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SPECIAL TOPIC

Gender-Affirming Surgery

Gender-affirming Phalloplasty: A Postoperative Protocol for Success

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Background: Increased access to care and insurance coverage has led to an increase in gender-affirming surgeries performed in the United States. Gender-affirming phalloplasty has a variety of donor sites and surgical techniques including both pedicled and free flaps. Although surgical techniques and patient outcomes are well-described, no reports in the literature specifically discuss postoperative management, which plays a crucial role in the success of these operations. Here, we present a postoperative protocol based on our institution's experience with gender-affirming phalloplasty with the hope it will serve as a standardized, reproducible reference for centers looking to offer these procedures.

Methods: Patients undergoing gender-affirming phalloplasty at our institution followed a standardized protocol from the preoperative stage through phases of postoperative recovery. Medication, laboratory, physical and occupational therapy, flap monitoring, and dressing change guidelines were extracted and compiled into a single resource detailing the postoperative protocol in full.

Results: Our institution's standardized postoperative protocol for gender-affirming phalloplasty is detailed, focusing on flap monitoring, mobilization and activity, medications, and postoperative dressing care. One hundred thirty first-stage phalloplasty procedures were performed between May 2017 and December 2021, with two patients (1.5%) experiencing partial necrosis and one incidence (0.8%) of total flap loss.

Conclusions: For optimal and safe surgical outcomes, the surgical and extended care teams need to understand flap monitoring as well as specific postoperative protocols. A systematic approach focusing on flap monitoring, mobilization and activity, medications, and postoperative dressing care decreases errors, accelerates recovery, shortens length of stay, and instills confidence in the patient. *(Plast Reconstr Surg Glob Open 2022;10:e4394; doi: 10.1097/GOX.0000000000004394; Published online 20 June 2022.)*

INTRODUCTION

Increased access to care and health insurance coverage has led to an increase in the number of gender-affirming surgeries performed in the United States. Gender-affirming phalloplasty has a variety of donor sites and surgical techniques, including both pedicled and free flaps. Although many groups have written extensively on their surgical techniques and patient outcomes, there are no reports in the literature specifically discussing the postoperative management, which can play a crucial role in the success of these operations. Here, we present a postoperative protocol based on our institution's experience with gender-affirming phalloplasty with the hope it will serve as a standardized, reproducible reference for centers looking to offer these procedures. From May 2017 to December 2021, we performed 130 first-stage phalloplasty procedures utilizing this protocol, with two patients (1.5%) experiencing partial necrosis and one incidence (0.8%) of total flap loss. A summary of our protocol is provided in Table 1.

PREOPERATIVE

As part of our institution's enhanced recovery after surgery (ERAS) protocol and focus on multimodal pain management, patients receive one dose of Tylenol 1g per os (PO) and gabapentin 100 mg PO administered with a

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sip of water in the preoperative holding area on the morning of surgery.

SURGICAL TECHNIQUES

Our group utilizes a two-stage approach to phalloplasty (Big Ben method),[1] and a brief description of our surgical technique of the first stage is presented here.

Radial Forearm Free Flap Phalloplasty

A two-team approach is used to increase efficiency of the operation. The patient is placed in lithotomy position. A preoperative Allen test is performed, and the forearm is marked using our institutional template (Fig. 1). Importantly, this is merely a template and may be adjusted based on patient-specific factors or goals. A tourniquet is inflated to 250 mmHg, and dissection begins proximally. The medial and lateral antebrachial cutaneous nerves (MABC and LABC) and cephalic vein are identified and preserved, and the pedicle is identified. A bridge of fascia and subcutaneous tissue is preserved between the proximal urethral flap segment and the pedicle. The flap is then raised in a standard fashion, from ulnar to radial up to the flexor carpi radialis tendon and from radial to ulnar up to the brachioradialis tendon. Care is taken to preserve the dorsal sensory branches of the radial nerve. The distal pedicle is identified and ligated, and flap dissection proceeds from distal to proximal, maintaining all perforating vessels within the septum between the flap and pedicle. The communicating branch between superficial and deep venous systems is maintained, and the pedicle dissection is completed. The tourniquet is deflated, and flap is shaped into a "tube within a tube" creating a neourethra and neophallus.

