

Abdominal phalloplasty

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Overview

Decision to Undergo Surgery: Patients may choose to undergo a metoidioplasty prior to or after an abdominal phalloplasty. Metoidioplasty allows the urethra to be advanced from the natal urethral orifice and permits voiding while standing. The urethra can be subsequently advanced in abdominal phalloplasty if a patient wishes. For patients considering abdominal phalloplasty who wish to maximize urethral advancement, we initially perform a metoidioplasty with urethral lengthening and vaginectomy without release of the suspensory ligament.

Assessing Patient Candidacy: Preoperative selection is crucial for maximizing the success of abdominal phalloplasty. Patients with a low body mass index may lack the subcutaneous tissue for an adequate phallus. Alternatively, too much subcutaneous tissue precludes tubularization of the phallus and abdominal skin closure. To assess a patient's candidacy for surgery, we pinch the donor site to provide an estimate of both the length and the width of the phallus that can be obtained and that of the suppleness of the donor site and the ability to close the defect after the phallus is constructed (Fig. 1).

Operative Steps: Depending on the thickness of the donor site's subcutaneous tissue and the pinching maneuver, a 10–14-cm-long rectangular segment that is 8–12-cm wide is harvested. An abdominal flap is raised, and care is taken to avoid injury to the vascular supply at the base of the phallus. The phallus is then tubularized without tension. If the phallus is under tension after the initial tubularization, then a skin graft can be harvested to cover the defect and minimize potential ischemia on the skin edges.

Postoperative Management: Postoperatively, the phallus is closely monitored and kept upright by suturing it to the abdominal skin. The patient is encouraged to keep the thighs flexed for the first 2 days after surgery. These maneuvers prevent kinking of the vasculature and allow for venous drainage.



Fig. 1

Surgeon pinching the adipose tissue of the lower abdomen to assess for tubularization during the preoperative evaluation. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*

Adjunctive Procedures: After 6 months, patients may consider adjunctive surgeries, including glansplasty, urethral advancement, and penile prosthesis placement.

Anatomical considerations

Knowledge of the anatomy of the clitoris and neurovascular supply to the mons pubis, labia majora, and lower abdomen is critical when performing abdominal phalloplasty. The principal blood supply in contemporary abdominal and suprapubic phalloplasty is from the superficial epigastric artery and the superficial external pudendal artery (Fig. 2). For example, in our approach, the skin overlying the superficial external pudendal artery may need to be mobilized to tubularize the flap. The superficial external pudendal artery arises from the femoral artery and supplies the skin of the lower abdomen and labia majora [1]. Use of a handheld Doppler can assist in identifying these vessels. Anecdotally, we have found that flaps can survive despite anemic vessels, suggesting that a flap may also survive in part as a random flap. An alternative technique described by Bajpai [2] utilizes more lateral lower abdominal “bird-wing” skin flaps because their shape and location are more reliant on the superficial epigastric artery. The superficial epigastric artery arises from the femoral artery

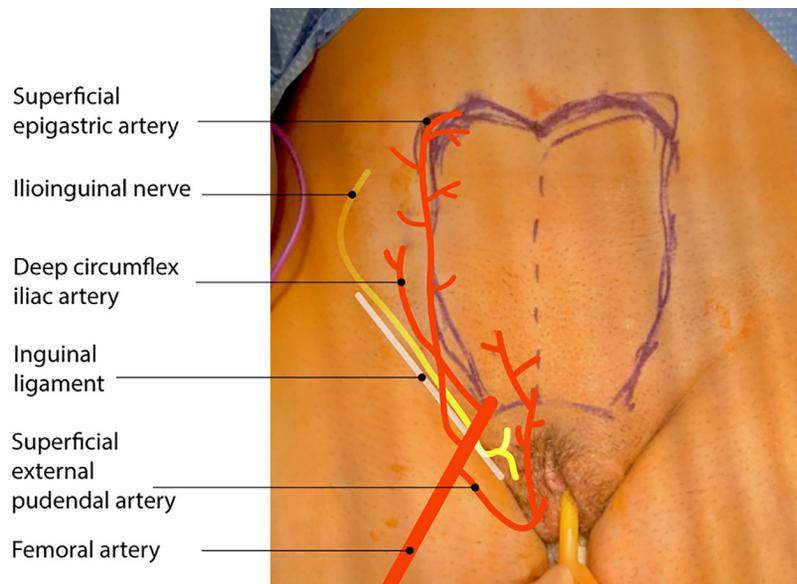


Fig. 2

The abdominal phalloplasty flap may be supplied by the superficial external pudendal artery, the superficial epigastric artery, and the deep circumflex iliac artery, with the primary blood supply depending on the surgical technique. The flap is innervated by the ilioinguinal nerve.

about 1 cm distal to the inguinal ligament and cranially travels anterior to the ligament. The Bajpai approach also makes use of the deep circumflex iliac artery that arises from the femoral artery and supplies the muscles of the anterolateral abdominal wall, the skin overlying the anterior superior iliac spine, and the iliac crest.

