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Complications of MTF Vaginoplasty

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17.1 Complications of Male-to-Female Sex Reassignment Surgery

Many transgendered individuals desire surgical procedures as a component of their individual gender transition. Such surgical procedures are generically described as sexual reassignment surgery (SRS). More recently, with respect to genital surgical procedures in male-to-female (MTF) transsexuals, such procedures are also described as "gender/genital reassignment surgery" (GRS) or "gender affirming surgery." Vaginoplasty, also referred to as neocolporrhaphy (Latin for creation of new vagina), is nearly synonymous with SRS in MTF individuals.

The specifics of the surgical technique utilized for SRS/GRS vary widely across the globe but have evolved dramatically since the "world's first sex change" was performed on Einar Wegener

(later named Lili Elbe) in 1931 Berlin. For Ms. Elbe, who ultimately died as a result of complications attributed to the operation, her surgical sex change was the culmination of more than two decades of research and interest in transsexualism [1] in pre-WWII Germany. In fact, the term transsexual was first coined by Magnus Hirschfeld, a gay sexologist, whose transsexual laboratory was among the first casualties following Adolf Hitler's ascent to power in 1933 [1]. Unvanquished, the transgender movement smoldered. Newer surgical techniques eventually followed and gradually showed improvements in cosmetic and functional outcomes. Complications have also reduced precipitously.

Although uncommon, complications of SRS/GRS/vaginoplasty still occur. This chapter will discuss categories of complications that can occur with contemporary vaginoplasty techniques with an emphasis on recognition, strategies of prevention, and treatment. Complications specific to colovaginoplasty will not be considered in this discussion.

The role of primary care providers (PCP) in the management of postoperative complications of SRS/GRS cannot be overemphasized. Although the number of qualified surgeons is growing worldwide, most surgical care is offered regionally in large metropolitan areas. Patient preference for certain surgeons, variance and inconsistency among surgical techniques, and differing eligibility criteria in national health plans and among insurers mean that most patients

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travel great distances to access surgical care. Fortunately, with current approaches, the incidence of complications is increasingly rare and relatively minor. This current model of care delivery consequently shifts the postoperative care burden to PCPs.

17.1.1 Acute Postsurgical Complications

Acute postsurgical complications include those inherent to any major surgical procedure such as blood loss, wound-related complications (infection or hematoma), and thromboembolic events (e.g., venous thrombosis or pulmonary embolism). Complications unique to this advanced procedure may include tissue necrosis (e.g., flap, urethral, or neoclitoral), neovaginal graft expulsion, or urinary complications such as stricture, fistula, or misdirected stream. Surprisingly, urinary incontinence is not commonly reported following MTF reassignment due to surgical activity confined distally to the internal urinary sphincter. Finally, and most significantly, there is also intraoperative risk of entry into viscus structures such as the bladder, urethra, or rectum.

17.1.2 Late Postsurgical Complications

Most complications related to GRS occur outside of the acute postsurgical period and include sensory loss, problems related to tissue healing (e.g., granulation or scar tissue), pelvic or genital pain, scarring, vaginal stenosis or stricture, vaginal prolapse, or development of fistula (Fig. 17.1). Fistulous complications in particular can be devastating as they can require multiple surgical interventions and result in a compromised or potentially nonfunctional neovagina. Recognition of each complication and strategies for prevention and solution become critical for both the surgeon and primary care provider. Poor cosmetic outcomes as well as many functional complications can be corrected at a second surgery or "labiaplasty." The timing and exposure required for labiaplasty likewise allow correction of issues with pain or urologic problems.

Fig. 17.1 Immediate, uncomplicated post-op MTF vaginoplasty appearance. Foley, vaginal packing, and JP drain (on right) visible

17.1.3 Blood Loss

Average blood loss for male-to-female SRS is minimal. However, pelvic blood flow is impressive and blood loss can quickly exceed 600 cc even among experienced surgeons. Risk of hemorrhage increases with BMI >30, in younger patient age, and in patients who experience tumescence (erection) at the time of surgery. Less blood loss is seen in older patients, in those with prior orchiectomy, and in patients with medical problems that compromise microvascular blood flow (e.g., diabetes and hypertension) [2]. A 2012 German study involving 332 patients who underwent single-stage vaginoplasty reported an average of 150 mL blood loss with very low need for blood transfusion (2 %) [3]. For most surgeons, modest blood loss normally does not result in transfusion. The author's experience was that transfusion was necessary in just 7 of 1,135 (0.6 %) GRS procedures (Bowers ML, 2014, MTF vaginoplasty blood loss, unpublished data). Surgeons typically no longer have blood on site, favoring a type and screen as opposed to type and cross. Threshold criteria for blood transfusion have also changed and become increasingly selective. In general, a hematocrit of greater than 22 % (hemoglobin 7.0 g/dL) immediately postoperatively, in the absence of symptoms and

significant cardiac risk factors, is well tolerated by patients and does not require transfusion.

