are common, and the general urologist and urogynecologist should be able to identify and treat problems in this population after review of this chapter.

Keywords Female urology · Gender-affirming surgery · Genitourinary complications

Introduction

Genital gender-affirming surgery has increased in frequency over the last number of years [1]. Given this increase in both male to female (MtF) and female to male (FtM) surgeries, specific complications will need to be addressed by nonsurgical clinicians and urologists. It is important for complications to be identified and addressed in a timely fashion. The contemporary urologist should know these unique complications and concerns that can be identified and managed in this patient population. They can be broadly categorized as early or late complications.

In this review, we will identify the clinical signs of symptoms of complications of the genitourinary system after surgery. We will address the best treatment options for the general urologist and non-primary surgeon to manage these problems.

This article is part of the Topical Collection on *Female Urology*

✉ Stanton C. Honig
stanton.honig@yale.edu

Campbell Bryson
Campbell.bryson@yale.edu

[1] Department of Urology, Yale School of Medicine, 789 Howard Avenue, FMP 302, New Haven, CT 06519, USA

[2] Department of Urology, Yale School of Medicine, 330 Orchard St. Suite 164, New Haven, CT 06511, USA

Male to Female Surgeries (MtF, Feminizing Genitoplasty)

The goal of MtF surgeries must align with patient goals, usually for an externally pleasing genital appearance. Goals of surgery are characterized by both functional and anesthetic issues. These goals include sitting to void with a good stream, pleasing external genital appearance, orgasms with clitoral stimulation, and a vaginal vault able to allow for penetrative intercourse. This involves removal of the testes and phallus tissue, and formation of a neovagina and external labia [2]. The internal male organs of the prostate and seminal vesicles are not removed at the time of surgery as this is in continuity of the urinary tract. Some patients may request an initial bilateral orchiectomy in the months prior to neovaginal formation, as this allows the patient to stop anti-androgen medications and reduce the dose of oral estrogens needed, limiting side effect profiles.

The most common method of MtF vaginoplasty is an inverted penile skin with or without a graft usually scrotal skin

as the new internal vaginal lining. This may allow for more adequate length and width of the neovagina. It may be supplemented with intestinal mucosa, buccal mucosa, peritoneum, or other appropriate tissue at the surgeons' discretion. The corpora spongiosum and urethra are trimmed back to approximate the appropriate placement of urethral meatus in cis-women. The penile neurovascular bundles are dissected off the penile shaft with or without the dorsal aspect of Buck's fascia and are folded back with a miniaturized glans penis to form the neoclitoris. The inverted penile skin is sometimes secured to the sacrospinous ligament or posterior peritoneum, via a trans-neovaginal or laparoscopic/robotic approach. Remaining scrotal skin is shaped and trimmed to make a cosmetically satisfactory labia majora and minora [2].

Inherent with any surgical procedure, gender-affirming surgeries have intraoperative risks including bleeding, infection, damage to adjacent structures, anesthetic risks, and allergic reactions. Intra-abdominal approaches for vaginal fixation or use of bowel segments as a graft can have risks of bowel obstruction, rectal injury (and subsequent colostomy or rectovaginal fistulae), sepsis, and peritonitis. The perineal approach to vaginal fixation has similar non-intra-abdominal risks, and if sacrospinus fixation is done, risks of nerve or vascular injury are possible as well. Given the prolonged nature of the procedure usually in lithotomy position, risk of deep vein thrombosis, pulmonary embolism, and nerve entrapment (usually peroneal nerve compression) and fascial entrapment are possible. Neurological and/or vascular evaluation may be necessary if symptoms are identified and should be evaluated in the immediate postoperative period. In this report, we will focus on urological issues, and though important for the operative surgeon, these other complications will not be covered in detail here.