Innervation of the skin over the mons pubis and labia majora is from the ilioinguinal nerve that comes off of the L1 ventral ramus. This nerve travels through the inguinal canal and divides into terminal sensory branches after passing through the superficial inguinal ring. The pudendal nerve originates from the ventral rami of S2–S4, travels through the greater sciatic foramen, reenters the lesser sciatic foramen, travels through the pudendal canal, and then gives off branches. The dorsal nerve of the clitoris is a branch of the pudendal nerve. When developing the flap, the adipose tissue anterior to the rectus sheath fascia is raised. It has been posited that the preservation of innervation from the ilioinguinal nerve allows some cutaneous tactile sensation in the abdominal phalloplasty flap. Erogenous sensation is preserved through the maintenance of the clitoris at the base of the phallus [1]. A recent analysis of sensation recovery in phalloplasty techniques with nerve coaptation has suggested that sensation in the phallus may be related to the physical transmission of vibration and pressure to the clitoris with a resultant experience of erogenous sensation, which is separate from neurotomy [3].

Preoperative workup

Patient selection for this surgery is of paramount importance. The evaluation begins by eliciting patient concerns and goals. For phalloplasty, we discuss the patient's wishes for cosmetic appearance, urination, sensation, and the possibility of a penile prosthesis in the future. Discussions should highlight the advantages of suprapubic phalloplasty, such as the lack of vascular risks associated with microvascular anastomosis, an inconspicuous donor site, homogeneous skin color of the phallus and the groin, and an adequate phallus size, and the drawbacks, such as the lack of neurotomy, concerns for an elevated risk of urethral lengthening given the lack of a well-vascularized tissue, and a thick subcutaneous tissue limiting tubularization. Patients often choose abdominal phalloplasty because it offers a limited scar, an adequately sized phallus, and a fairly quick recovery.

In the preoperative physical evaluation, the patient's abdomen should be carefully examined in the supine position. Attention should be given to any prior surgical scars on the abdomen as these may compromise the vascularity of the flap. The operating surgeon should pinch the adipose tissue where the phallus will be and evaluate the ability to tubularize the flap (Fig. 1). If there is too much adipose tissue, then the flap will be difficult to tubularize and would be under tension at the time of closure. If there is insufficient adiposity, then the phallus may be too narrow, resulting in a poor cosmetic outcome and preventing later erectile implant placement or urethroplasty. This examination should be explained to the patient with any findings clearly linked to possible surgical outcomes. Patients may consider electrolysis or laser hair removal of any hair-bearing area that may comprise the phallus for esthetic concerns. Hair removal can also be performed postoperatively. We do not ask patients to stop testosterone prior to surgery but do request cessation of nicotine products and drug use.

Informed consent for this procedure should include a thorough discussion of all the options available for a gender-affirming genital surgery and the risks of surgical complications. Surgeons may consider use of a surgical priorities scale. One study found that patients were often concerned about being able to stand to urinate and erotic sensation. Concerns regarding the phallus length, phallus girth, and the ability to engage in penetrative intercourse were variable [4].

OR equipment

One major advantage of abdominal phalloplasty is the absence of a microvascular anastomosis required in a free flap phalloplasty. As such, there is little need for surgery-specific equipment.

Equipment we commonly utilize are as follows:

- A 16-Fr Foley catheter
- Electrocautery
- Towel clamps
- Supplies for possible split-thickness skin graft, including a dermatome, a mesher, and mineral oil
- 3-0 Monocryl for skin closure
- Vicryl for subcutaneous tissue closure
- Handheld Doppler ultrasound

Surgical techniques

Overview of techniques

Historical techniques

Abdominal phalloplasty first appeared in the medical literature in 1936 [5] when Bogoras described use of a pedicled abdominal flap, which was tubularized and incorporated into the rib cartilage for rigidity. This technique was then adapted by Gillies and Harrison [6], who constructed a neourethra with abdominal phalloplasty and used the costal cartilage for rigidity. Dubin et al. [5] described a three-stage abdominal flap technique, leading to the creation of a skin-lined tube within a tubularized abdominal phallus. The patient would then insert a Teflon baculum for rigidity as desired. Davies and Matti [7] reported developing a musculocutaneous abdominal flap incorporating the rectus muscle for a phallus supplied by deep inferior epigastric artery perforators.

Current techniques

Bettocchi et al. described their suprapubic pedicled phalloplasty technique in 2005. They constructed the phallus from a tubularized suprapubic abdominal wall flap and performed urethral lengthening with the neourethra made from a pedicled labial skin flap. In an analysis of outcomes in 82 patients, 6% of these patients chose not to have neourethral construction. Initially, Bettocchi and team performed a single-stage surgery and noted a high urethral complication rate (stricture: 94%, fistula: 94%). They then transitioned to a two-stage surgery with a decrease in the urethral stricture rate to 44% and that in the urethral fistula rate to 29%. Approximately 37% of patients who underwent neourethra creation (including second-stage if applicable) reported satisfactory voiding while standing and about 25% were able to void while standing with some difficulties [8]. This approach was further advanced by Falcone et al. [9], who described creating a 12-cm wide and a 13-cm long flap of abdominal wall skin as measured from the base of the clitoris with incorporation of the superficial external pudendal vessels into the base of the flap.

In 2013, Bajpai et al. described their approach for phalloplasty using lower abdominal flaps in four patients between the ages of 6 and 17 years with a history of disorders of sex development. They described a “bird-wing” incision with the base in the suprapubic region that bilaterally extended to the lower abdominal skin crease with a base-to-limb ratio of 4 or 5:1. The incision depth was to the level of the anterior rectus sheath medially and the external oblique aponeurosis laterally. The flap was vascularized by the superficial epigastric and circumflex iliac vessels. The lateral limbs were then approximated with subcuticular sutures to tubularize the phallus in the midline. The authors reported a phallic length of 7.5–12.5 cm. Second-stage urethral reconstruction would then be performed at least 6 months after the first stage, with potential for penile implant placement once protective sensation returned [2].

