

Chapter 10

Gender Confirmation Surgery



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History

The first reported gender confirmation surgery (GCS) was performed in Berlin in 1931 [1]. Prior to that only ablative procedures such as hysterectomy and gonadectomy were reported for gender dysphoria, notably the case of Alan L. Hart, an American physician born Alberta Lucille Hart who underwent hysterectomy and gonadectomy in 1917, at the age of 27 [2]. After a setback due to World War II, GCS in the United States resumed, notably with the creation of the Johns Hopkins Gender Identity Clinic in 1965. Led by plastic surgeon Milton Edgerton, this was the first multidisciplinary center for the care of transgendered patients and was composed of psychiatrists, psychologists, plastic surgeons, gynecologists, urologists, and endocrinologists. The center was closed in 1979 but reopened in 2017. Significant change occurred in 2014 when the United States Department of Health and Human Services review board ruled that Medicare would pay for GCS.

Surgical Goals

Adjusting the body to the mind is the overarching goal of gender confirmation surgery [3, 4]. For transwomen, this includes removal of the phallus and scrotum and creation of a natural-appearing vulva, sensate neo-clitoris, and vagina of adequate depth and width to enable penetrative intercourse. Adjunct procedures that achieve feminization include breast augmentation, thyroid chondrolaryngoplasty, as well as voice and facial feminization.

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For transmen, the ability to achieve standing micturition and sexual penetration via phalloplasty or metoidioplasty is the mainstay of GCS. In addition, subcutaneous mastectomy and facial masculinization are common procedures.

Preoperative Evaluation

No patient should undergo gender confirmation surgery without proper screening and preoperative evaluation. Prior to proceeding to surgery, two referral letters from a qualified mental health professional are generally required. A diagnosis of persistent gender dysphoria should be well documented, and the patient must complete at least a year's trial of living in the gender role most congruent with their gender identity. Patients are required to have undergone at least 1 year of continuous hormone therapy as required for their gender goals. In addition, any medical or mental health concern must be reasonably well controlled, and patient must have the capacity to provide informed consent.

Hormone Therapy

It is critical for the surgeon to understand the effects of hormonal therapy. Though specific regimens may differ, the surgeons must be familiar with the possible side effects and how they may affect the surgery and recovery.

Feminization

Feminization is achieved by the suppression of androgen effects and induction of female secondary sex characteristics. Suppression of androgen effects may be achieved by medications that either suppress gonadotrophin-releasing hormone (GnRH) or are GnRH antagonists, suppress production of luteinizing hormone, interfere with testosterone production or interfere with androgen binding to its receptor at target tissues. Estrogens are used to induce female secondary sex characteristics through its action on tissue receptors.

After the initiation of feminizing hormone therapy, body fat redistributes into a female fat pattern, muscle mass decreases, skin softens, and libido decreases. Facial hair becomes finer, and breast growth commences.

Masculinization

Testosterone is the mainstay of masculinization hormone therapy. Testosterone therapy via either parenteral or transdermal routes increases muscle mass, decreases fat mass, increases facial hair, induces male-pattern baldness, causes clitoromegaly, deepens the voice, atrophies the vagina, increases libido, and causes cessation of menses. Testosterone levels should be monitored to avoid complication of excess testosterone—liver dysfunction, hypertension, lipid changes, erythrocytosis, excessive weight gain, salt retention, and cystic acne [5]. Estrogen levels may be decreased through the use of GnRH analogs or medroxyprogesterone.

Surgical Therapy

Feminization

A successful feminization of the genitalia achieves a natural-appearing vagina that can support penetrative intercourse, a feminine-appearing mons pubis, labia majora, and labia minora, and a sensate neo-clitoris with adequate clitoral hooding. This may be achieved through a number of surgical procedures, although the mainstay of genital feminization is vaginoplasty.

Currently, three major options exist for vaginoplasty—penile inversion, rectosigmoid colon intestinal transposition, and nongenital flaps. Of these, penile inversion [6, 7] and intestinal transposition [8] are most common. Intestinal transposition allows for the creation of a vascularized vagina of adequate length, with a moist lining, and that requires less postoperative vaginal dilation and lubrication. However, this technique subjects the patient to an intra-abdominal operation with bowel anastomosis and all its associated complications such as postoperative ileus, anastomotic leak, adhesions, and perforations. In addition, intestinal transposition GCS may be complicated by excess neo-vaginal secretions and malodorous discharge. Penile inversion, on the other hand, avoids the risks of intra-abdominal surgery, but requires postoperative neo-vaginal dilation to maintain length and manipulation of the urethra to provide moisture. Nongenital flaps are a tertiary option and are generally only used for reconstruction following oncologic resection, trauma, or failed primary reconstruction.