Meanwhile, the recipient site is marked as an upside-down "C" in the midline at the level of the pubic symphysis (Fig. 2). An incision is made, and dissection proceeds until the left dorsal clitoral nerve and its branches are identified and isolated. A space on the mons is created for the pedicle and the inguinal canal is identified. The ipsilateral greater saphenous vein (GSV) and deep inferior epigastric artery (DIEA) are both dissected and rotated into the recipient site. At least two nerves, typically the LABC and MABC, are coapted to two branches the ipsilateral dorsal clitoral nerve branch, and the radial artery and common vein branch are anastomosed to the DIEA and GSV, respectively. The flap is then inset, and the forearm is covered with an unmeshed split-thickness skin graft (STSG) and wound vacuum-assisted closure (VAC).

Pedicled Anterolateral Thigh Phalloplasty

As above, a two-team approach is utilized with the patient in supine position. Perforators are identified using handheld Doppler, and the flap is designed as a square of varying size, depending on the thickness of skin and patients' preference for phallic length. The proximal skin incision is made down to fascia, and the lateral femoral cutaneous nerve (LFCN) is identified, dissected, and clipped proximally. Next, the medial skin incision is made, and flap dissection continues in a suprafascial plane from medial to lateral. The septum and anterolateral thigh (ALT) perforators are identified, and a fascial incision is made to reveal the underlying vastus lateralis muscle. Perforator and pedicle dissection are then performed in the standard fashion, with the pedicle typically dissected up to the first rectus femoris muscle branch. Indocyanine green angiography is performed to determine perfusion to the flap, excising any nonviable areas judiciously. A tunnel is created underneath the rectus femoris and sartorius muscle, and a subcutaneous tunnel is developed connecting the thigh to the groin recipient site. The flap is carefully passed through the tunnel ensuring proper orientation and gentle pedicle lie. The flap is tubed, and the LFCN is coapted to the dorsal clitoral nerve. Finally, the flap is inset ensuring no stretch, kink, or twist of the pedicle. The ALT donor site is skin grafted.

Takeaway

Question: What is the ideal postoperative management following gender-affirming phalloplasty?

Findings: A systematic approach focusing on flap monitoring, mobilization and activity, medications, and postoperative dressing care decreases errors, accelerates recovery, shortens length of stay, and instills confidence in the patient.

Meaning: We hope this protocol will serve as a standardized, reproducible reference for centers looking to offer these procedures.

POSTOPERATIVE DAY 0

Following completion of the surgical procedure, patients are transported to the postanesthesia care unit (PACU). Assessment of flap viability is critical during this immediate postoperative period, and flap checks are performed by nursing every 15 minutes for four occurrences, every 30 minutes for four occurrences (all to be completed while still in PACU in case of acute change necessitating return to operating room), and then every 1 hour thereafter. Patients are then transferred to the intensive care unit for ongoing hourly flap monitoring, Patients are initially on strict bedrest, with head of bed (HOB) elevation no greater than 20 degrees to avoid potential kinking of flap vessels in the groin, and foley to bedside drainage. For patients undergoing a radial forearm free flap (RFFF) phalloplasty, an STSG from the ipsilateral thigh is used to resurface the donor site. A wound VAC dressing is placed over the skin graft recipient site, whereas the thigh is dressed with a semiocclusive tegaderm dressing, and the arm is elevated postoperatively. Following ALT phalloplasty procedures, an STSG from the ipsilateral thigh is similarly used to resurface the flap donor site and covered with a wound VAC dressing. In both cases, a bed of fluffed kerlix gauze is used to support the phallus in a neutral position to avoid kinking the pedicle (Fig. 3). Patients are maintained on maintenance intravenous (IV) fluids and started on a clear liquid diet.