Intraoperative and Early Urological Complications

- Urethral injuries: anterior and proximal urethral injuries can occur intraoperatively, are rare, and are managed with primary repair and/or reanastomosis and prolonged catheter drainage [3–5].
- Urinary retention: usually transient in the postoperative period, acute retention can occur in up to 15% of transwomen. Usually, urethral catheterization is continued for about 7 days postoperatively. It is important to recognize that the prostate with its effects on urinary obstruction can present postoperatively, especially in the older patient. This is usually managed with temporary catheter placement and the use of standard alpha blockade with medications such as tamsulosin. A coude tip catheter can aid in catheterization in some cases [6].
- Urinary incontinence: stress incontinence, urge incontinence, or mixed incontinence can occur in the postoperative period in up to 20% and should be treated accordingly. Unrecognized detrusor overactivity may be unmasked by the shortened urethra and managed with medications such as antimuscularinic agents. The internal and external urinary sphincters are not included in the resection of the distal urethra, but injury to the external sphincter or fibrosis of the proximal urethra from manipulation may lead to stress incontinence. In persistent stress incontinence, bulking agents can be placed peri-urethrally, but this is rare as well.
- Atypical urinary stream: usually dorsally directed streaming or splaying of urine. This is not uncommon in the acute postop period after the catheter is removed and can continue usually up to 4–6 weeks postoperatively. This can be distressing to patients and reassurance is usually required at this time. This may result from an "uncentered" urethra that may be edematous and may resolve with time [7].
- If the urinary stream does not allow for voiding in the sitting position due to an upward stream, then a subsequent ventral meatoplasty may be necessary. This may involve angulation of the distal urethral downward with tapering or shortening of the urethra with straightening of the angle of the meatus. Sometimes, external scarring from an assymetric labia or external adhesions may cause this and can be treated with lysis of adhesions or revision labioplasty [8].
- Meatal stenosis: occurring in up to 10% of patients and treated with meatoplasty. This is the most common complication and may result in acute urinary retention. If a small catheter cannot be passed, a stepwise approach to treatment is indicated. This would include dilation of meatus with dilators or placement of suprapubic cystotomy catheter in the acute setting. If this is necessary, formal meatoplasty with cutback of the urethral meatus until healthy tissue is identified and urethral advancement is performed. In rare cases, a formal graft such as buccal mucosa may be necessary.
- Urinary tract infection: Due to 1 week of urethral catheterization, it is not uncommon for postop patients to experience urinary tract infections. These are managed with antibiotics and drainage if large post void residuals are present. In cases of recurrent urinary tract infections, it is important to search for a nidus such as foreign body in the bladder, fistula, etc.
- Granulation tissue: This is commonly seen in multiple areas of the wound. This includes the external labia, periurethral, periclitoral area, and the vaginal introitus and vault. This usually resolves with time but sometimes requires local treatment with silver nitrate or excision and closure.
- Bleeding: Significant bleeding from the surgical site in the acute postoperative period needs to be identified. The most common location of bleeding after penile inversion vaginoplasty is at the site of the corpus spongiosum

laterally on the urethra. If this cannot be managed conservatively with pressure dressing and cold packs, formal re-exploration with oversewing of bleeding location is encouraged if active bleeding is present. Other sites of bleeding may be the neovaginal space as there are many bleeders in the area of dissection through the levator ani muscles and perirectal and periprostatic spaces. This may present with unilateral or bilateral significant labial swelling if drains are not working adequately [5].

Late Complications

- Hair growth in the neovagina: hairballs, concretions of bodily fluids and lubricants, and irritation can be most effectively avoided by preoperative laser hair removal on any skin which will be incorporated into the neovagina. Depilation intraoperatively can be performed as well. This laser hair depilation can also be performed postoperatively as necessary but is much more difficult.
- Urethrovaginal fistula: This is rare and typically presents with continuous urinary incontinence and recurrent urinary tract infections. Initial treatment involves conservative management including diversion with suprapubic catheterization. Operative intervention is required if does not close with conservative management.

– This may require formal urethroplasty with interposition of omentum or other intervening tissue if complex.

- Vesiconeovaginal fistula occurs in a small no. of patients (0.9%) [8]. This usually results from either a recognized or unrecognized bladder injury at the time of surgery.

Operative intervention is required if does not close with conservative management.

– This may require formal repair either perineally or transabdominally with interposition of omentum or other intervening tissue if complex.

- Urethral prolapse: this may occur if too much urethra is left in place.
- Urethral necrosis: rare as blood supply to the urethra is very good
- Prolonged pain: The etiology of prolonged pelvic pain is unclear in many cases but be affected by disruption of the levator ani muscles during dissection of the space for the neovagina. This may be helped by formal pelvic floor rehabilitation with a physical therapist who has experience with both pelvic floor rehabilitation and experience with patients undergoing genital gender-affirming surgery [5].
- Neovagina or introitus stenosis/narrowing: lifelong neovaginal dilation is required for all patients postoperatively, and this should be discussed and accepted by patients. There are different protocols with different surgeons but all agree that after penile inversion vaginoplasty, daily regular dilation is required. Some start with large dilators and others work with patients on sequential dilation. Refractory narrowing or stenosis may require operative management with relaxing incisions or U-shaped introitoplasty [2, 7].
- Neovaginal prolapse may occur in up to 7.5% of patients [7]. This may be prevented in some cases by sacrospinous fixation or peritoneal fixation performed laparoscopically-robotic assisted. Repair of this problem may be performed by colpopexy. Published data on the approach to this is limited and the surgeon should have experience with male pelvic anatomy to procedure in repair by either a perineal or abdominal approach.

