

Case Report

## Phalloplasty with an Innervated Island Pedicled Anterolateral Thigh Flap in a Female-to-Male Transsexual

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Since 2001, we have been performing phalloplasty with a radial forearm free flap as the flap of first choice in female-to-male transsexuals (FTMTS). In the present case, a 22-year-old FTMTS with a negative Allen test, we achieved good results by performing phalloplasty with an innervated island pedicled anterolateral thigh flap using the “tube within a tube” technique, in which the penis and urethra are constructed with a single flap. As compared to a forearm flap, use of an innervated island-pedicled flap may have the following advantages in phalloplasty: 1) no need for a microsurgical technique; 2) no scars at noticeable sites; 3) small functional loss in the flap donor area; 4) no sacrifice of major blood vessels. Thus, this technique seems to be a useful clinical alternative for phallic reconstruction.

**Key words:** gender identity disorder, sex reassignment surgery (SRS), phalloplasty

The Japanese Society of Psychiatry and Neurology published “the diagnostic and therapeutic guidelines for patients with gender identity disorder” in 1997 [1]. According to these guidelines, we began performing sex reassignment surgery (SRS) in patients with gender identity disorder in January 2001, and have performed phalloplasty in 23 female-to-male transsexuals (FTMTS) as of December 2008 [2]. Although radial forearm free flaps have been used as the flaps of first choice, deep inferior epigastric artery perforator flaps, superficial circumflex iliac artery flaps, *etc.*, have also been used in patients with a negative result of the Allen test and in those not wishing to have the flap taken from the forearm.

In the present case, an FTMTS patient with a negative Allen test underwent phalloplasty with an

innervated island pedicled anterolateral thigh flap using the so-called “tube within a tube” technique, in which the penis and urethra are constructed with a single flap, and good results were obtained.

### Case

The patient was a 22-year-old who had been diagnosed as a FTMTS and had initiated hormone therapy 5 years previously, according to “The diagnostic and therapeutic guidelines for patients with gender identity disorder” of the Japanese Society of Psychiatry and Neurology [1]. The patient had undergone bilateral mastectomy 4 years earlier and ovariectomy and urethral lengthening 2 years earlier. We planned to perform phalloplasty in this patient.

Before surgery, the Allen test on the left hand was negative and multidetector-row computed tomography (MDCT)-angiography also showed circulatory impairments in the left superficial and deep palmar arches

(Fig. 1); we therefore dropped the idea of reconstruction using a left radial forearm free flap. A search for perforators using acoustic Doppler flowmetry revealed 2 perforators at a distance one-third distal to the center of the right anterolateral thigh, and MDCT-angiography confirmed perforators at the same site (Fig. 2A, 2D). In addition, MDCT-angiography revealed the descending branch of the lateral circumflex femoral artery (DB-LCFA) with a length of approximately 15cm (Fig. 2A, 2B), and phalloplasty with an innervated island pedicled anterolateral thigh flap was therefore planned.

The flap was designed preoperatively. The position of the perforators identified by acoustic Doppler flowmetry was marked on the skin of the right thigh, and the flap was designed such that the mark was located at its center. The flap consisted of 3 portions: a  $4 \times 15$ cm rectangular lateral segment for use in the construction of the neourethra; a trapezoidal medial segment with a proximal width of 12cm, a distal width of 9cm, and a length of 11cm for use in the construction of a neophallus; and a deepithelialized  $1 \times 13$ cm



Fig. 1 Preoperative multidetector-row computed tomography (MDCT) angiography showed circulatory impairments in the left superficial and deep palmar arches.