Colonic Interposition Vaginoplasty

In this technique, a neo-vagina is created from a portion of the bowel—most frequently from the sigmoid colon, although small or large intestine may be used. The sigmoid colon has the benefit of a large diameter lumen and decreased the rate of secretions compared to other parts of the bowel.

A bowel prep is required prior to surgery and colonoscopy is performed to rule out suspicious lesions or malignancy. Surgery is performed in conjunction with a general surgeon, who mobilizes 12–15 cm of sigmoid colon while the plastic surgeon begins the perineal dissection. The sigmoid segment remains attached to its vascular pedicle and is sutured to the neo-introitus. The distal end is stapled, and the mesentery is sewn to the pelvis to maintain length and prevent torsion. The ends of the native colon are then primarily anastomosed to restore continuity of the digestive tract. Of note, postoperatively the patient must continue surveillance for colonic malignancy.

Penile Inversion Vaginoplasty (Fig. 10.1a–g)

Penile inversion vaginoplasty is performed by deconstructing the penis and using the penile skin to create a neo-vagina. After placing a urinary catheter, the scrotum is incised along the median raphe and an orchiectomy performed. A circumcision incision is performed below the glans and the skin is dissected free from the underlying penile shaft. The dorsal neurovascular bundle is dissected from the underlying corpora cavernosa, which is separated from the corpora spongiosum.

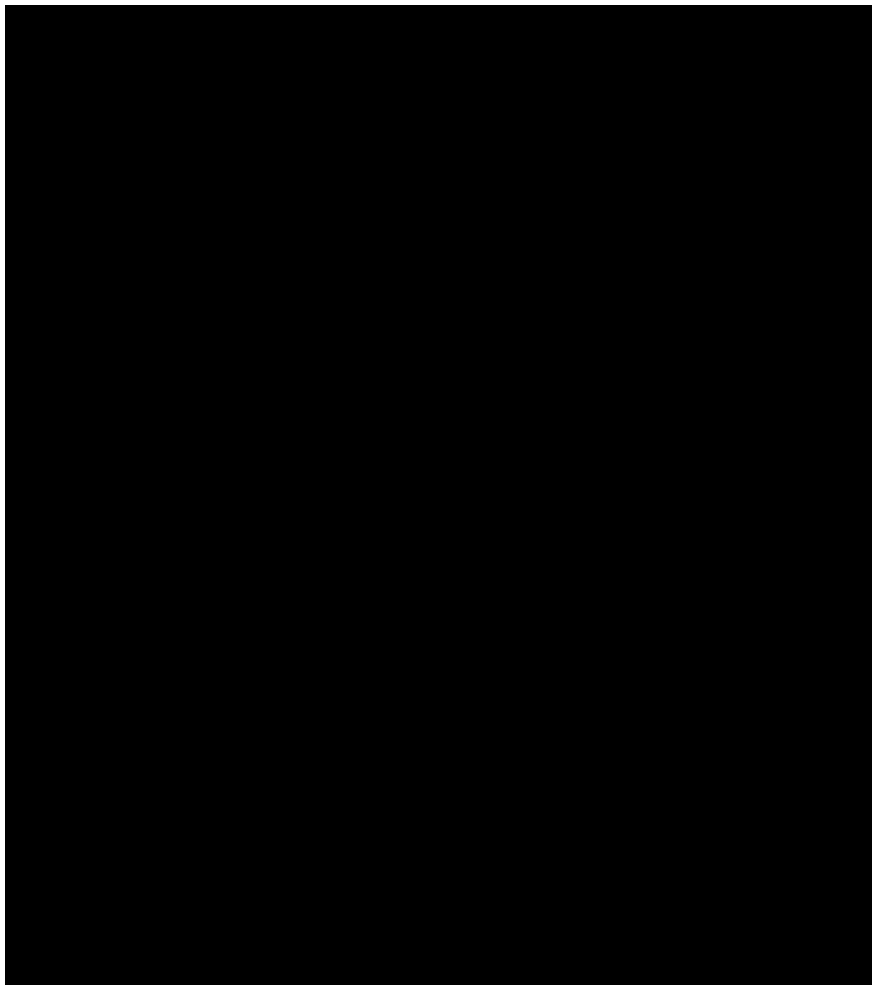


Fig. 10.1 a g Vaginoplasty using penile inversion technique. **a** Preoperative vaginoplasty markings. **b** Penile skin inversion. **c** Separating the urethra from the corpora. **d** Formation of neo vagina by inverting penile shaft skin tube. **e** Neo vagina insertion. **f** Labia majora contouring and positioning of the urethra and neo clitoris. **g** Final post operative view tie over bolster. Reprinted by permission from Springer Nature: Leclère et al. [24]