17.1.4   Surgical Site Infection (SSI)

Infection of tissue, whether grafted, a flap, or adjacent to the surgical site, is unusual but may arise because of compromised blood supply and tissue stretching. One study reported a 5 % rate of SSI (superficial abscesses, largely labial) that was successfully managed with incision and drainage and cephalosporin-based antibiotics [3]. A Detroit center reported on 43 patients who underwent genital reconstructive operations between years 1984 and 2008 and found a 21 % rate of SSI in those who underwent male-to-female GRS. Importantly, SSIs were independently associated with increased frequency of total operative procedures [4]. Other authors have suggested that development of SSI, particularly severe infection, contributed to complications such as loss of vaginal depth or stricture requiring additional surgical revision [3]. In general, the incidence of SSI is lower with increased surgeon experience and reduced operative time [5].

17.1.5   Tissue Necrosis

The etiology of this complication relates to devascularization of tissues secondary to ligation of arterial supply, compression of arterial structures, or poor host blood supply. Medical history (presence or absence of comorbidity) and nutritional status can also play a significant role in determining outcome and successful healing. Diabetes, while not a contraindication to GRS per se, is associated with greater risk for tissue necrosis. Selective debridement of tissues, wet-to-dry dressings, and "a tincture of time" are the best allies in treatment of these issues. Reopening of a portion of the incision and drainage is indicated for abscess but is rarely necessary. Pelvic and perineal circulation tends to be excellent and resilient, allowing many of these losses to ultimately resolve with such conservative management.

17.1.6   Clitoral Necrosis

*Necrosis of the neoclitoris*is, fortunately, is uncommon. Most surgeons report an incidence of 1–3 % [3, 6–9], but rates as high as 10 % were noted in one review series [10]. Even in these cases, the outlook remains reasonably positive, as most patients can achieve orgasm with or without clitoral sensation. The best evidence for this comes from earlier techniques for GRS (Drs. Biber and Schrang) where clitoral preservation using homologous tissues was not done. In those procedures, amputation of the dorsal nerves and arteries at the crus meant that postoperative sensation arising from the neoclitoris was not possible. Despite a lack of sensory innervation from the dorsal nerves, cavernosa, and glans, most of these patients – via innervations from residual spongiosum tissue, retained in these surgeons' patients as the neoclitoris – were able to orgasm. When clitoral necrosis does occur, the necrosis is most often partial with neovascularization and some residual sensation possible. Finally, for the rare patient whose clitoris loses both blood supply and innervation, the other areas retaining erectile or erogenous sensation (spongiosum, G-spot, prostate, etc.) can provide enough stimuli to allow orgasm. If patients remain anorgasmic after 1 year, topical testosterone cream (1 % compounded) can be helpful.

Labial necrosis is uncommon, with *wound dehiscence* being a more frequently reported problem [3]. Dehiscence is generally focal and localized and, in such cases, is best managed with local wound care and healing by secondary intention. Cosmetic complaints or scarring can be addressed at subsequent labiaplasty. Labiaplasty is normally not offered until at least 3 months following primary GRS to permit optimal healing and restoration of blood flow in flaps. For surgeons who perform a so-called two-stage procedure, this secondary cosmetic procedure is routine. In patients who have undergone vaginoplasty in a single stage, labiaplasty and/or scar revision could be offered as an additional surgical procedure but is rarely necessary due to the remarkable healing capacity of this area of the body.

17.1.7 Venous Thromboembolism (VTE)

Major surgery predisposes patients to a risk of *deep venous thrombosis or pulmonary embolism*. The pathophysiology relates to acute inflammatory reaction caused by tissue trauma, activation of clotting cascade, and venous slowing or stasis created by prolonged immobility [10]. Risk is further compounded by certain comorbidities such as age, obesity, tobacco smoking, malignancy, and certain medications. While long-term use of cross-gender hormones appears to be safe [11–13], these patients, theoretically, may be at greater risk of VTE due to use of exogenous hormones during the perioperative period. Rare reports of nonfatal VTE associated with GRS are found in the literature [14].