Table 1. Phalloplasty Postoperative Protocol

	Preoperative	POD 0	POD1	POD2	POD3	POD4	POD5
Medications	(Given in AM with sip of water in prep) Tylenol 1 g PO × 1 Gabapentin 100 mg PO × 1	1) Resume home meds including hormone therapy and anxiolytics BP medications resumed at ½ dosing with hold parameters 2) Antibiotics: cefazolin 1 g q8h × 3 doses. If PCN or cefazolin allergy, then clindamycin 300 mg q6h x 3 doses 3) DVT prophylaxis: heparin 5000 U SQ at 2200 4) Pain medications: Tylenol 1 g PO q6h standing (decrease to q8h is low BMI or if on HAART therapy); oxycodone 5–10 mg PO q4h PRN; gabapentin 100 mg PO q8h standing	Pain medication: Add motrin 600 mg q6h standing unless contraindicated; If able, decrease oxycodone to 2.5/5 mg q4h PRN mod/severe pain DVT prophylaxis: Lovenox 40 mg SQ daily starting 6 AM (decrease to 30 mg if weight ≤ 50 kg)				
IV fluids	—	100–125 cc/h LR	Continue IVF Fluid bolus before mobilization	Decrease IVF to ½	Fluids discontinued if taking sufficient PO		
Laboratories	—	Immediate postop laboratories: CBC, BMP, Mg	Repeat only if specific derangement				
Diet	—	Clear liquids	Advance to regular diet				
Bowel regimen	—	Senna 1 tablet QHS	Increase senna to 2 tablets QHS; Add Miralax 1 packet daily	Increase senna to 2 tabs BID	Increase Miralax to 1 packet BID if needed	Increase Miralax to 2 packets BID if needed	
Activity	—	Bedrest, HOB ≤30 degrees	OOB to stand/steps in room with PT/OT. No sitting	Shuffling gait; Increase activity coordinated with PT/OT;	Continue to advance as tolerated. Slouch sitting only, no flexion at hip (may sit on toilet with leg extended)		
PT/OT	—	—	Begin mobilization as above	Increased ambulation	Increased ambulation, slouch sitting	Shower (with nursing and OT)	
Flap checks		q15 min × 4 occurrences, then q30 min × 4 occurrences (done in PACU), then every 1 h	Continue q1h, with increased frequency when mobilizing	q2h flap checks		q4h flap checks	
Dressing						Dressings removed on AM rounds	
Discharge planning						Discharge supply bag; Review wound care, discharge date/time, and instructions with patient and caregiver	Discharge home by noon
Miscellaneous	—	Foley to bedside drainage	Integrative health consult		Consider foley removal (depending on progress); TOV 6-8 hrs post removal	D/C foley if not removed POD3	

BMP, basic metabolic panel; CBC, complete blood count.