Regarding general complications, one study suggests that age, BMI, and extent of hormone replacement therapy are not risk factors for complications [8]. However, follow-up was only up to 12 weeks in this study.

Female to Male Surgeries (Masculinizing Genitoplasty, FtM)

Similar to MtF surgeries, the female to male genital gender-affirming surgery must incorporate patient goals. Two surgical options are available for reconstruction: metoidioplasty and phalloplasty. This may or may not be performed with colpectomy, vaginectomy, or removal of the vaginal epithelium.

Metoidioplasty involves extension of the clitoris into a glans with extension of the corporal bodies and urethral reconstruction. It is similar to a proximal hypospadias surgery in pediatric urologic patients and involves taking the native urethra and extending it with tubularized labia minora or other graft material. Previous androgen therapy hypertrophies the clitoris which is dissected and elongated to form the new glans. The labia majora is shaped to form the neoscrotum. The former vagina is resected. The advantages of this surgery are the relatively simple operation with minimal recovery time, maintenance of clitoral stimulation for sexual activity, and ability to void upright. However, metoidioplasty typically results in penile length that is not usually sufficient for penetrative intercourse. This procedure requires a tubularized urethral extension, usually with buccal mucosa.

Phalloplasty is a much more invasive and complex option, with a graft from local and/or distant sites tubularized into a new phallus. This can be a single stage but is usually a multi-staged surgery. The goals for the resulting phallus are to allow for penetrative intercourse, upright voiding, and an esthetically appearing phallus. The combined surgical expertise of

urologists, gynecologists, and plastic surgeons is employed for these surgeries. Grafts have been used from multiple sites: radial forearm free flaps, anterolateral thigh free or pedicled flaps, pedicled groin flap, suprapubic abdominal wall free flap, fibula free flap, latissimus dorsi free flap, and pedicled gracilis flaps [9]. A plastic surgeon comfortable with various methods can identify ideal flaps for individual patients. The urologist will usually find his or her role of management of the phalloplasty either in the acute setting postoperatively with urinary retention, or by assisting in urethroplasty and placement of penile prosthesis.

Notable Complications

- Postvoid dribbling/spraying of stream: affecting up to 30% of patients [8], this is usually self-limited and managed conservatively. It is thought to result from a floppy pendulous urethra that does not drain promptly.
- Hair-bearing urethra: if the site of the graft has not been treated preoperatively or not depilated, parts of the urethra may grow hair. This may result in chronic infections, urinary stasis, and debris and stone formation. Many times, this is asymptomatic, but if symptoms occur, either local therapy to remove debris and hair is necessary and in rare cases, a new graft may be necessary.
- Urethrocutaneous fistula: conservative management with prolonged catheterization can heal many small fistulae, but surgical management is necessary for recalcitrant fistula. This may require excision with primary repair or formal regrafting procedures.
- Flap failure/necrosis: devastating complication resulting in loss of phallus. The non-urethra-related complications are typically managed by plastic and vascular surgeries, but may require a perineal urethrostomy or other temporary end urethral remnant.
- Urethral stricture: this is a common complication occurring after masculinizing gender-affirming surgery. Figure 1 shows the areas of anastomosis of native urethra to bridge graft to distal skin tubularized graft. The most common locations of stricture are at the anastomosis with the proximal area called the "pars fixa" [11]. Strictures of the urethra in the neophallus most commonly require open surgical revision to prevent recurrence although a small minority can be managed with dilation alone or with internal urethrotomy. This may present as a urethrocutaneous fistula as described above as well.

Urinary Retention urinary retention in a patient with a phalloplasty can be a challenging endeavor for the clinician. Blind catheterization can be attempted by those familiar with the anatomy, *but should be avoided* if possible by non-urologists, and only providers who understand the unique anatomy of the neo-urethra should be consulted for management. Placement of a wire into the bladder using a pediatric cystoscope or a ureteroscope rather than the wider flexible cystoscope is prudent as the caliber of the urethra is usually small. Catheters should be small, 12 F,14 F, or 16 F to prevent pressure on the urethral tissue. Suprapubic drainage with a temporary punch cystotomy catheter can be considered if smaller instruments are not available.