Terrier et al. have published their staged technique for suprapubic phalloplasty. The first stage involves placing two subcutaneous tissue expanders, which are then slowly inflated by an injection of saline solution to gradually distend the skin of the abdomen. Three months later, the second stage is performed that includes tubularizing the expanded skin to form the phallus, which is then left in situ for 3 months to encourage neovascularization. The flap is completely lifted in the third stage. The clitoris is then de-epithelialized and buried at the base of the phallus or left in situ. Subsequent stages can be performed for urethroplasty, glansplasty, and penile and testicular implant placement. In an outcomes analysis, the authors found that 95% of patients were satisfied with their choice of phalloplasty [10].

Abdominal phalloplasty may also be performed as a secondary phalloplasty after metoidioplasty. An international multicenter case series found that high-volume centers performing secondary phalloplasty have complication rates comparable to primary phalloplasty [11].

Urethral advancement

Options for urethral advancement are varied in abdominal phalloplasty. This goal is usually achieved through staged urethroplasty after phalloplasty with prior metoidioplasty or staged urethroplasty with phalloplasty first. Metoidioplasty with a local vaginal flap (pars fixa) can help advance the urethra superiorly and anteriorly.

The creation of the pars pendulans in abdominal phalloplasty requires the use of a second flap or graft. When urethral construction of the distal phallic shaft is the goal, the primary approach in abdominal phalloplasty is staged. Abdominal phalloplasty may first be performed in a shaft-only manner, with subsequent delayed stages for urethroplasty. One option includes the placement of a skin graft into an incision in the ventral aspect of the phallus. Then, after allowing for healing, the graft is tubularized and the shaft is closed in the third stage. This is often accompanied by the pars fixa creation [12].

Another option for neourethra creation is radial artery urethroplasty (RAU) using a radial artery forearm free flap inside a preexisting suprapubic phalloplasty. A 4-cm by 20-cm

free flap neourethra based on the radial artery is developed from the medial forearm. A space is created through the phallus using Hegar dilators, the tubularized neourethral flap is then tunneled through the phallus and joined to the pars fixa neourethra, if present, with a spatulated urethral anastomosis, and microsurgical vascular and neural anastomoses are performed. If a pars fixa neourethra is not present, then the proximal aspect of the RAU neourethra is joined to the native urethra using local labia minora and anterior vaginal flaps in the second-stage surgery [13,14]. In a series of 27 patients, 2 lost the RAU due to ischemic complications, 1 had a urethral stricture, and 2 had a urethral fistula. However, all 19 patients who had completed all stages at the time of follow-up (median 9.2 months) were able to void from the tip of the phallus while standing [13].

Alternatively, a two-stage urethroplasty performed 3 months after the completion of the expanded suprapubic abdominal phalloplasty with a split-thickness skin graft or a total skin graft from the abdomen or thigh, tubularized over a 20-Fr urethral catheter, has been described [15]. This tubularized graft is placed inside the phallus and joined to the pars fixa neourethra, which is created with a labia minora skin flap and an anterior vaginal wall flap. In a 2021 analysis of the outcome of 25 urethroplasties, there was a 13.6% rate of urethral diverticula, 60% rate of urethral fistula, and 50% rate of urethral stricture. In all, 68% of patients required intervention to manage their urethral complications [15].

Falcone et al. looked at 34 patients in a consecutive series from 2 referral centers who had undergone staged suprapubic pedicled phalloplasty. Two patients then underwent radial artery-based forearm free flap urethroplasty and nine underwent creation of a perineal urethrostomy followed by vaginectomy. Patients may have also elected to proceed with glans sculpting, scrotoplasty, and urethral anastomosis in the third stage, concluding with penile prosthesis implantation if desired. In a study of the first-stage results at follow-up (median of 88 months), 18 patients had completed all 3 stages and were included in a functional outcomes analysis. It should be noted that the two patients in the study who had undergone RAU were excluded from this analysis. There were two cases with partial necrosis of the phallus and two cases with wound dehiscence. In all, 89% of patients reported being “fully satisfied” with their phallus [9].

Depending on patient preference, patients may desire the urethra only at the level of the metoidioplasty. This approach permits standing for urination and eliminates the need for additional surgeries with the attendant risks. If the patient prefers, then they may also forgo urethral advancement and continue to void via the native orthotopic orifice.

Glansplasty

A modified Norfolk technique may be used for glansplasty [16]. Akhoondinasab and Reza describe making a 11-cm-long incision about 3 cm from the dorsal aspect of the phallic tip. This incision is then deepened to the subcutaneous tissue and distally undermined for

approximately 1 cm on the dorsal aspect of the phallus and for approximately 0.5 cm on the ventral aspect of the phallus. The resultant circumferential skin flap is then rolled on itself and sutured in place. A split-thickness skin graft is obtained from a separate donor site and used to cover the defect [17].