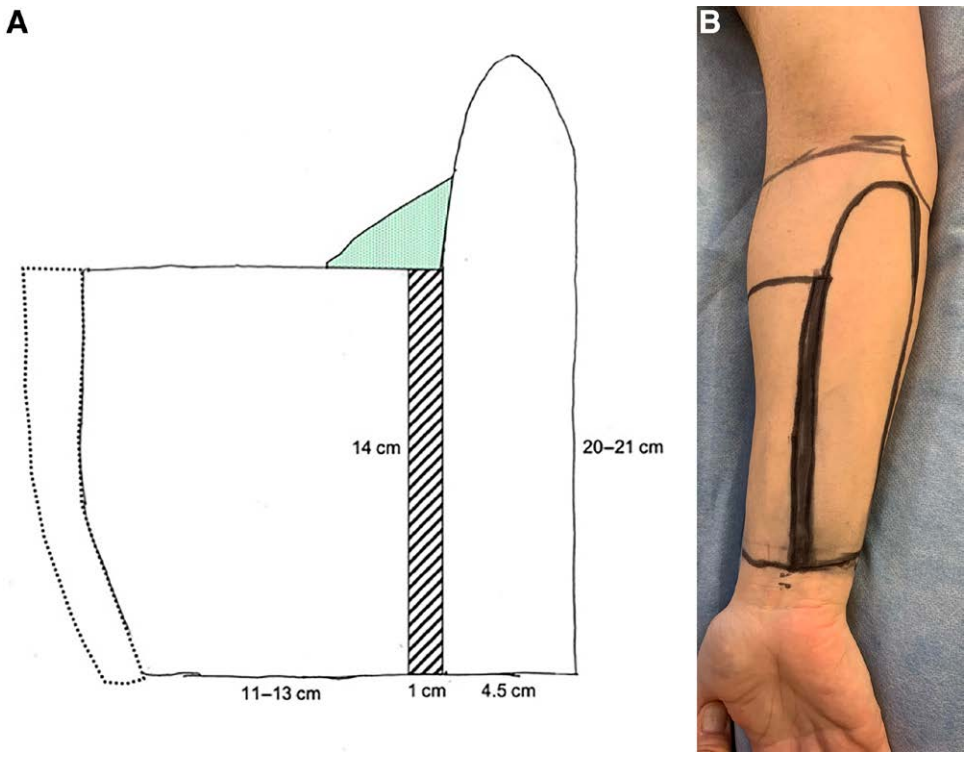

Fig. 1. Radial forearm phalloplasty template. Clinical photographs of the RFFF template (A) and in situ markings (B). The template may be adjusted based on patient-specific factors or preferences. However, typically a 4.5 × 20–21 cm segment is used for the neourethra, and a 14 × 1 cm segment laterally is de-epithelialized (diagonal shading). At the lateral-most portion of the template (dashed lines), an additional 1–2 cm segment may be included in larger patients with additional forearm bulk. The green shaded segment corresponds to additional subcutaneous/fatty tissue that should be included with the flap to assist with venous drainage.

With respect to medication, antibiotic prophylaxis is limited to a 24-hour perioperative period, with 1 g cefazolin administered every 8 hours for three doses. Heparin 5000 units SQ is given before induction and then every 8 hours for the first 24 hours. For pain management we use a multimodal narcotic sparing protocol. Tylenol 1 g PO every 6 hours (this may be decreased to every 8 hours if the patient has a low BMI or is on HAART therapy), ibuprofen 600mg PO every 6 hours and gabapentin 100 mg PO every 8 hours is administered in a standing fashion. For breakthrough pain, oxycodone 5–10 mg PO is administered every 4 hours. Anxiety is not uncommon and should be distinguished from pain. Anxiolytic therapy should be considered along with pain management and tailored to patient's home medications. Constipation is a common postoperative issue given the need for opiate pain medication and decreased mobility. Every effort is made to minimize narcotics and mobilize early. Senna and Miralax are titrated up with the goal of a bowel movement by postoperative day (POD) 3. Last, home medications are resumed including hormone therapy and anxiolytics, antidepressants, and blood pressure medications (½ dosing with hold parameters).

Fig. 2. Clinical photograph of the RFFF recipient site with markings.

POD 1

On POD 1, complete blood count and basic metabolic panel are obtained. Patients are advanced to a regular diet and the bowel regimen is increased to two tabs senna nightly with hold parameters for loose stools. If tolerated,

Fig. 3. Fluffed kerlix gauze is used in the postoperative period to support the phallus in a neutral position to avoid kinking the pedicle.

opiates are decreased, oxycodone 2.5/5 mg q4h for moderate/severe pain, respectively. For DVT prophylaxis, heparin is switched to Lovenox 40 mg SQ daily starting at 06:00 (with a decrease to 30 mg if patient weight is less than 50 kg). Integrative health sees the patient to offer relaxation and pain management strategies. IV fluids are maintained at the same rate. Our experience has demonstrated that a 500 mL fluid bolus administered 30 minutes before initial mobilization is helpful in preventing positional hypotension and vasovagal response.