Complications with *Implanted Penile Prosthesis* Typically, insertion of penile prosthesis is performed after successful

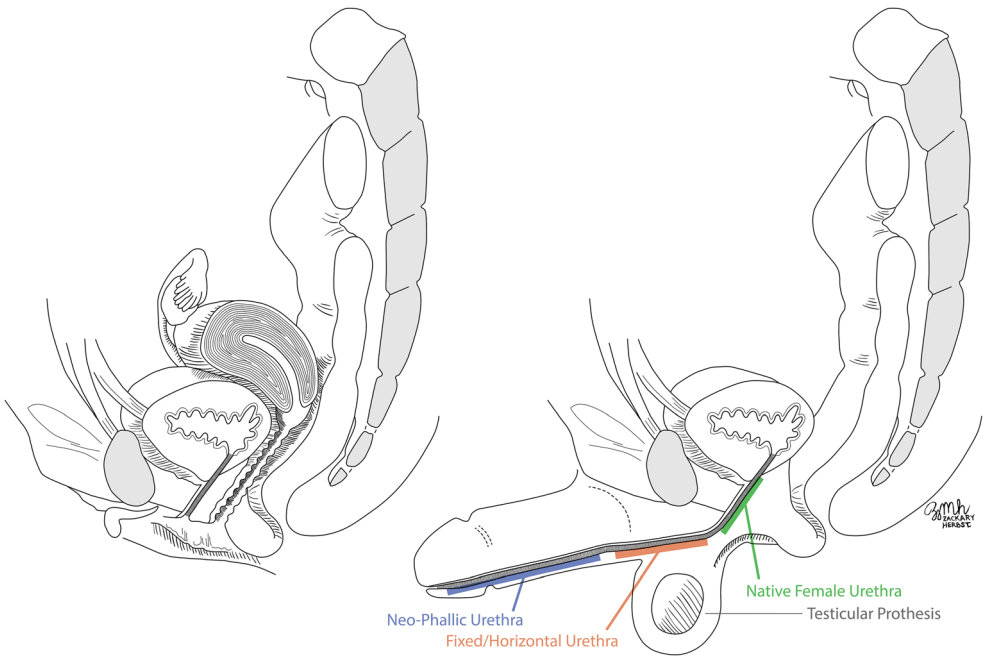

Fig. 1 Radial forearm free flap phalloplasty (left: preoperative female anatomy, right: postoperative anatomy). Urethral strictures often occur at the junction of the pars fixa (fixed/horizontal urethra) and neophallic urethra. Illustrations by Zackary Herbst. With permission: Geolani W. Dy, Jeff Sun, Michael A. Granieri, and Lee C. Zhao [10]

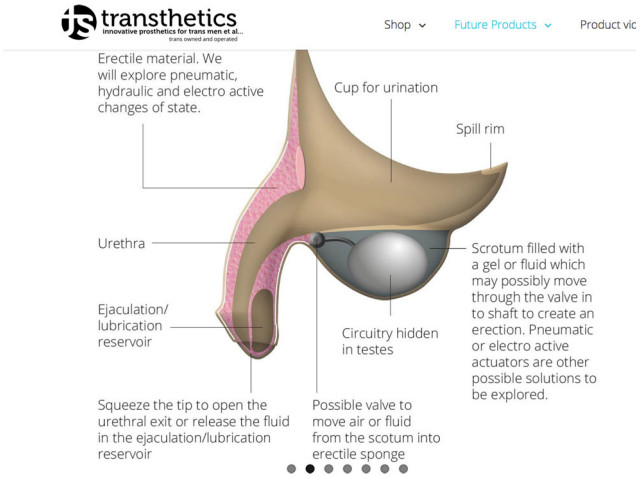

Fig. 2 Transthetics product (www.transthetics.com). Prototype of device to temporarily attach to pubic bone for voiding and sexual function

phalloplasty has been in place for at least 1 year. Multiple complications are possible. Measures must be taken to identify and preserve the blood supply and nerve supply to the phallus as injury can result in catastrophic loss of phallus. Whereas infection and erosion rates in naïve cis-male patients typically occur in 1–3% of patients, phalloplasty patients have a very high 30–70% infection and erosion rate [2, 4, 9, 12–14]. This may present as infection, erosion, urethra injury causing retention, fistula, or nonhealing wounds. Because the neophallus does not have a tunica albuginea to place implant in a "fixed" location, some will surround implant with graft material and new approaches include formal fixation to bone with either sutures or bone anchors. Despite all of this, a functional neophallus is not a guarantee in most cases. In fact, some prosthetic companies have developed "attachment devices" for sexual and urinary activities (see Fig. 2). It is important to counsel patient that after about 4 years only 50% of primary implants remain in place, with 15–70% requiring revision or removal overall, though up to 30% have second penile implants placed, and a small percentage (~ 7%) have a third [15].

