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Pedicle anterolateral thigh flap phalloplasty combined with radial forearm free flap urethral reconstruction in gender-affirming surgery: a report of two cases

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This case report presents two female-to-male (FTM) patients, aged 21 and 35 years, respectively, who underwent phalloplasty and urethral reconstruction at our institution. The patients' requests included a phallus >9 cm, concealed donor-site scars, and the ability to void while standing. In the first case, a 4.5×13-cm radial forearm free flap (RFFF) taken from the nondominant side was retrieved and anastomosed to the deep inferior epigastric artery and vein. Simultaneously, a 10×16-cm pedicle anterolateral thigh (ALT) flap was relocated to the genital area and wrapped around the RFFF after nerve coaptation. The second case involved a 5.5×14-cm RFFF and a 20×13-cm pedicle ALT flap using a similar procedure. Both cases had stable double flaps with no complications, and Foley catheters were removed at 14 days and 3 months after surgery, respectively. Double-flap phalloplasty is thus a viable option for patients with a short forearm circumference or a preference for a less visible forearm scar.

Keywords: Gender dysphoria, Phalloplasty, Free tissue flaps, Microsurgery

Introduction

Gender confirmation surgery is crucial for transgender individuals, especially considering this population's risks for psychological and physical complications [1]. Phalloplasty is a challenging reconstructive surgery that requires a multidisciplinary approach due to the complexity and function of male anatomy [2]. The ideal phallic reconstruction should result in the ability to urinate while standing, sensation (both tactile and erogenous), sexual satisfaction, low morbidity for both the recipient and donor sites, and an aesthetically pleasing phallus [3].

The radial forearm free flap (RFFF) is the most commonly used technique in phalloplasty for transgender patients [4-6] and is considered the gold standard due to its thin and flexible forearm skin, reliable vascularization, and ease of resensitization [4]. The tube-in-tube design of the flap allows for standing urination [7]. However, drawbacks include donor-site morbidity, a noticeable large scar on the forearm, and potential penile color mismatch. Donor-site morbidity is more common with RFFF phalloplasty than with other RFFF-based reconstructions because of the larger flap size, which can be approximately two-thirds the circumference of the forearm.

An alternative surgical option is pedicle anterolateral thigh (ALT) phalloplasty [8], which also results in significant donor-site scars albeit easier for patients to conceal (e.g., with underwear or swimwear) compared to the RFFF scar. Consider-

ably, tube-in-tube ALT phalloplasty is only feasible for thin patients with minimal subcutaneous tissue. However alternative surgical approaches can be considered for patients who are not suitable for either tube-in-tube RFFF or ALT phalloplasty but still desire standing urination.

We conducted a series of one-stage double-flap phalloplasty procedures using a pedicled ALT and RFFF urethral reconstruction to identify phalloplasty techniques with less significant negative donor-site impact. Herein, we present two cases of pedicled anterolateral thigh flap phalloplasty and RFFF urethral reconstruction.

Case report

This report was approved by the Institutional Review Board of Hallym University Kangdong Sacred Heart Hospital (No. 2023-09-016).

Written informed consent was obtained from the patients for the publication of this report including all clinical images.

1. Case 1

A 21-year-old female-to-male (FTM) patient visited our LGBTQ+ Center for phalloplasty and urethral reconstruction gender affirmation surgery. The patient had already undergone hysterectomy, vaginectomy, and chest masculinization surgery. This patient had thin and short arms and expressed a desire for about 9 to 10 cm long phallus. After several consultations, phallus reconstruction using a right pedicled ALT flap and urethral reconstruction using a left forearm free flap were considered.