Penile prosthesis implantation

Penile prosthesis implantation may be performed in a delayed manner after urethroplasty is completed. In patients with prior suprapubic pedicled phalloplasty, Chiriaco et al. [14] described placing a penile prosthesis with a polyethylene terephthalate cap with placement of the reservoir in the extraperitoneal position with testicular prosthesis implanted via separate groin incisions. In a 2005 series, eight patients had a malleable penile prosthesis placed with subsequent loss of six malleable prostheses through skin erosion, contributing to the switch to an inflatable penile prosthesis implant (Dynaflex). The authors placed the Dynaflex within a Dacron sheath, which was then secured with bone anchors to the pubic periosteum [8]. A study on the outcomes after erectile implant placement included 23 patients who had undergone a suprapubic phalloplasty. Early-onset complications were most often related to infection; later-onset complications included erosion, infection, implant dysfunction, and malpositioning. They did not see a significant difference between the AMS Ambicor prosthesis and the Ambicor prosthesis with a vascular graft with regard to malpositioning or implant dysfunction [19].

Sexual function after abdominal phalloplasty

Gender-affirming genital surgery in transmasculine people can positively influence their sexual experience. Patients may also experience changes in sexuality [20]. After expanded suprapubic phalloplasty, 79% of patients reported satisfaction with their current sexual life [15]. Although not common, penetrative sexual intercourse without a penile prosthesis can occur after abdominal phalloplasty. This may be secondary to the suprapubic scar, which may act as a suspensory ligament and allow for penetrative intercourse without a prosthesis [10]. In a study of the satisfaction and sexual function of 10 patients who had undergone suprapubic phalloplasty, all patients who had clitoral transposition to the base of the phallus were able to achieve orgasms with direct stimulation of the clitoral site. In all, 90% of patients reported masturbation with their phallus. Patients who were able to orgasm prior to surgery retained their ability to orgasm after penile prosthesis placement [21]. This was corroborated in a separate study in which 66% of 18 patients who underwent penile prosthesis placement after a staged suprapubic pedicled phalloplasty were able to orgasm during penetrative intercourse [9].

Our technique for abdominal phalloplasty

After induction of general anesthesia, the patient is positioned supine on the operating table with all bony prominences well-cushioned. The abdomen is bilaterally prepped to the

umbilicus and to the mid-thigh with ChloraPrep. The groin and genitals are prepped with betadine. Blue towels are used to drape the abdomen and groin. A 16-Fr Foley catheter is placed on the field. The surgical site is then completely draped. The planned incision is marked out after the lower abdominal tissue is pinched to estimate the thickness of the flap and its ability to be tubularized. We aim for 10 cm in the midline from the estimated base of the phallus just above the clitoris at the mons pubis to the most cranial aspect of the incision. The lateral aspects of the incision are made symmetric and are approximately 10–15 cm in length. The most cranial transverse aspect of the incision is approximately 8–10 cm in length (Fig. 3). The superior incision is curved to mimic the natal glans (Fig. 4). If a patient has had a prior Pfannenstiel incision, then a more lateral and curved incision can be made to avoid the scar tissue (Fig. 5).

The incision is then made sharply, and electrocautery is used for further dissection down to the level of the rectus fascia. The incision is developed at an angle through the subcutaneous tissues inward to ease in closure of the flap later. In patients who have greater amounts of adipose tissue, the flap is harvested into the subcutaneous tissues superficial to the anterior rectus fascia (Fig. 6).

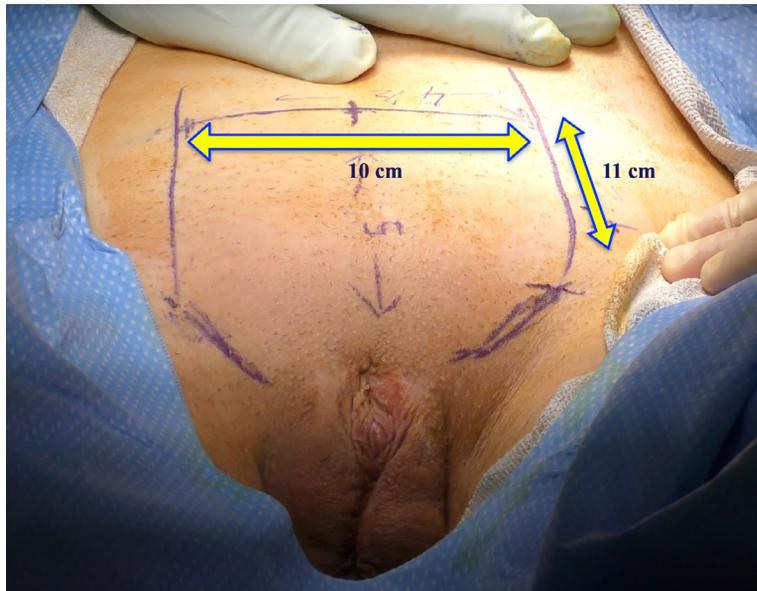


Fig. 3

Planning the surgical incision for abdominal phalloplasty with two lateral 11-cm incisions joined together at the distal aspect of the flap with a 10-cm transverse incision. The proximal aspect of the incision is tapered toward the base of the flap. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*



Fig. 4

(A) The superior aspect of the planned incision is curved to create the angle of the glans. (B) Pinching the lower abdomen along the planned incision to assess for tubularization and to estimate the phallic length. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*