Early mobilization has proven to be safe, improves mental health, decreases pain, and shortens LOS.[2] Patients begin standing and walking on POD 1 with the assistance of a multidisciplinary team. Patients are evaluated by both physical therapy (PT) and occupational therapy. Activity orders are placed by a member of the surgical team and followed strictly. When the patient gets out of bed PT, a member of the surgical team and the bedside RN are all present to assist monitoring the flap, managing the lines, and physically supporting the patient. When walking, the

Fig. 4. For mobilization and showering, the phallus is supported at all times with a hole cut in a pair of mesh underwear and kerlix fluffs and abdominal pads.

phallus is supported at all times with a hole cut in a pair of mesh underwear and kerlix fluffs below (Fig. 4). Although activity is liberalized to allow standing and ambulating, sitting is still limited to 20 degrees. Small steps (no lunges) should be used. Flap checks with Doppler are performed immediately before, during, and after mobilization. If there is a change in the turgor, color, or Doppler signal of the flap, the session is terminated and the surgical team is immediately notified. Flap checks are maintained at q1h, with increased frequency when mobilizing as above.

POD 2 and 3

On POD 2, laboratories are not obtained unless there is a specific issue. Fluids are decreased to half the initial rate. The bowel regimen is adjusted as needed, with an increase in senna to two tabs twice daily (BID) if needed. If a decrease in narcotic pain medication was not tolerated on POD 1, dose reduction is attempted again (to 2.5/5 mg q4h for moderate/severe pain, respectively). Activity is gradually increased by nursing and PT/OT, with increased ambulation (with shuffling gait), but still no sitting allowed. Flap check frequency is decreased to every 2 hours, in addition to before and after mobilization.

On POD 3, activity continues to advance as tolerated. Patients are allowed to sit on the toilet with one leg extended. The foley is removed once the patient feels confident ambulating to the toilet. Following catheter removal, a 6- to 8-hour trial of void (TOV) is initiated, and postvoid residuals (PVRs) should be checked following the first several voids to ensure adequate bladder emptying. IV fluids are discontinued as long as the patient has sufficient PO intake. Not all patients will have a successful voiding trial, and some may require replacement of the foley catheter, which can be very traumatizing in the transmasculine population. In our experience, although recatheterization is very uncommon, there are important strategies that should be incorporated. All of our patients are screened for a history of trauma, and we make a specific point to discuss the possibility of need for catheter replacement with the patients ahead of time, before the surgery. Additionally, all staff are trained in taking care of patients with history of trauma as well as in gender-affirming care.

POD 4

As patients continue to make progress and approach discharge, flap check frequency is reduced to every 4 hours and the goal is to prepare the patient for discharge. On the morning of POD 4, the VAC dressing and the skin graft donor site tegaderm dressing are removed on morning rounds. The patient and nursing staff are informed in advance to set expectations, and premedication pain control is administered ahead of time if needed. The skin graft donor site is left open to air, with Aquaphor applied twice daily. For the forearm donor site, the entire skin graft is covered with bacitracin and adaptic nonstick dressing and wrapped with kerlix and then an ace wrap. For the ALT donor site, bacitracin and adaptic are similarly placed over the entire skin graft, covered by gauze and secured with paper tape. The patient showers with the help of both a member from occupational therapy and nursing present. During the shower, the phallus may be supported by either the patient, or with mesh underwear with a cut hole and kerlix as is the case during ambulation. All incisions and body parts can and should be washed with soap and water. If possible, the shower is coordinated such that the patient's caregiver can be present for observation. The wound care and dressings, bathing and activity are reviewed in detail with both the patient and the caregiver. During this review, all questions are answered and understanding by the patient and caregiver are confirmed; whenever possible, a smartphone recording is obtained to be used as a future reference once at home. A bag of supplies consisting of bacitracin, nonstick gauze, kerlix, and mesh underwear is provided to the patient.