The corpora spongiosum is resected from the base of the penis to prevent it from constricting the neo-vagina when engorged during sexual arousal. The corpora cavernosa are resected at the pubis, but a short amount is left to provide a base for the neo-clitoris. The neo-clitoris is then formed from the dorsal glans. A neo-vaginal pocket is dissected between the rectum and penile shaft. The penile skin is inverted, closed to create a blind pouch, and inserted into this space. A urethral flap may be inset with the penile skin to provide lubrication to the

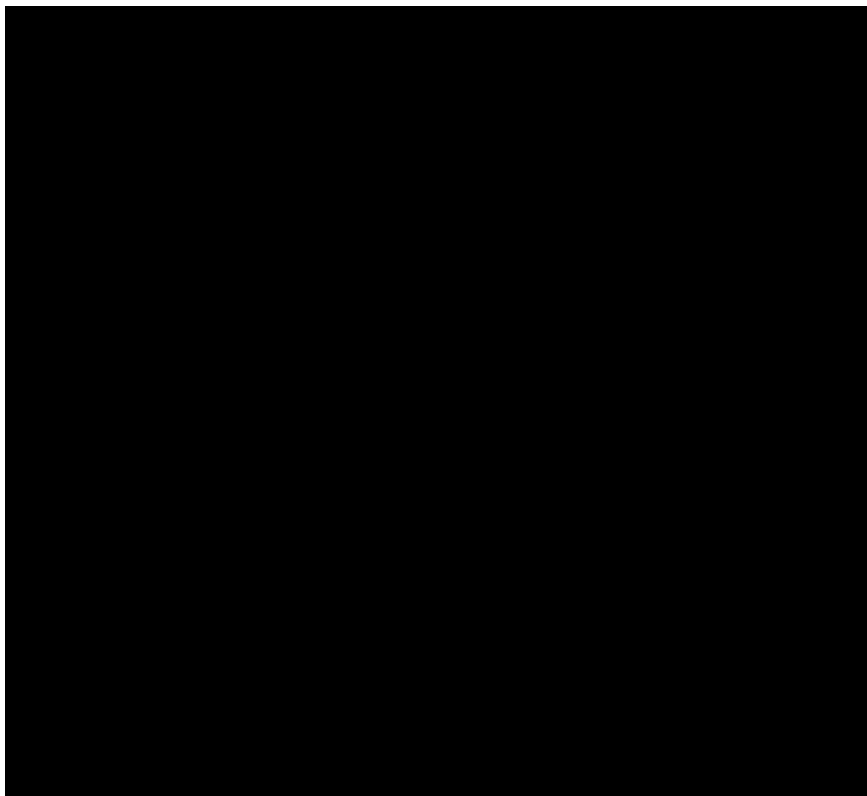


Fig. 10.1 (continued)

vaginal cavity. The urethra is shortened and incised ventrally. The glans penis is brought out through this opening thus creating a neo-clitoris surrounded by labia minora and a clitoral hood. The cut end of the urethra is spatulated to create a new urethral meatus. The scrotal skin is tailored to form the labia majora and a silastic stent is inserted into the neo-vagina to maintain patency of the vaginal cavity. This, along with the urinary catheter, is kept in place for 4–6 days. After removal of the vaginal stent, a vaginal dilation regimen is begun. The patient may initiate vaginal intercourse 6–8 weeks after surgery. Of note, continued prostate exams are recommended as per national guidelines.

Hair Removal

Hair removal prior to vaginoplasty is an important and required step. Hair should be removed from any area that will either be in contact with urine (i.e., skin used to construct a neourethra) or form a partially closed cavity (i.e., skin used to line the neo-vagina). This is important because hair within the neourethra will obstruct the flow of urine thus promoting urinary retention and may become encrusted with calculi and debris. In both cases, that patient would be at an increased risk of

urinary infections. Likewise, hair within the neo-vagina may become a potential source of infection. Options for permanent hair removal include electrolysis and laser hair removal. Although neither is 100% effective, laser hair removal is generally considered superior to electrolysis [9]. Topical anesthetics are often used, and areas to be treated should be confirmed by the surgeon prior to hair removal.