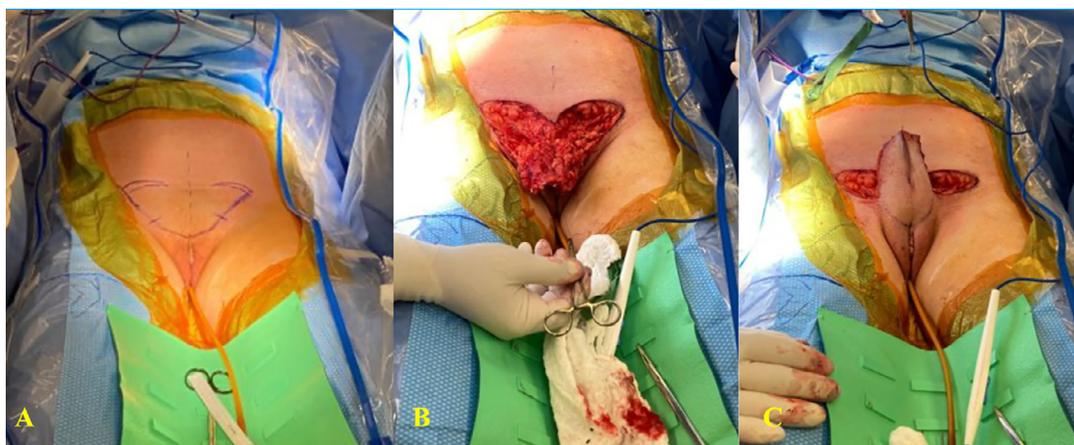


Fig. 5

(A) Planned incision in a patient with a history of hysterectomy with a low Pfannenstiel incision. The planned incision is slightly lateral and curved to avoid the scar tissue. (B) The flap is harvested into the subcutaneous tissues above the rectus fascia. (C) The flap is then tubularized beginning distally. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*

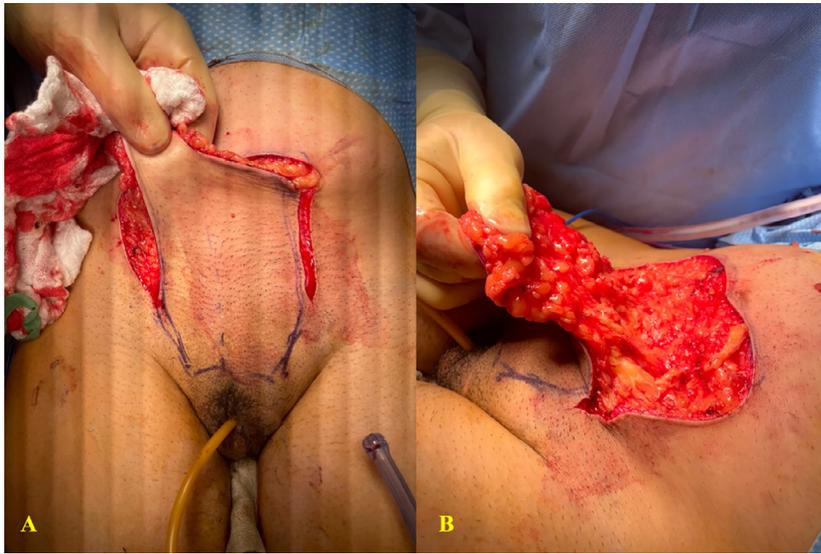


Fig. 6

(A) Assessing the thickness of the flap. Electrocautery is used to further dissect the flap. (B) In patients with greater amounts of adipose tissue, the flap is harvested into the subcutaneous tissues superficial to the anterior rectus fascia. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*

The flap is then raised with careful attention to the thickness of the tissue. The phallus is then tubularized using interrupted 3-0 Monocryl monofilament sutures with the distal end tubularized first to allow for the adjustments made during the proximal development of the flap (Fig. 7).

If the phallus is too thick, then judicious defatting may be performed sharply. If tubularizing sutures cause too much tension on the phallus, then they should be removed and a split-thickness skin graft may be harvested from the anterior thigh and used to cover the area of concern. Care should be exercised here to avoid a narrow or triangular-appearing phallic base (Fig. 8).

Closure of the donor site can be challenging. Typically, extensive superior flap mobilization is required to close the defect with minimal tension. The abdominal incision is then approximated with the use of towel clamps with the goal of minimizing tension, and 1-0 Vicryl deep dermal sutures are placed to approximate the tissue (Fig. 9). A Jackson-Pratt drain is placed to bulb suction. The skin is then closed with a skin stapler. If necessary, a split-thickness skin graft can be used to cover any defects that cannot be closed.



Fig. 7

(A) The distal aspect of the flap is first tubularized to allow for adjustments to be made during the proximal development of the flap. (B) The proximal aspect of the flap continues to be developed during tubularization. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*

The phallus incision should remain covered with a warm, moist dressing, and a bolster should be sewn in place if any skin grafts are used. The phallus itself is sutured to the skin in an upright position to prevent any angulation of the vascular supply, and a xeroform with gauze is placed beneath it (Fig. 10).

Postoperative management

Patients may be admitted to the general floor after the first-stage phalloplasty procedure with periodic nursing checks in position to optimize venous drainage and avoid kinking of the flap. Broad-spectrum antibiotics are continued for 7 days during the postoperative period, and warm compresses are applied to the phallus. The patient remains supine with the hips flexed ideally for 48 h before slow mobilization on postoperative day 2. The phallus is kept protected during this period by covering with a plastic basin (Fig. 11). During this time, patients are kept on DVT prophylaxis, including sequential compression devices, and administered a prophylactic dose of subcutaneous heparin if hemoglobin levels are stable as appropriate. Patients may resume a general diet on postoperative day 1.