- Placement of testis prosthesis: as with any placement of prosthesis, infection and erosion are possible. This is less common with testis prostheses than with penile prosthesis but removal is sometimes necessary. This is more likely to occur than in naïve cis-males where the prosthesis is placed near the overlying suture lines where the neoscrotum is created from labia majora skin or other graft sites [15].
- Colpectomy/vaginectomy/destruction of vaginal epithelium and closure: This may or may not be performed. Benefits include prevention of vaginal discharge. This discharge may increase with transudation of fluid during sexual stimulation and can be bothersome to some patients. In addition, removal of tissue prevents the risk of fistulation of vaginal-urethral communications during phalloplasty. Complications include vesicovaginal and neovaginal fistula and bleeding [11]. Incomplete excision of vaginal epithelium may result in persistent mucous drainage, abcess, and fistulae.

Conclusions

Both femininzing and masculinizing genital gender-affirming surgeries are complex and may result in morbidity that affects structures that are monitored by the urologist. Knowledge of the new anatomy of the genitourinary tract in these patients is important to manage these patients in the acute and long-term setting. Complications do occur and sometimes require local management before transferred back to the primary surgeon for further care.

Compliance with Ethical Standards

Conflict of Interest Campbell Bryson and Stanton C. Honig each declare no potential conflicts of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

References

1. Canner JK, Harfouch O, Kodadek LM, Pelaez D, Coon D, Offodile AC, et al. Temporal trends in gender-affirming surgery among transgender patients in the United States. JAMA Surg. 2018;153(7):609–16.
2. Hadj-Moussa M, Ohl DA, Kuzon WM. Feminizing genital gender-confirmation surgery. Sex Med Rev. 2018;6(3):457–468.e2.
3. Pan S, Honig SC. Gender-affirming surgery: current concepts. Curr Urol Rep. 2018;19(8):62.
4. Cristofari S, Bertrand B, Leuzzi S, Rem K, Rausky J, Revol M, et al. Postoperative complications of male to female sex reassignment surgery: a 10-year French retrospective study. Ann Chir Plast Esthet. 2018.
5. Massie JP, Morrison SD, Van Maasdam J, Satterwhite T. Predictors of patient satisfaction and postoperative complications in penile inversion vaginoplasty. Plast Reconstr Surg. 2018;141(6):911e–21e.
6. Dreher PC, Edwards D, Hager S, Dennis M, Belkoff A, Mora J, et al. Complications of the neovagina in male-to-female transgender surgery: a systematic review and meta-analysis with discussion of management. Clin Anat. 2018;31(2):191–9.
7. Ferrando CA. Vaginoplasty complications. Clin Plast Surg. 2018;45(3):361–8.
8. Gaither T, Awad M, Osterberg E, Murphy G, Romero A, Bowers M, et al. Postoperative complications following primary penile inversion vaginoplasty among 330 male-to-female transgender patients. J Urol. 2018;199(3):760–5.

9. Cohen AJ, Bhanvadia RR, Pariser JJ, Hatcher DM, Gottlieb LJ, Bales GT. Novel technique for proximal bone anchoring of penile prosthesis after radial forearm free flap neophallus. Urology. 2017;105:2–5.
10. Dy GW, Sun J, Granieri MA, Zhao LC. Reconstructive management pearls for the transgender patient. Curr Urol Rep. 2018;19:36.
11. Nikolavsky D, Hughes M, Zhao LC. Urologic complications after phalloplasty or metoidioplasty. Clin Plast Surg. 2018;45(3):425–35.
12. Neuville P, Morel-Journel N, Maucourt-Boulch D, Ruffion A, Paparel P, Terrier J-E. Surgical outcomes of erectile implants after phalloplasty: retrospective analysis of 95 procedures. J Sex Med. 2016;13(11):1758–64.
13. Zuckerman JM, Smentkowski K, Gilbert D, Storme O, Jordan G, Virasoro R, et al. Penile prosthesis implantation in patients with a history of total phallic construction. J Sex Med. 2015;12(12):2485–91.
14. Hoebeke PB, Decaestecker K, Beysens M, Opdenakker Y, Lumen N, Monstrey SM. Erectile implants in female-to-male transsexuals: our experience in 129 patients. Eur Urol. 2010;57(2):334–40.
15. Hadj-Moussa M, Agarwal S, Ohl DA, Kuzon WM. Masculinizing genital gender confirmation surgery. Sex Med Rev. 2018;6:457–468.e2.