A 4.5×13-cm flap was elevated from the nondominant side forearm (Fig. 1). The vascular pedicle was tunneled to the groin and end-to-end microscopic anastomosis of the radial artery to the deep inferior epigastric artery and the vena comitantes end-to-end to deep inferior epigastric veins (Fig. 2). The 10×16-cm pedicled ALT flap was dissected subfascially using the two-team approach, including two perforators from the descending branch of the lateral femoral circumflex artery. The pedicled ALT was relocated to the genital area (Fig. 3). Subsequently, the lateral femoral cutaneous nerve was microscopically coapted to one of the dorsal clitoral nerves and the ALT was wrapped around the RFFF without tension or torsion on its vascular pedicle (Fig. 4). The neophallus and urethral flap were closely monitored, and the double flap was stable with no complication. After 14 days, a Foley catheter was removed with no fistula or stricture observed during the voiding test.

2. Case 2

A 35-year-old FTM patient who had already undergone chest masculinization visited our LGBTQ+ Center seeking hysterectomy, phalloplasty, and urethral reconstruction gender affirmation surgery. The patient had thin and short arms and expressed a desire for a 12 cm long phallus. After several consultations, phallus reconstruction using a right pedicled ALT flap

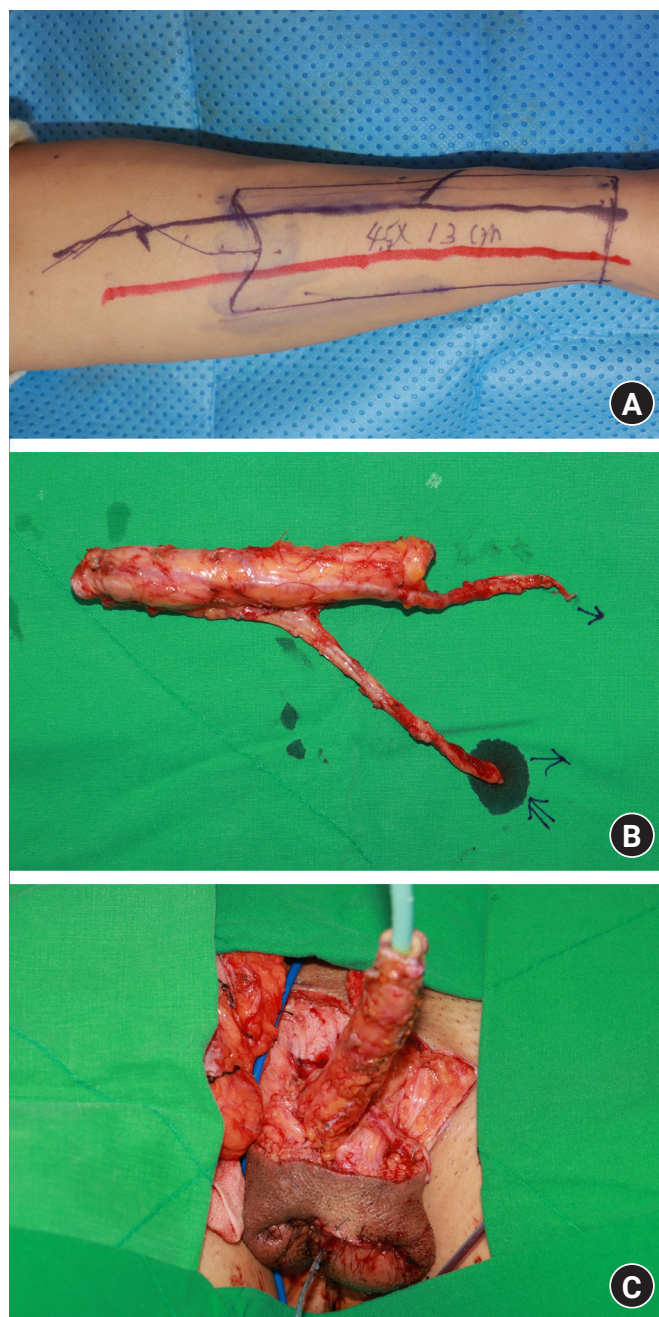


Fig. 1. (A) A 4.5×13-cm free flap from the left forearm was retrieved for urethral reconstruction. (B) The radial forearm free flap (RFFF) flap was harvested after pedicle dissection. (C) The RFFF was placed on the recipient site for urethral anastomosis.