To reduce the risk of thromboembolic complications, most clinicians have advocated discontinuation of exogenous hormones several weeks prior to plastic surgery procedures [12, 15]. In fact, half of British plastic surgeons who responded to a survey advocated discontinuation of hormone replacement therapy prior to surgery, with most recommending a hormone-free interval of 5–6 weeks prior to reassignment [13]. Although a dose-related risk assessment of HRT does not exist, these recommendations have been accepted as fact, although route of administration and type of hormone rather than presence or absence of HRT may be more important in terms of risk assessment for VTE. Transdermal application of estrogens appears to hold a lower risk for VTE than oral administration [16]. Additionally, ethinyl estradiol is known to increase VTE risk by 20-fold in MTF transsexuals on cross-sex HRT and is no longer recommended [11, 13]. Recent data suggests that *reduction* of estrogens prior to surgery, rather than outright discontinuation, may improve perioperative feelings of well-being without increasing the risk of VTE. Accordingly, not all surgeons who perform GRS consistently recommend discontinuation of exogenous hormones prior to surgery [17]. Early postoperative mobilization, sequential compression devices, and prophylactic anticoagulant therapy may be sufficient prophylaxis for the majority of low-risk clientele.

17.1.8 Hollow Viscus Injury

Inadvertent entry into the bowel, bladder, or urethra is an inherent risk of MTF vaginoplasty. Although rare and not disastrous in experienced hands, these complications need immediate recognition and repair if major fistulous sequelae are to be avoided. A fistula represents the gravest of potential complications and can occur even with expert repair. A mechanical bowel prep with or without antibiotic is recommended preoperatively by most surgeons when embarking upon perineal dissection to create the neovaginal cavity. The key anatomic landmark followed is the central tendon of the perineum immediately beneath the urethra, a route similarly taken in perineal prostatectomies. Urologic structures are normally well protected with the use of a handheld retractor (Ferreira Breast Retractor 95×25 mm, smooth end with fiber-optic light) held squarely in the midline. For rectal protection, aside from assiduously following the central tendon, keeping a portion of it posterior to the dissection field, surgeons variably use other methods. This can include the use of a Lowsley retractor placed transurethrally to retract the urologic structures anteriorly to allow the rectum to drop as dissection advances cephalad. Others employ an assistant's finger or dilator in the rectum, retracting posteriorly in addition to the anterior retraction. This allows the surgeon an additional palpable posterior backstop as dissection proceeds. Thermal injury is a potential problem but does not appear to be a significant factor in viscous injury [18]. Some have also advocated blunt dissection as opposed to sharp or cautery dissection, although this surgical philosophy remains debatable. Fistula rates after viscous injury are rarely reported but should not occur if a tension-free repair of the viscous injury has been performed [19].

17.1.9 Rectovaginal Fistula

Rectovaginal fistula presents with passage of stool or rectum through the neovagina.

Presentation later than 6 weeks post-op is unusual, although reports of late RV fistula in patients with inflammatory bowel disease have been reported. Aside from RV fistula arising de novo secondary to inflammatory bowel disease, the etiology of most other RV fistulas is likely surgical. Dilator related injuries causing RV fistula have been reported. Cautery injuries do not appear to be causative. Most injuries occur within 3 cm of the vaginal introitus, although a higher injury is possible. Diagnosis is best confirmed by Gastrografin enema. Referral to a colorectal surgeon is indicated for repair.

17.1.10 Hematoma

Hematoma is often recognized as labial asymmetry or as a firm, often fluctuant swelling beneath the neolabia majora. Postoperative induration is normally present but can easily be confused with hematoma. Ultrasound can be extremely helpful in clarifying the nature of the swelling and in estimating size. A hematoma of less than 4 cm is best managed conservatively with time and pressure. For larger hematomas, needle aspiration can result in significant reduction in size. Reopening the incision and evacuation of the hematoma can also be helpful and will relieve symptoms quickly. The reopening incision can be quite small if expressed, packed, and allowed to drain (Table 17.1).

17.1.11 Granulation Tissue

Granulation tissue results from tissue nonunion or dehiscence. It appears late in healing as bright-red, fleshy tissue that is tender and bleeds easily. It can originate along either incision, beneath the clitoral hood, or vaginally. For persistent complaints of bleeding beyond the usual recovery period (6–12 weeks), assume there is treatable granulation tissue. Granulation tissue can be managed by application of silver nitrate, although this may require several applications and multiple visits. Best practice is to simply excise the tissue at its base and treat residual bleeding with silver nitrate.