Complications

Complications from GCS are similar to those of any surgery—bleeding, scarring, infection, delayed wound healing, and damage to surrounding structures. Complications specific to male-to-female GCS include strictures of the urethra and neo-vagina, rectovaginal fistula, flap loss, diminished or lost neo-clitoral sensation, and inadequate vaginal depth or constriction of the introitus. Additional complications specific to colonic interposition GCS include anastomotic leak, ileus, and abdominal adhesions.

Nongenital Adjunct Procedures

For many patients, the ultimate goal of their transition are GCS. However, there is a subset of patients who choose not to have GCS and only undergo procedures that affect features seen during social interaction when fully clothed. For patients who do choose to undergo GCS, these procedures are often performed prior to genital surgery. Generally, for male-to-female transition, this includes chest surgery and facial feminization.

Chest Surgery

Chest surgery, commonly referred to as top surgery, includes creation of an esthetic breast mound and female nipple. Although there is some breast growth as a result of hormone therapy, this is often inadequate, and augmentation is required to produce the desired result. Options for augmentation include silicone and saline implants, and more recently have evolved to include autologous tissue reconstruction. For implant-based reconstruction, implants may be placed in either subglandular, subfascial, or subpectoral pockets, with subpectoral being the most common. This may be done through either transaxillary, periareolar, or inframammary crease incisions, depending on a patient's anatomy and preferences.

Recently, autologous breast reconstruction, a procedure that is commonly performed for breast reconstruction after mastectomy, has been offered to transgender patients. This differs from implant-based reconstruction because the patients' own tissue is used to augment the breast, thus avoiding the need for a permanent foreign body. Most commonly, tissue from the abdomen (a deep inferior epigastric perforator flap) is transferred and attached to blood vessels in the chest (Fig. 10.2a, b). This produces a natural-appearing result that feels like a native breast. Although this technique avoids the complications associated with breast implants (implant infection, capsular contracture, rupture, rippling, etc.), it is associated with a small but real risk of flap loss.

Facial Surgery

The goal of facial surgery in a male-to-female patient is feminization of the facial features. This is achieved by reshaping or recontouring masculine facial features to achieve a feminine appearance. Areas of the face that readily define the sex include