Urethral extension

We typically extend the urethra in the second stage by tubularizing the skin of the metoidioplasty and bringing this up through a ventral incision on the phallus (Fig. 12).



Fig. 8

Careful attention should be paid to avoid making the phallic base too narrow or triangular. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*

An alternative that can also be used as an adjunctive technique is a two-stage buccal mucosa graft. This graft is placed after an incision is made on the ventral phallus and a space is developed (Fig. 13). Once the graft has developed neovascularity and is supple and pliable, it can be incorporated with a small amount of adjacent skin and is tubularized over a Foley catheter to advance the neourethra. Lateral skin flaps can be mobilized to cover the neourethra and minimize fistula formation. A suprapubic tube can be placed and left to straight drainage for 3 weeks. At 3 weeks, we perform a retrograde urethrogram and remove the suprapubic tube if no leak of radiographic contrast is observed.

A staged, combined approach with tubularization of the clitoral skin and further extension with staged buccal mucosal grafts can be used to maximally lengthen the urethra toward the tip of the phallus (Fig. 14).

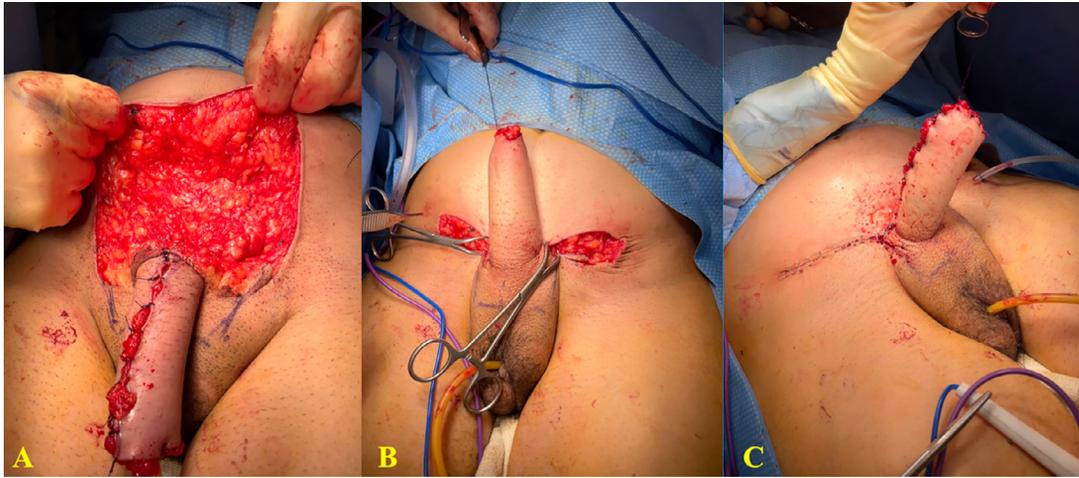


Fig. 9

(A) The donor site is assessed for closure. Extensive mobilization of the superior flap is often required to close the defect with minimal tension. (B) After mobilization, towel clamps are used to approximate the incision. (C) Deep dermal sutures approximate the subcutaneous tissues, a Jackson-Pratt flat drain is placed, and the skin is closed with staples. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*



Fig. 10

(A) The abdominal phallus at the conclusion of the surgery with tacking sutures placed but not tightened. (B) The phallus in an upright position with xeroform and gauze beneath it. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*



Fig. 11

The patient remains supine with the hips flexed for 48 h. The phallus is protected during this period by covering it with a plastic basin. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*

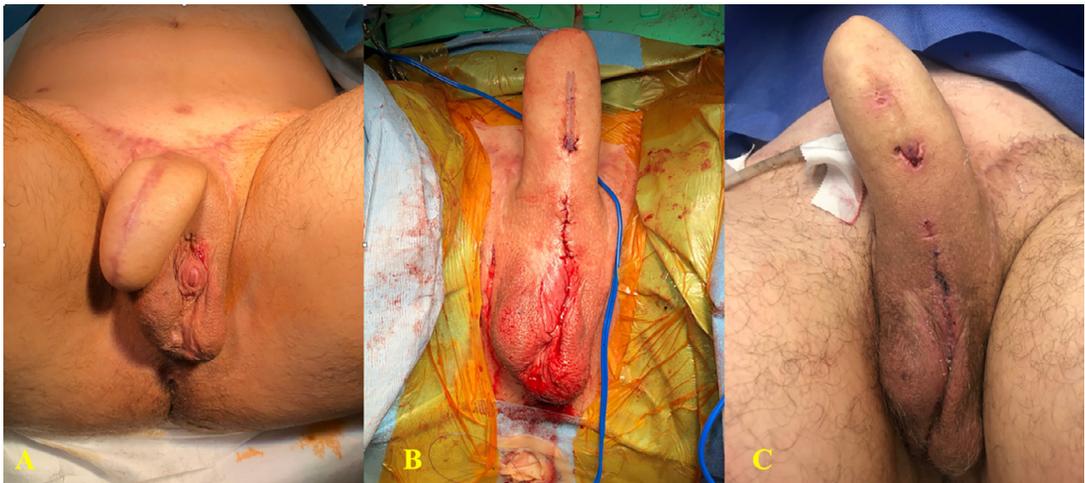


Fig. 12

(A) A preoperative photograph of a patient with prior abdominal phalloplasty and metoidioplasty. (B) The skin of the metoidioplasty is tubularized and brought up through a ventral incision on the phallus. The clitoral remnant is de-epithelialized and buried. (C) Postoperative appearance 3 weeks later. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*



Fig. 13

(A) A patient who underwent abdominal phalloplasty after metoidioplasty and urethral extension after creation of a recipient bed for a buccal graft. (B) Appearance of the buccal mucosa graft intraoperatively. (C) Graft site 2 weeks after placement. (D) Graft's 4-month postoperative appearance. Once the graft is supple, it will be tubularized and covered with a local adjacent tissue.

Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.

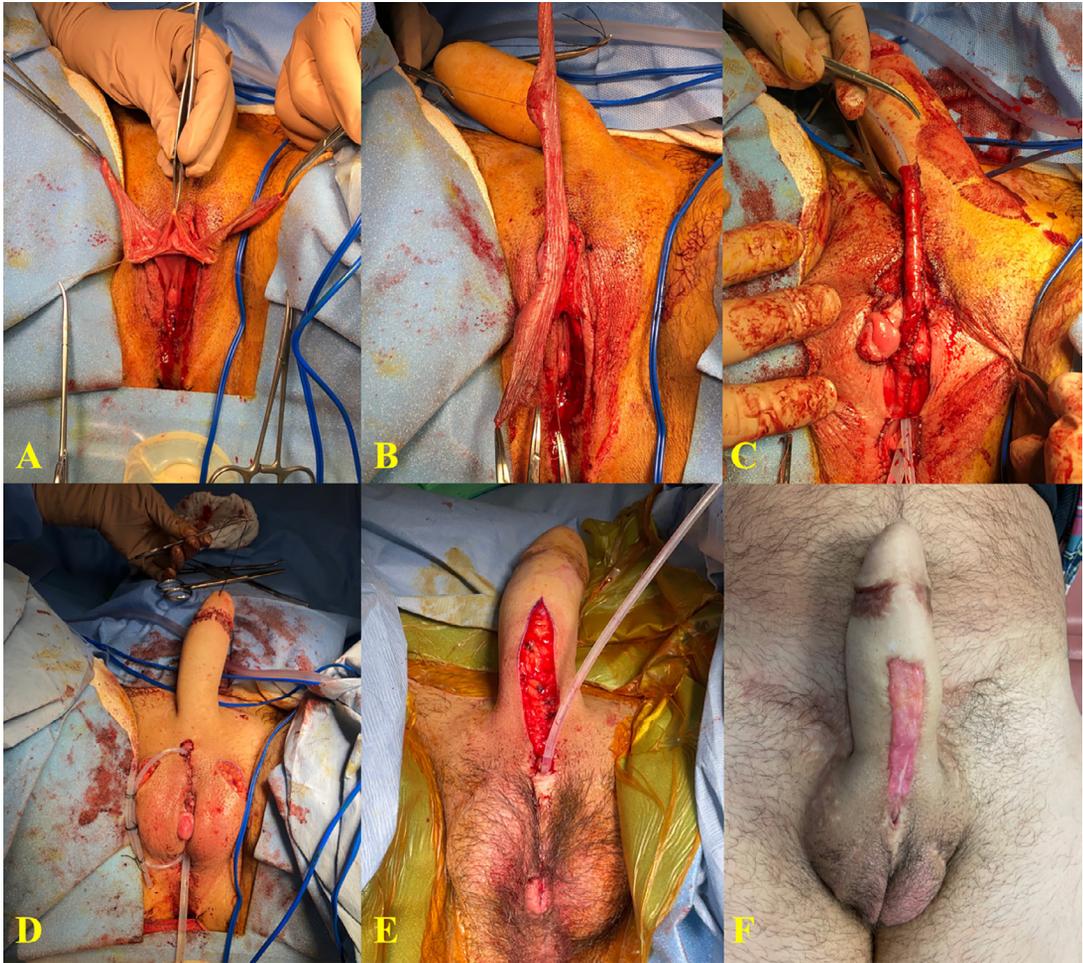


Fig. 14

(A) Dissecting the clitoral skin and developing labia minora flaps. (B) The clitoral and labial skin is well-vascularized and supple. (C) Tubularization of the clitoral skin over a Foley catheter. (D) A patient who underwent abdominal phalloplasty after urethral extension with the tubularized clitoral skin. (E) Creation of a recipient bed for the buccal graft in the second stage of urethral extension. (F) Graft's 3-month postoperative appearance. Once the graft is supple, it will be tubularized and covered with a local adjacent tissue. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*

Glansplasty

We offer a Norfolk glansplasty 6 months after the initial abdominal phalloplasty. The glansplasty can be performed at the time of urethral lengthening. The graft to cover the phallus defect after coronal ridge reconstruction may be taken from the abdominal donor site if there is sufficient laxity. If scarring prohibits this, then the graft may need to be taken from a fresh donor site (Fig. 15).