17.1.12 Urologic Complications

Urologic complications are uncommon and can be as simple as an adhesion band deviating the urinary stream. Other urologic complications are surprisingly rare. *Urethral stenosis* is particularly rare with modern approaches to vaginoplasty which splays open the posterior length of urethral spongiosum to line the inner labia. This technique not only lines the labia with mucosal, non-hair-bearing tissue but also makes urinary stricture theoretically impossible. "Fishmouthing" the neourethra can also allay the possibility of stenosis (Figs. 17.2 and 17.3). *Urinary incontinence* is not associated with

Table 17.1 Sources of postoperative vulvar swelling in MTF vaginoplasty

Induration	Hematoma	Seroma	Abscess
Neolabial swelling unilateral or bilateral	Neolabial swelling unilateral or bilateral	Neolabial swelling, tends to be unilateral	Neolabial swelling, almost always unilateral
Weeks to months in duration	Weeks to months in duration	Weeks to months in duration	Weeks to months in duration
Non-tender	Moderately tender	Non-tender unless large	Extremely tender
	Variable size to 20 cm or more	Variable size corresponding to preexistent hematoma	Usually small 2–5 cm
Self-limiting	Can evolve to abscess or seroma if undrained		
Drainage unlikely	Spontaneous dark bloody drainage possible	Spontaneous clear amber fluid drainage possible	Spontaneous purulent drainage possible
Expectant management and/or pressure	Aspiration or incision and drainage or time and pressure for 5 cm or less	Aspiration or incision and drainage	Incision and drainage, packing and antibiotics, +/− culture

Fig. 17.2 Neoclitoris with superficial necrosis, bilateral labial necrosis, and slight posterior incisional dehiscence. Patient recovered without debridement or additional intervention

Fig. 17.4 Multiple urethrocutaneous fistulae, the largest of which is identified here at the time of consultation in preparation for corrective surgery

Fig. 17.3 Large area of labial granulation easily excised with scissors. Bleeding treated with silver nitrate. A smaller area located near the vaginal apex was also identified in this patient and treated

Fig. 17.5 Large residual spongiosum preventing dilation. Corrected at surgical resection

neocolporrhaphy due to limitations of the dissection field which do not extend above the internal urethral sphincter.

17.1.13 Vaginal Stenosis

Vaginal stenosis or lack of depth can be attributed to one of several technical problems: (a) surgical omission, (b) failure to dilate, or (c) infection, dehiscence, or pain which prevents a patient from suitably maintaining a satisfactory dilation regimen. In most cases, dilation is always recommended in order to maintain depth and diameter following vaginoplasty. When this is omitted, particularly during the first year following GRS/SRS, the body tends to narrow the caliber of the vaginal introitus with fibrosis and scarring (Figs. 17.4 and 17.5). Treatment options include: (a) reengaging the patient in the dilating process, (b) releasing scar tissue that has narrowed the introitus, (c) surgically reopening the area along the original lining scar along the original dissection plane and repacking the vagina, then resumption of dilation, or (d) vaginal deepening with a relining of some or all of the

neovagina. Estrogen cream can be a helpful addition to this process.

17.1.14 Psychological Regret

Although not a complication of SRS per se, *regret or remorse* following genital surgery is frequently thrown up as a precautionary red flag by practitioners and outsiders who are not familiar with the technique or outcome results. Regret is exceedingly uncommon among patients who have undergone MTF vaginoplasty, perhaps less than for any surgery available in any specialty [6]. This fact alone, despite risks and variable outcomes, supports the long-standing, deeply held convictions that most trans persons hold when contemplating irreversible genital surgery. Current and evolving "standards of care" requiring psychological assessment and a period of time living in the role of the intended gender also contribute to a low, but not zero, likelihood of dissatisfaction with operative results.

In summary, vaginoplasty for MTF transsexuals is a relatively safe procedure with important but relatively rare complications. Most *major* complications present in the immediate postoperative period. Current trends of remote surgical care and recovery over weeks and months mean that the majority of postsurgical care will continue to fall to primary care providers to recognize and treat or refer. With more education of surgeons and increasing standardization of operative techniques, outcomes should continue to improve (Fig. 17.6).