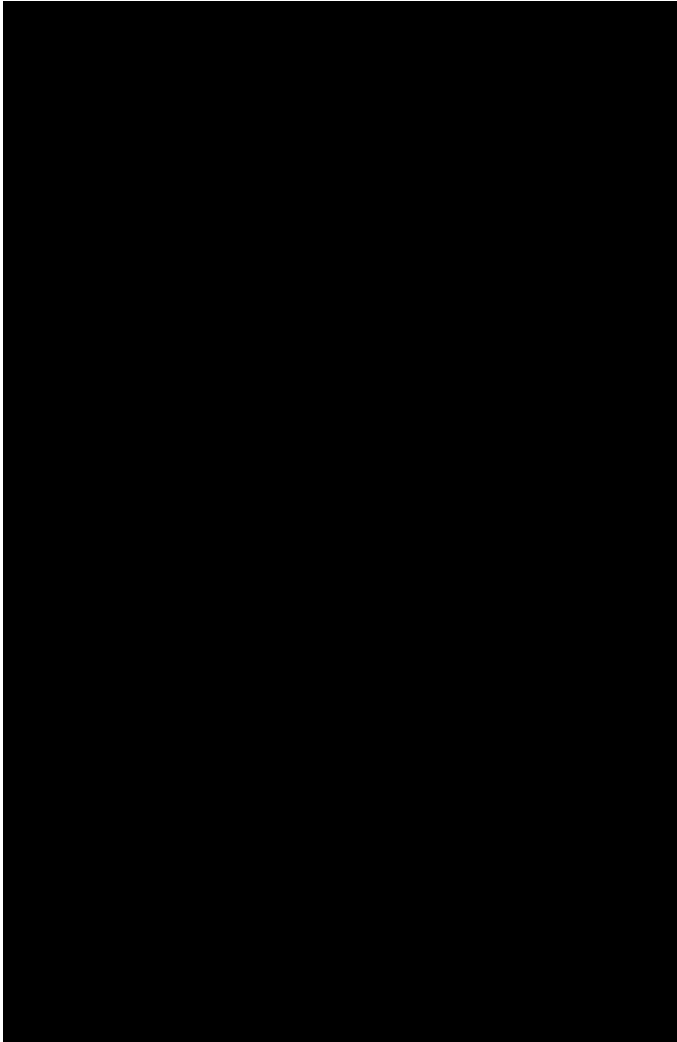


Fig. 10.2 a,b Deep inferior epigastric artery perforator flap (DIEP) technique used for male to female chest surgery. Figures courtesy of A. Perry MD, M. Smith MD)

the forehead, nose, lips, cheeks, chin, and jawline. The forehead shape can make a significant difference in facial appearance. Men generally have a more prominent supraorbital ridge, which can be shaved down to achieve a feminine forehead and brow. The hairline can be moved forward and the brows can be lifted. The shape of the eye sockets can also be altered to achieve a smaller, higher set orbit. The nose can be narrowed, the dorsal height decreased, and the tip rotated to produce a more feminine shape. Cheek implants may be used to add projection and produce fuller, more prominent cheeks. Subtle changes to lip shape can be enacted by decreasing

the distance between the lips and nose, and by using fillers to produce fuller lips. The jaw and chin can be contoured to achieve a feminine appearance. The angles of the jaw can be burred down to narrow the face and a sliding genioplasty can be performed to decrease the projection of the chin. Lastly, the thyroid cartilage (Adam's apple) can be reduced as a prominent thyroid cartilage is a male secondary sex characteristic.

Masculinization

Metoidioplasty (Fig. 10.3a c)

Of the options for female-to-male GCS, metoidioplasty is the simpler operation with lower complication rates. It relies entirely on local tissue and does not require specialized instruments or techniques. However, patients undergoing metoidioplasty are less likely to be able to achieve sexual penetration than those undergoing phalloplasty.

During the course of testosterone therapy, the clitoris gradually enlarges to an average length of 4–5 cm. During metoidioplasty, the clitoris is lengthened by releasing the suspensory ligament and resection of the ventral chordee. The female urethra is also lengthened with the use of vaginal musculomucosal flaps or the labia minora. A vaginectomy is often performed at the same time. Scrotoplasty may also be performed concomitantly using labia majora flaps. Testicular implants may be placed immediately or in a delayed fashion to decrease the risk of infection.

Phalloplasty (Fig. 10.4a d)

Phalloplasty has become the most common choice for constructing a neo-phallus due to high patient satisfaction, ability to achieve standing micturition, and success in penetrative intercourse after the addition of a prosthetic implant.

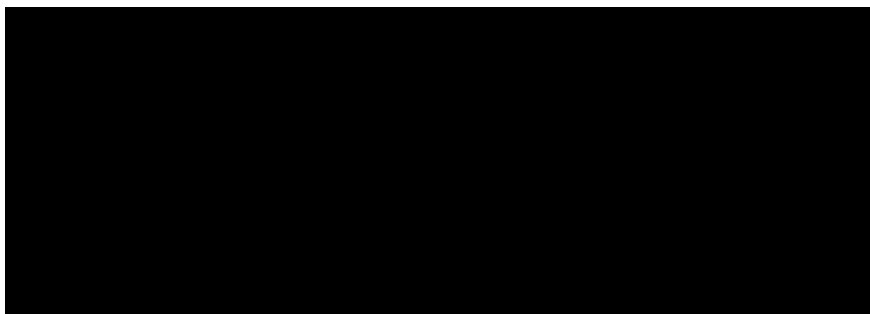


Fig. 10.3 a c Metoidioplasty. a Pre op, b post op, c 1 year post op. Reprinted by permission from Springer Nature: Cohanad [25]