Outcomes

Final results after tattooing (Fig. 16A and B). Falcone et al. reviewed the outcomes of the abdominal phalloplasty techniques in a narrative review. Postoperative complications included wound infection, distal flap necrosis, need for surgical revision, need for regrafting, shearing sutures, and, rarely, complete flap loss. Distal flap necrosis may be managed by selective resection or amputation with preservation of the residual length of the phallus [18]. Complications in patients with urethroplasty can include urinary fistula, urinary obstruction, and urinary retention [22]. Overall, complication rates appear to be reduced with a staged approach and the use of well-vascularized tissues [8].

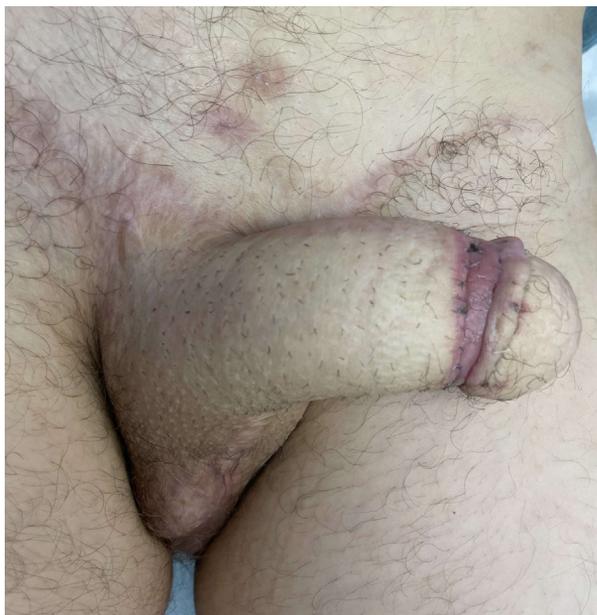


Fig. 15

Healing phallus after a Norfolk glansplasty. *Courtesy of Dr. Miroslav L. Djordjevic, MD, PhD.*

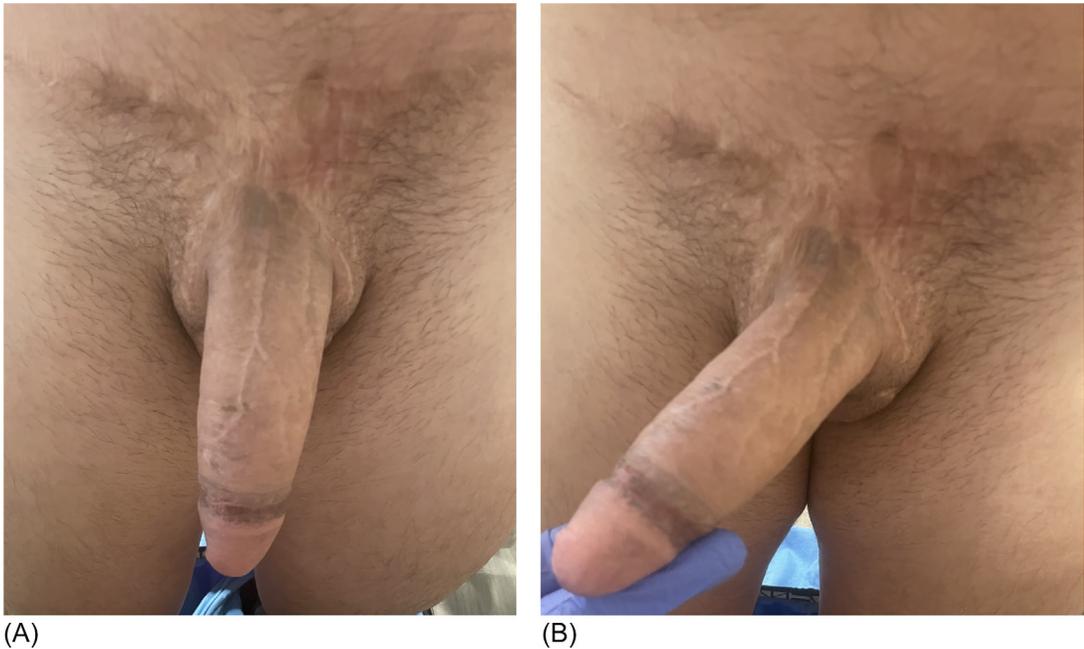


Fig. 16

Final results after tattooing. *Courtesy of Dr. Rajveer S. Purohit, MD, MPH.*

Tips and pitfalls

- The “pinch test” is critical to determining patient candidacy for surgery.
- Prioritize a tension-free closure of the phallus, and use split-thickness skin grafts as needed for coverage.
- Sutures at the tip of the phallus should be loose to minimize pressure within the graft with postoperative swelling.
- The phallus can be defatted after the flap is mobilized to minimize tension.
- Younger patients tend to have decreased elasticity of the subcutaneous tissues and the donor site can be more difficult to close. Older patients tend to have increased elasticity of the subcutaneous tissues, and the donor site may be more amenable to closure even with increased adipose tissue.
- Ensure adequate subcutaneous tissue thickness when raising the flap.
- Carefully observe the phallus intraoperatively prior to completing the closure for signs of congestion (blue tint to the skin, edema or swelling, shortened capillary refill) or ischemia (pale color, delayed capillary refill, cool to touch).

Take-home message

Preoperative counseling with a thorough exploration of the patient's long-term wishes and shared decision-making is key to a successful outcome.

- Surgeons must be familiar with the vascular anatomy of the lower abdomen to minimize the risk of flap loss.
- Options for urethral advancement vary, so be sure to discuss the patient's goals for urination and complication risk prior to phalloplasty.

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