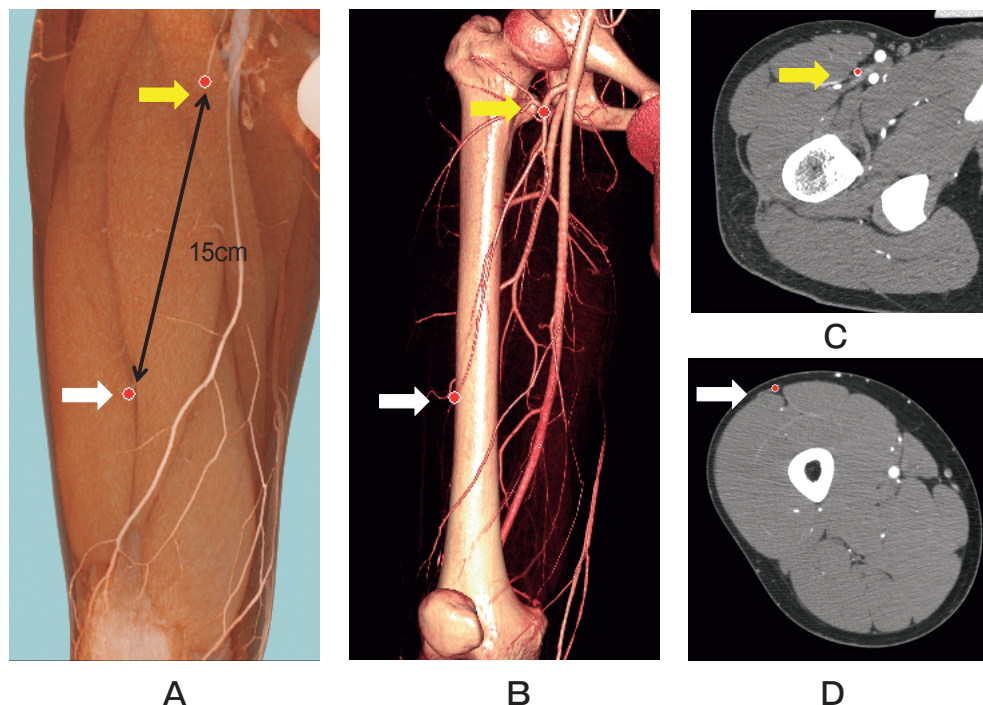


Fig. 2 Preoperative MDCT-angiography of the left thigh revealed the descending branch of the lateral circumflex femoral artery (DB-LCFA) with a length of approximately 15cm (length from the origin of the descending branch to the skin perforator). Yellow arrow: origin of the descending branch, White arrow: skin perforator.

rectangular middle segment to suture the flap (Fig. 3).

The flap was raised with the patient in the supine position. The skin and underlying fascia were incised at the medial border of the flap and dissected subfascially in a medial to lateral direction. Two perforators in the intermuscular septum between the rectus femoris and vastus lateralis were identified and preserved. Subsequently, the DB-LCFA was dissected in the intermuscular septum. Motor branches of the femoral nerve running parallel to the vascular pedicle were carefully separated. Next, 2 lateral femoral cutaneous nerves were identified at the proximal border of the flap, dissected an additional 5 cm proximally, and divided. Subsequently, the lateral border of the flap was incised down to the fascia, and dissection was continued in a lateral to medial direction under the fascia of the vastus lateralis muscle. The distal border of the flap was then incised, and the flap was elevated in a distal to proximal direction.

A W-shaped incision was made in the pubic skin (Fig. 4), and the innervated nerve island-pedicled ALT flap was moved to the genital area through a tunnel under the rectus femoris and sartorius muscles. The lateral flap segment was wrapped around an 18 Fr urethral catheter to create a neourethra (Fig. 5A). In

addition, the neourethral tube was covered by the medial flap segment to create a tube within a tube. The neourethra was anastomosed to the external orifice of the urethra that had been lengthened up to the level of the clitoris in the previous surgery. Two dorsal nerves of the clitoris, which were the terminal branches of the pudendal nerve, were identified on both sides of the clitoris (Fig. 5B) and anastomosed to the 2 lateral femoral cutaneous nerves of the flap (Fig. 5C). The fascia of the neophallus was sutured to the pubic periosteum, followed by closure of the skin (Fig. 6A, 6B). The flap donor site was covered with a split-thickness skin graft taken from the contralateral thigh (Fig. 6C).

Antibiotics were given for 7 days, but no anticoagulants were administered after the surgery. The patient was kept on bed rest for 7 days and then allowed to walk. Fourteen days later, the urethral catheter was removed and the patient became able to urinate in the standing position (Fig. 7A). The postoperative course was uneventful, without complications such as flap necrosis, formation of a urethrocutaneous fistula, or urethral stenosis. Six months postoperatively, the patient was able to feel sexual sensations in the reconstructed phallus. Ten months after the surgery, sculpturing of the neoglans was

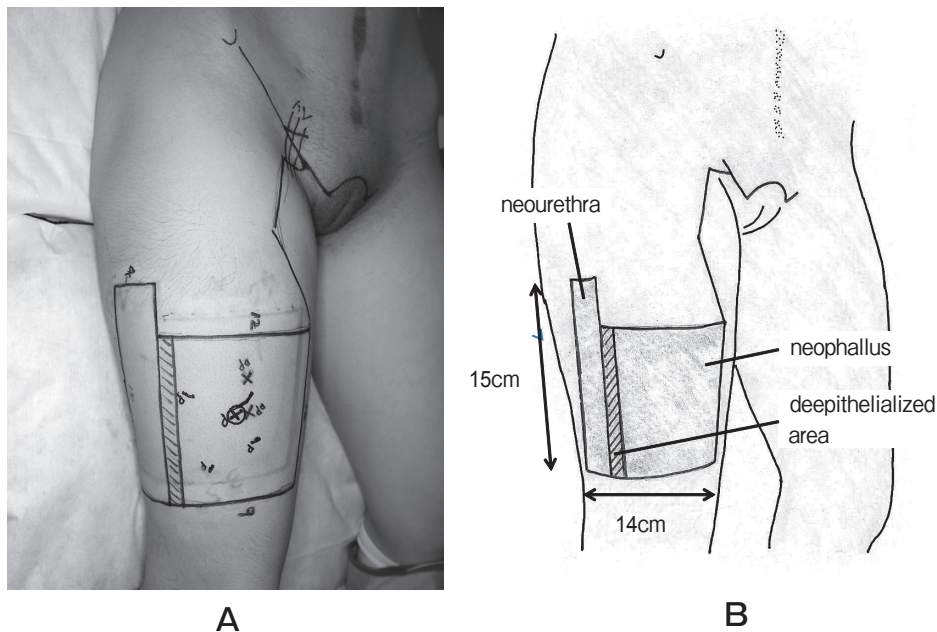


Fig. 3 The 22-year-old female-to-male transsexual patient. A, the patient's condition before surgery; B, flap design in the right thigh.