Fig. 2. A square design, measuring 10×16 cm, was marked on the right anterolateral thigh (ALT) preoperatively for ALT flap design.

and urethral reconstruction using a left forearm free flap were conducted.

A 5.5×14-cm RFFF was elevated from the nondominant side forearm (Fig. 5). The vascular pedicle was tunneled to the groin and the radial artery was microscopically end-to-end anastomosed to the right deep inferior epigastric artery and the vena comitantes and then end-to-end anastomosed to the right deep inferior epigastric veins. A 20×13-cm ALT flap was then dissected subfascially using the two-team approach (Fig. 6), including two perforators from the descending branch of the lateral femoral circumflex artery. The pedicled ALT was then relocated to the genital area. Subsequently, the lateral femoral cutaneous nerve was microscopically coapted to one of the dorsal clitoral nerves and the ALT was wrapped around the RFFF with no tension or torsion on the vascular pedicle (Fig. 7).

Although a perineal fistula developed 1 month after surgery,

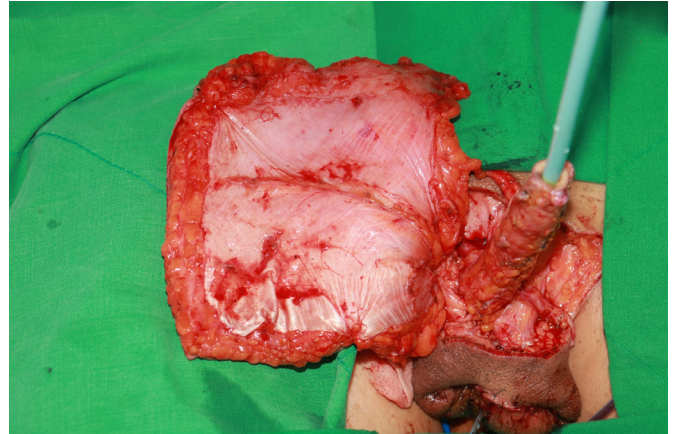


Fig. 3. The pedicled anterolateral thigh flap was relocated to the genital area through a tunnel created underneath the rectus femoris and adductor muscles while avoiding tension or torsion on the vascular pedicle.

the urethral anastomosis site remained intact during a pericatheter urethrography. The Foley catheter was also maintained, and the patient was monitored through outpatient visits to the urology department. The Foley catheter was removed three months after surgery, and the patient was still voiding well at the time of this report.

Discussion

Phalloplasty techniques continue to advance, and there is no universal approach for all patients [1]. Phallus reconstruction presents considerable challenges, especially considering the absence of suitable substitutes for urethral and erectile tissue [9]. Among the variety of flaps used to create the phallic shaft for transgender patients and enhance outcomes, the RFFF and ALT flap are the most frequently reported and used in clinical practice [2].

Free or pedicled flap phalloplasty is a complex reconstructive surgery performed by specialized surgeons. Ideally, one-stage phalloplasty should provide a neourethra to facilitate standing urination, erogenous sensibility, sufficient rigidity for penetration, aesthetically pleasing results, and minimal scarring, morbidity, and functional loss at the donor site [4]. The RFFF phalloplasty is generally regarded by reconstructive surgeons as the gold standard for transgender men undergoing gender affirmation surgery. The incidence of RFFF failure is approximately 1% to 5% of all cases, of which 2% to 11% are partial flap failures [6].