POD 5/Discharge

These milestones are routinely met without difficulty and the patient is prepared for discharge home on the morning of POD5. Discharge instructions are again reviewed with the patient and caregiver, addressing positioning and activity, bathing, clothing, wound care, and medications. Lifting more than 10 pounds, straining, and bending at the waist are not permitted for the first 6 weeks. Patients are not permitted to sit more than 30 degrees and should keep the affected leg extended when on the toilet. Walking with short strides is encouraged. For sexual activity, masturbation is allowed. The natal genitalia is usually very swollen; however, use of the phallus is deferred until 6 weeks postoperative. Patients are instructed to shower daily and wash all wounds with soap and water keeping the phallus supported and elevated. Loose fitting sweatpants or pajama pants, typically several sizes larger than the patient's actual size, should be worn to prevent pressure on the phallus. The phallus should remain supported for the first 2 weeks in mesh underwear with gauze for support. All home medications are continued. Additional medications include acetaminophen 1000 mg every 8 hours, ibuprofen 400 mg every 8 hours, gabapentin 100 mg every 8 hours for 3 days, and oxycodone 5 mg every 8 hours as needed, with a limited supply to limit its use. With constipation being a well-known side effect of narcotic use, senna and Miralax as needed are provided to the patient. Following discharge, patients follow up weekly for the first 4 weeks, then return at 6 weeks. If the patients are healing well, we plan for the next stage generally in 3–6 months based on the patient's schedule as long as incisions are fully healed. Like any dependent flap, postoperative edema frequently occurs in the phallus following the procedure. In our experience, this edema is more significant with ALT flaps versus RFFF. Although some groups have utilized phallic massage to address this issue, our group manages phallic edema with PT and daily wrapping of the phallus beginning at 4 weeks.

DISCUSSION

The importance of enhanced recovery protocols has been stressed following numerous procedures in most all surgical specialties. Using an evidence-based approach in

a multidisciplinary setting, these protocols create checklists or fast track line items to shorten hospital stays and reduce complications. Developed first in colorectal surgery, these protocols have been adapted to microvascular surgery in breast reconstruction.[3–5] Although breast reconstruction is different from phalloplasty, the complexity of the reconstruction is comparable, and data suggests with correct implementation, hospital stays are shortened, and opioid requirements are decreased. Reducing opioid use in the perioperative period is a paramount concern as the excessive use only contributes to undesired side effects including constipation, urinary retention, low mood and depression. Although not our intention to present an enhanced recovery protocol for gender-affirming phalloplasty, the line item, protocolized care plan does demonstrate similarities, and lends itself to contributing to a future practice. Patient-reported outcome measures (PROMs) are another increasingly important tool to measure outcomes pre- and postoperatively, with the GENDER-Q being a new PROM designed specifically for gender-affirming care that is currently undergoing international field testing.[6] Moving forward, our group plans to utilize these tools to better delineate patient-important outcomes and enable comparative treatment effectiveness research.

Given the relative infancy of gender-affirming surgery and its published techniques, outcomes, and complications, there is limited data on the postoperative care following these operations. Intraoperative techniques and outcomes data are important in furthering the progress of this field; however, the postoperative care is just as essential. To achieve optimal and safe surgical outcomes the surgical and extended care teams need to understand flap monitoring as well as specific postoperative protocols. A systematic approach focusing on flap monitoring, mobilization and activity, medications and postoperative dressing care decreases errors, accelerates recovery, shortens length of stay, and instills confidence in the patient. Moving forward, we hope other institutions with high volumes of phalloplasty surgery share their experience managing these patients postoperatively.

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