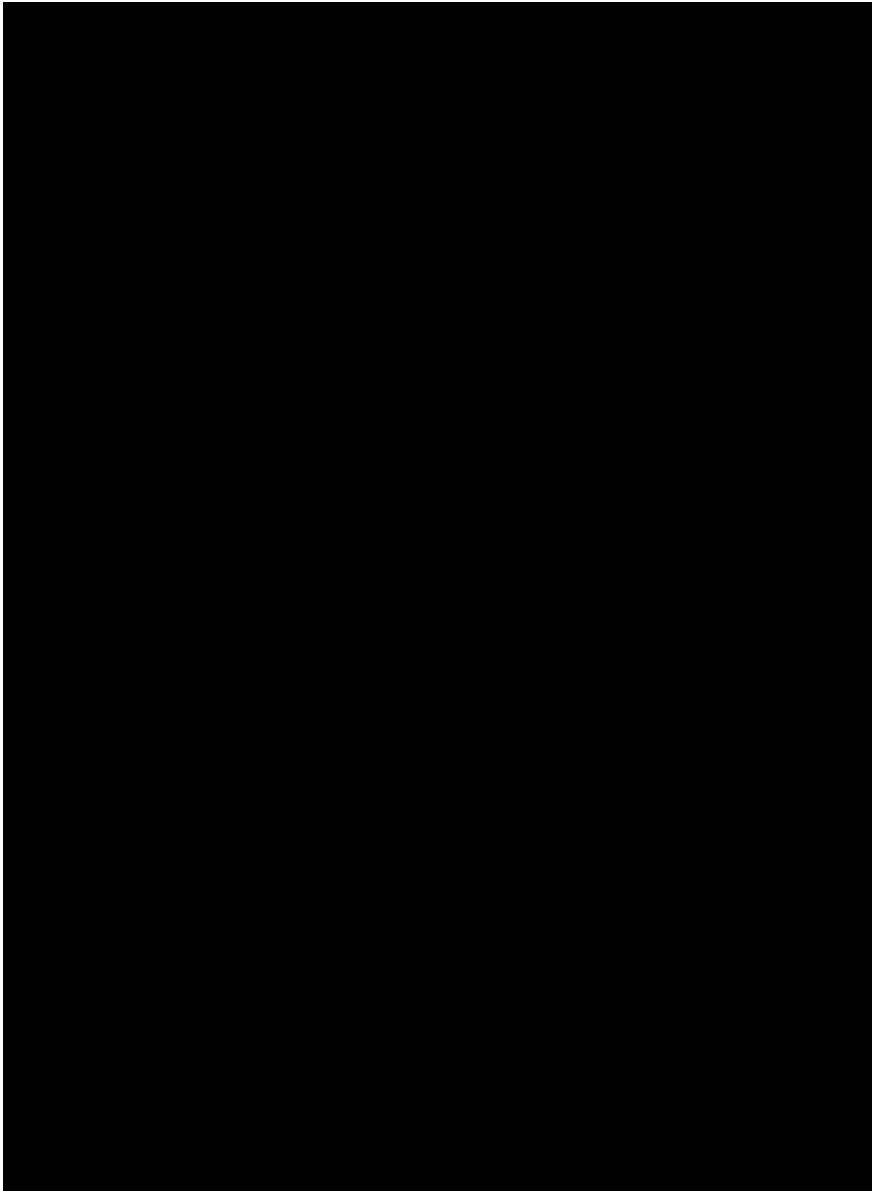


Fig. 10.4 a d Forearm free flap phalloplasty. **a** Radial forearm free flap harvest. **b** Femoral artery recipient site exposure. **c** Radial forearm flap is tubularized around a 16 French Foley catheter. **d** Final result of radial forearm phalloplasty. Reprinted by permission from Springer Nature: Trombetta et al. [26]

The first reported phalloplasty was performed in Russia for total penile reconstruction in 1936. A tubed abdominal flap and autologous rib cartilage were used to create a neo-phallus [10]. The first phalloplasty performed for GCS was in England by Plastic Surgeon Sir Harold Gillies in 1946, and involved a series of 13 operations on another British physician, Laurence Michael Dillon (born Laura Maude Dillon) [11].

Phalloplasty may be performed either by use of a pedicled flap (one where tissue is moved, but blood vessels remain attached to their origin), or a free flap (one where blood vessels are completely detached from their origin, and reconnected to a new, distant blood supply). Pedicled options include the groin flap [12], anterolateral thigh flap [13], and island tensor fascia lata flap [14]. Although pedicled flaps are a reliable option, free flaps have become a preferred option in large centers performing GCS.

Free tissue transfer enables the surgeon to bring in tissue that is best suited to construct a phallus. Options for free tissue transfer include the radial forearm free flap [15], lateral arm flap [16], osteocutaneous free fibula [17], latissimus dorsi free flap [18], and free scapular flap [19]. Of these, the radial forearm has become the gold standard for phalloplasty [20] with high rates of patient satisfaction. However, like all phalloplasty procedures, complication rates can be high [21].