The pedicled ALT flap is often considered a viable alternative, primarily due to its vascular reliability. Using the ALT as the pe-

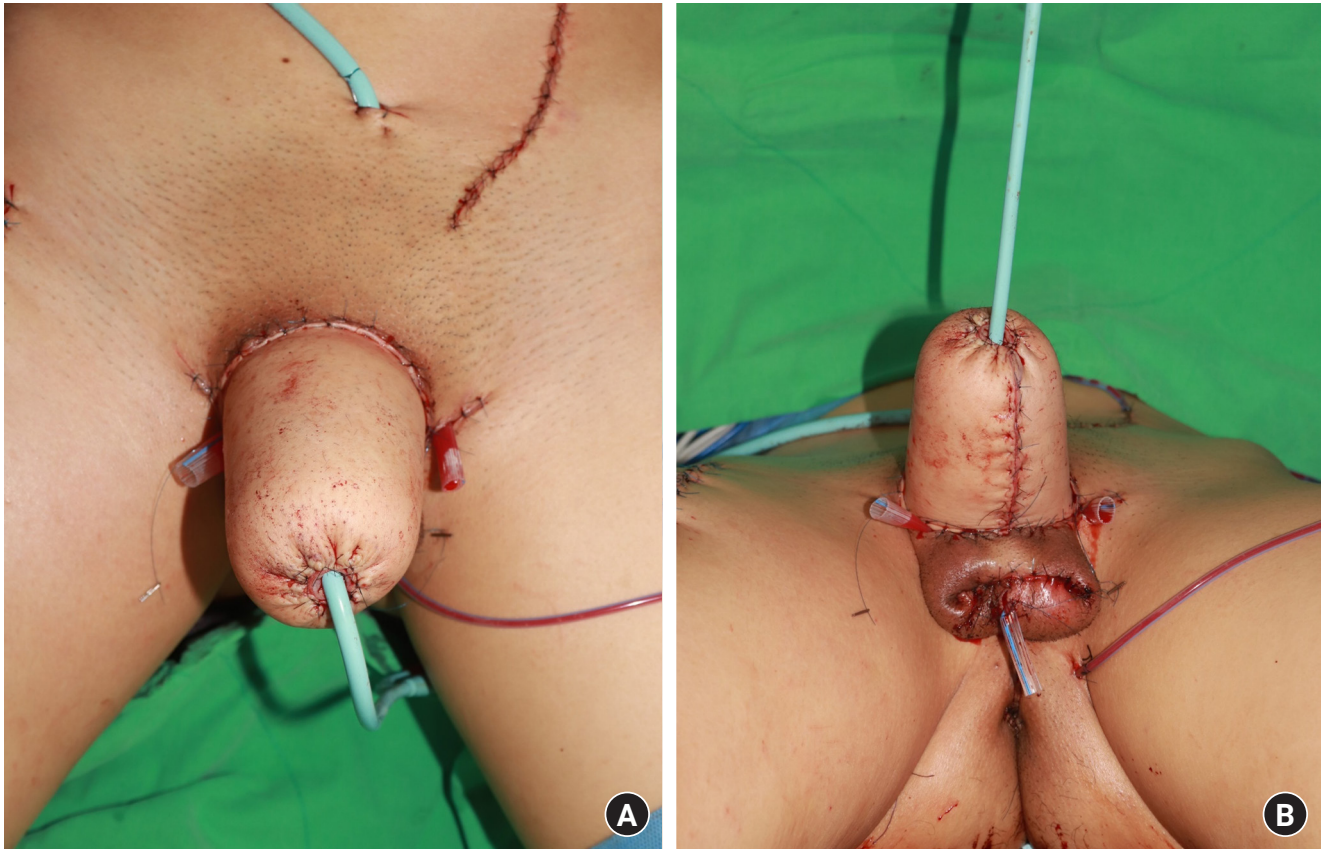


Fig. 4. Immediate postoperative photograph after the antero-lateral thigh flap was wrapped around the radial forearm free flap with no tension or torsion on the vascular pedicle. (A) Dorsal view. (B) Ventral view.