Fig. 17.6 MTF single-stage vaginoplasty, 4 months postop uncomplicated. Note clitoris, labia major, and labia minor

References

1. Meyerowitz J (2004) How sex changed: a history of transsexuality in the United States. First Harvard University Press, Cambridge. ISBN: 9780674013797
2. Jaap AJ, Shore AC, Tooke JE (1994) The influence of hypertension on microvascular blood flow and resistance to flow in the skin of patients with non-insulin-dependent diabetes. Diabet Med 11(9):883–887
3. Rossi Neto R, Hintz F, Krege S, Rubben H, Vom Dorp F (2012) Gender reassignment surgery–a 13 year review of surgical outcomes. Int Braz J Urol 38:97–107
4. Zhao JJ, Marchaim D, Palla MB, Bogan CW, Hayakawa K, Tansek R, Moshos J, Muthusamy A, Kotra H, Lephart PR, Wilson AN, Kaye KS (2013) Surgical site infections in genital reconstruction surgery for gender reassignment, Detroit: 1984–2008. Surg Infect (Larchmt). doi:10.1089/sur.2012.225
5. Uckay I, Harbarth S, Peter R, Lew D, Hoffmeyer P, Pittet D (2010) Preventing surgical site infections. Expert Rev Anti Infect Ther 8(6):657–6701
6. Lawrence AA (2006) Patient-reported complications and functional outcomes of male-to-female sex reassignment surgery. Arch Sex Behav 35:717–727. doi:10.1007/s10508-006-9104-9
7. Eldh J (1993) Construction of a neovagina with preservation of the glans penis as a clitoris in male transsexuals. Plast Reconstr Surg 91:895–900; discussion 901–893
8. Rehman J, Melman A (1999) Formation of neoclitoris from glans penis by reduction glansplasty with preservation of neurovascular bundle in male-to-female gender surgery: functional and cosmetic outcome. J Urol 161:200–206
9. Krege S, Bex A, Lummen G, Rubben H (2001) Male-to-female transsexualism: a technique, results and long-term follow-up in 66 patients. BJU Int 88:396–402
10. Baranyi A, Piber D, Rothenhausler HB (2009) Male-to-female transsexualism. Sex reassignment surgery from a biopsychosocial perspective. Wien Med Wochenschr 159:548–557. doi:10.1007/s10354-009-0693-5
11. Desciak MC, Martin DE (2011) Perioperative pulmonary embolism: diagnosis and anesthetic management. J Clin Anesth 23:153–165. doi:10.1016/j.jclinane.2010.06.011
12. Shiffman MA (2003) Estrogen and thromboembolic disorders: should patients stop hormones prior to cosmetic surgery? J Womens Health (Larchmt) 12:853–855; discussion 855. doi:10.1089/154099903770948078
13. Toorians AW, Thamassen MC, Zweegman S, Magdelyns EJ, Tans G, Gooren LJ, Rosing J (2003) Venous thrombosis and changes of hemostatic variables during cross-sex hormone treatment in

transsexual people. J Clin Endocrinol Metab 88:5723–5729. doi:10.1210/jc.2003-030520

14. Asscheman H, Giltay EJ, Megens JA, de Ronde WP, van Trotsenburg MA, Gooren LJ (2011) A long-term follow-up study of mortality in transsexuals receiving treatment with cross-sex hormones. Eur J Endocrinol 164:635–642. doi:10.1530/EJE-10-1038

15. Asscheman H, Gooren LJ, Eklund PL (1989) Mortality and morbidity in transsexual patients with cross-gender hormone treatment. Metabolism 38:869–873

16. Laliberte F, Dea K, Duh MS, Kahler KH, Rolli M, Lefebvre P (2011) Does the route of administration for estrogen hormone therapy impact the risk of venous thromboembolism? Estradiol transdermal system versus oral estrogen-only therapy. Menopause 18:1052–1059. doi:10.1097/gme.b013e3182175e5c

17. Johnson RL, Hemington-Gorse SJ, Dhital SK (2008) Do cosmetic surgeons consider estrogen-containing drugs to be of significant risk in the development of thromboembolism? Aesthetic Plast Surg 32:743–747. doi:10.1007/s00266-008-9156-4

18. Wu M-P, Ou CS, Chen SL, Yen EY, Rowbotham R (2000) Complications and recommended practices for electrocautery in laparoscopies. Am J Surg 179:67–73

19. Levine JH, Longo WE, Pruitt C, Mazuski JE, Shapiro MJ, Durham RM (1996) Management of selected rectal injuries by primary repair. Am J Surg 172(5):575–578; discussion 578–579