Briefly, the flap is outlined on the nondominant radial forearm after an Allen's test confirms a patent palmar arch. The flap is raised to include the radial artery, the cephalic and or basilic vein, and the medial antebrachial cutaneous nerve. It is then tubed to create a neo-phallus. Modification of the flap includes creating a tube within a tube for urethroplasty. The radial artery is clipped and cut at its origin. Then, an anastomosis is performed to either the femoral artery, femoral side branches, or inferior epigastric artery. The vein is anastomosed to the respective vein, and the nerve is coapted to the dorsal nerve of the clitoris.

If immediate urethroplasty is not performed, the ventral surface of the flap is opened 3 months following phalloplasty and a full-thickness skin graft or buccal mucosal graft is placed. Three to six months later, the healed graft is tabularized over a urinary catheter. Glansplasty (to create a neoglans) may also be performed either immediately or in a delayed fashion. The darker color of the glans can be achieved with tattooing.

Lastly, in order to achieve an erection, an implantable penile prosthesis must be inserted. This is usually performed after twelve months to reduce the risk of implant erosion or extrusion. Dilapidation may be performed prior to surgery or after surgery but before the return of sensation.

Complications after free-flap phalloplasty include partial or complete flap loss (<2% in large series), urethral fistula, urethral stricture, exposure or loss of the implant, and implant malfunction among others.

Nongenital Adjunct Procedures

Chest Surgery (Fig. 10.5a d)

Chest surgery, commonly referred to as top surgery, includes the removal of the stigmatizing female breast in order to achieve a masculine chest contour and nipple appearance. Techniques vary depending on the amount of breast tissue and skin laxity. Small breasts may be amenable to a mastectomy performed through a circumareolar incision, although larger breasts with excess skin will require subcutaneous mastectomy through an incision above the inframammary fold, with free

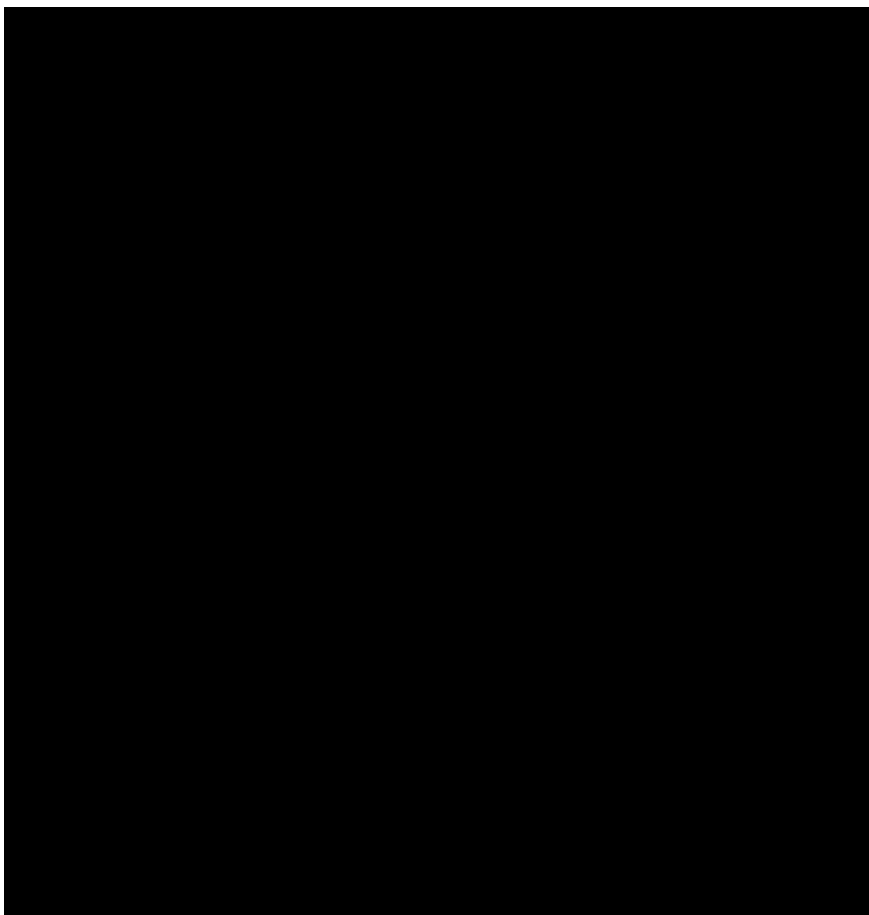


Fig. 10.5 a d Female to male chest surgery using “keyhole” periareolar technique and suction assisted liposuction. Left photos are pre op and right photos are post op. Figures courtesy of A. Perry MD