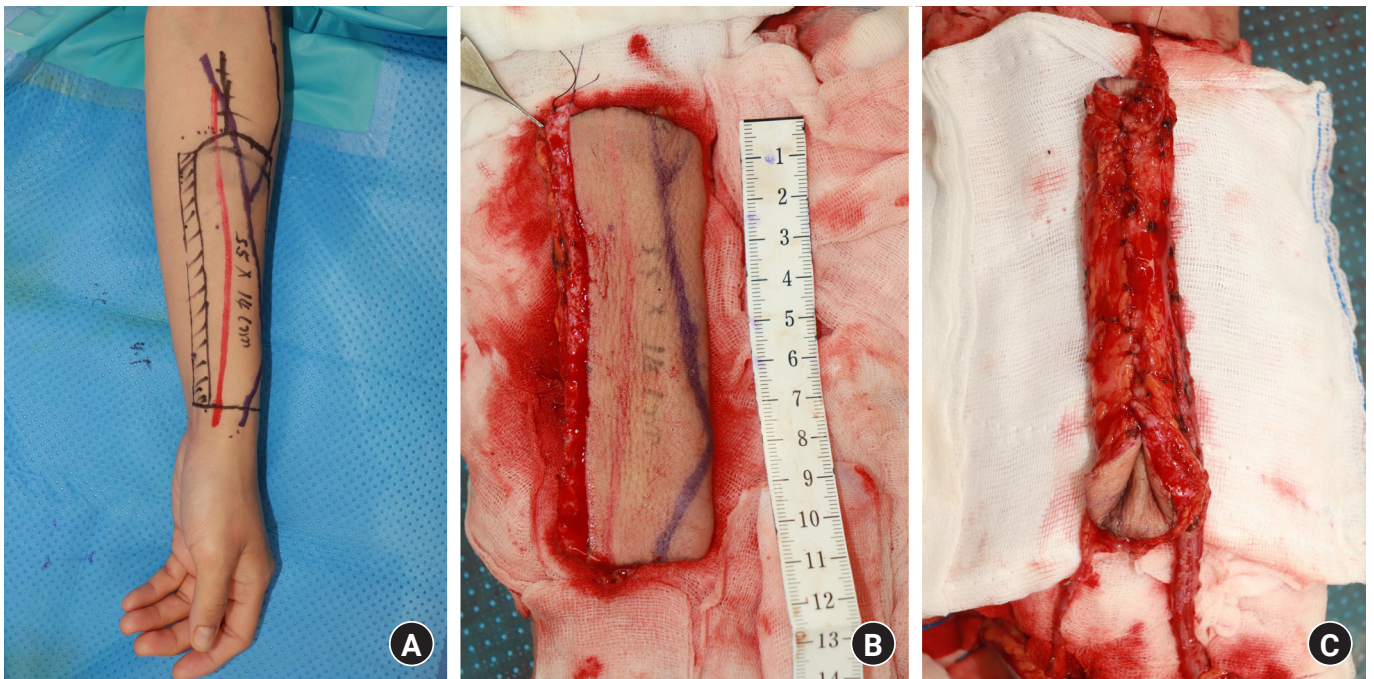


Fig. 5. (A) A 5.5×14-cm left forearm free flap was retrieved for urethral reconstruction. (B) The radial forearm free flap was elevated. (C) The elevated flap was shaped into a tube-in-a-tube structure.



Fig. 6. A square design, measuring 20×13 cm, was preoperatively marked on the right anterolateral thigh (ALT) for ALT flap design.

nile shaft offers cosmetic advantages, as its color closely matches perineal skin, and the donor scar remains concealed under clothing. A tube-in-tube design facilitates one-stage urethra and penis reconstruction [8]. Nevertheless, this is feasible mainly in thin patients with minimal subcutaneous tissue. In overweight patients, the flap may become excessively bulky, and conversion to a free flap may be necessary for cases with excessive tension on the pedicle is present.

A novel combination of techniques including the described one-stage double-flap phalloplasty can be performed for patients who wish to void while standing and avoid a prominent forearm scar. The RFFF, with its thin skin and long vascular pedicle, is suitable for urethral reconstruction and vascular anastomosis in the groin. Additionally, using a small RFFF solely for urethral reconstruction results in a smaller, less conspicuous donor-site scar compared to traditional RFFF phalloplasty. The reported failure rate of RFFF can be attributed to various factors, including outer flap issues such as swelling or hemato-

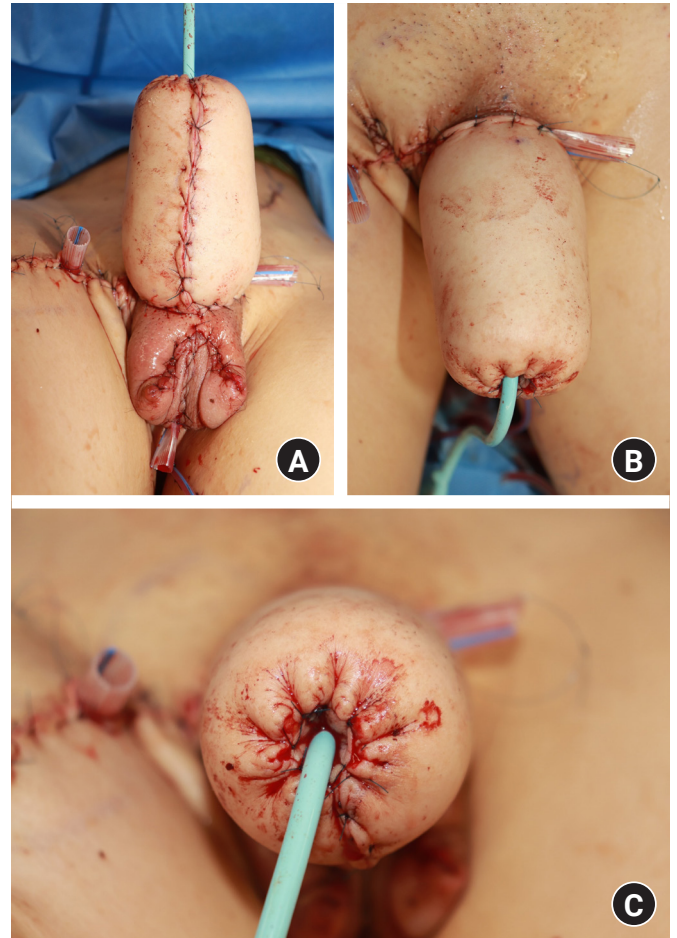


Fig. 7. Immediate postoperative photograph after the anterolateral thigh flap was carefully positioned around the radial forearm free flap without any tension or twisting on its vascular pedicle. (A) Ventral view. (B) Dorsal view. (C) Frontal view.

ma formation that may compromise vascularization of the inner flap, which is used for urethral reconstruction. However, difficulty in monitoring the flap's viability is a considerable challenge associated with free flap urethral reconstruction. Another drawback of the described technique is the extended operative time, which is why a two or three-team approach is employed at our institution to minimize surgery duration.

In the cases described, no urethral fistulas or strictures were observed. However, a previous study on double-flap phalloplasty reported that long-term urinary complications, mostly including urethral strictures, affected 10 of 19 (52.6%) patients included in the study [10]. Urethral complications, including strictures and fistulas, are a common complication of phalloplasty and urethroplasty surgery. In larger case series, urethral fistulas and strictures have been reported in 21% to 68% and

15% to 32% of RFFF phalloplasty combined with urethroplasty patients, respectively [4-6].

Double-flap phalloplasty with pedicled ALT and RFFF urethral reconstruction is a feasible surgical technique for transgender men seeking the ability to urinate while standing and minimal forearm scarring. Using the ALT as the penile shaft provides cosmetic advantages, such as the resemblance of perineal skin color and concealability of the donor-site scar. Utilizing a small RFFF exclusively for urethral reconstruction results in a smaller forearm donor-site scar. Although RFFF phalloplasty is often considered the gold standard, double-flap phalloplasty is a viable alternative for patients with insufficient forearm circumference for a large skin paddle or when minimizing visible forearm scarring is a priority, double-flap phalloplasty can be a viable option.

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Conflicts of interest

The authors have nothing to disclose.

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