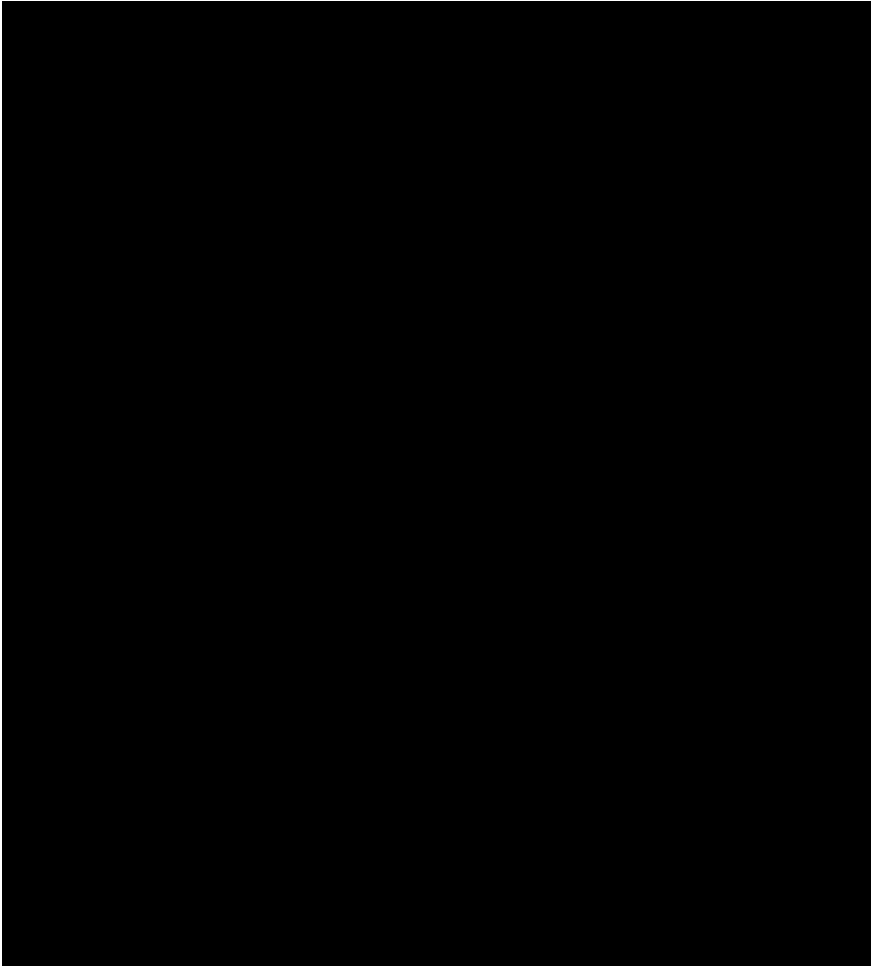


Fig. 10.5 (continued)

nipple grafting. In this technique, the nipple-areolar complex is harvested as a full-thickness skin grafts, reduced in size, and grafted at its new location on the chest wall. [22]

Facial Surgery

Facial masculinization surgery is a set of procedure that changes the female face to appear more masculine. The goals of these procedures are the opposite of those in facial feminization. Although some of the desired changes occur as a result of hormone therapy, surgical procedures can act as an adjunct to achieve a more masculine appearance.

As males tend to have a longer, more prominent forehead, forehead lengthening, and forehead augmentation with bone grafts or implants can be performed.

Similarly, the cheeks can be augmented with implants, fillers, or autologous fat. Rhinoplasty can be performed to create a larger nose, straighter dorsum, wider tip, and decrease nasolabial angle. Jaw and chin implants can be used to accentuate the jawline. Lastly, the thyroid cartilage can be masculinized using autologous rib cartilage [23].

Conclusion

Gender conformation surgery is the practice of aligning the body with the mind. Through these powerful techniques, patients are able to achieve a body that more closely resembles their perceived gender. Although every patient will have a different definition of what that means, these techniques enable the healthcare team to provide the necessary treatment and make their patients feel at home in their bodies.

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