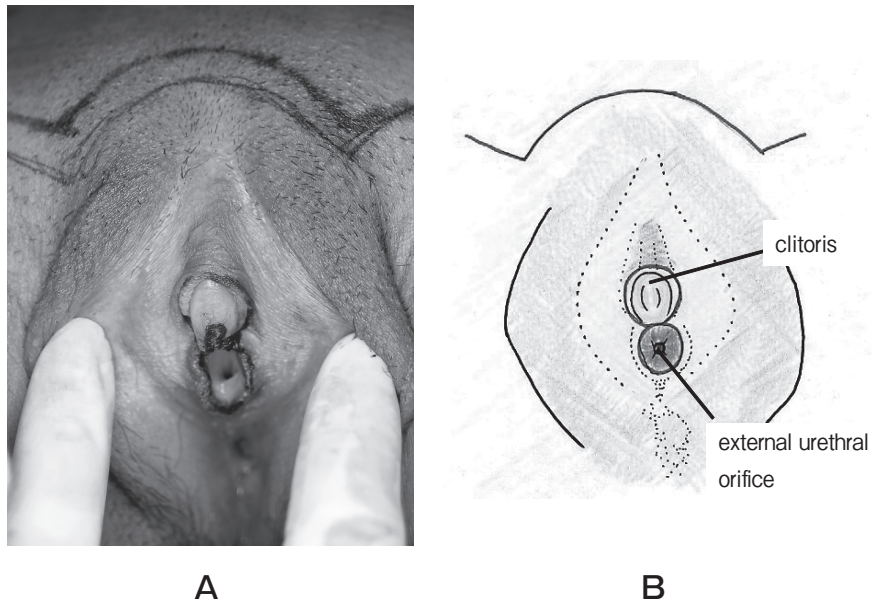


Fig. 4 The genital area's condition before surgery. **A**, the external urethral orifice was seen just below the clitoris because of urethral lengthening performed 2 years earlier; **B**, skin incision lines in the genital area.

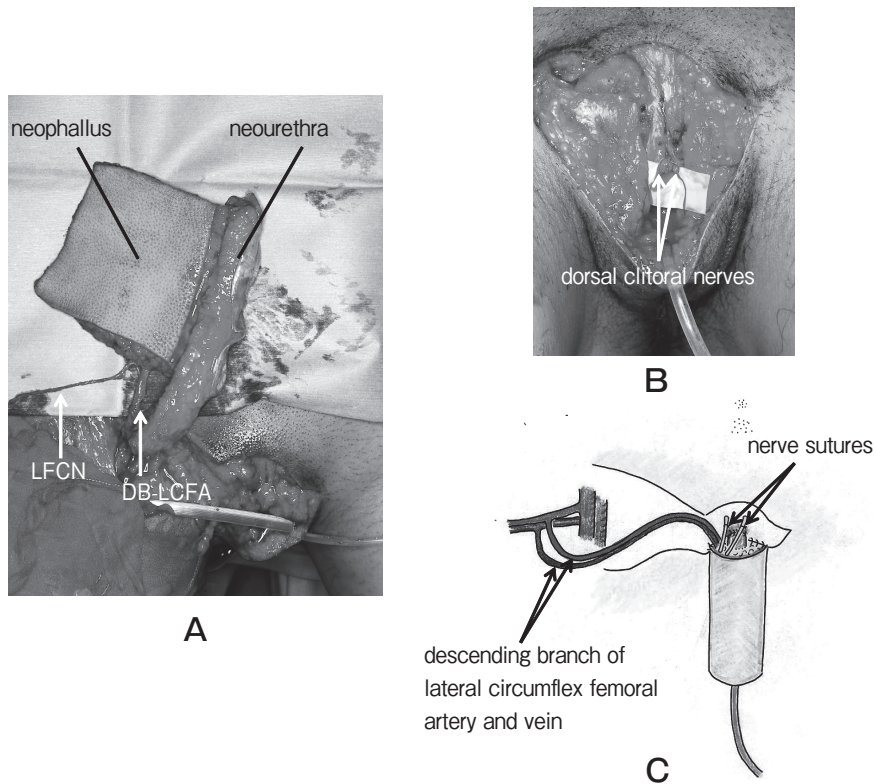


Fig. 5 Intraoperative findings. **A**, a neourethra was constructed with the lateral segment of the innervated island-pedicle ALT flap that was moved to the genital area; **B**, two dorsal nerves of the clitoris were identified on both sides of the clitoris; **C**, a neophallus was constructed using the "tube within a tube" technique, and 2 lateral femoral cutaneous nerves were sutured to 2 dorsal nerves of the clitoris.

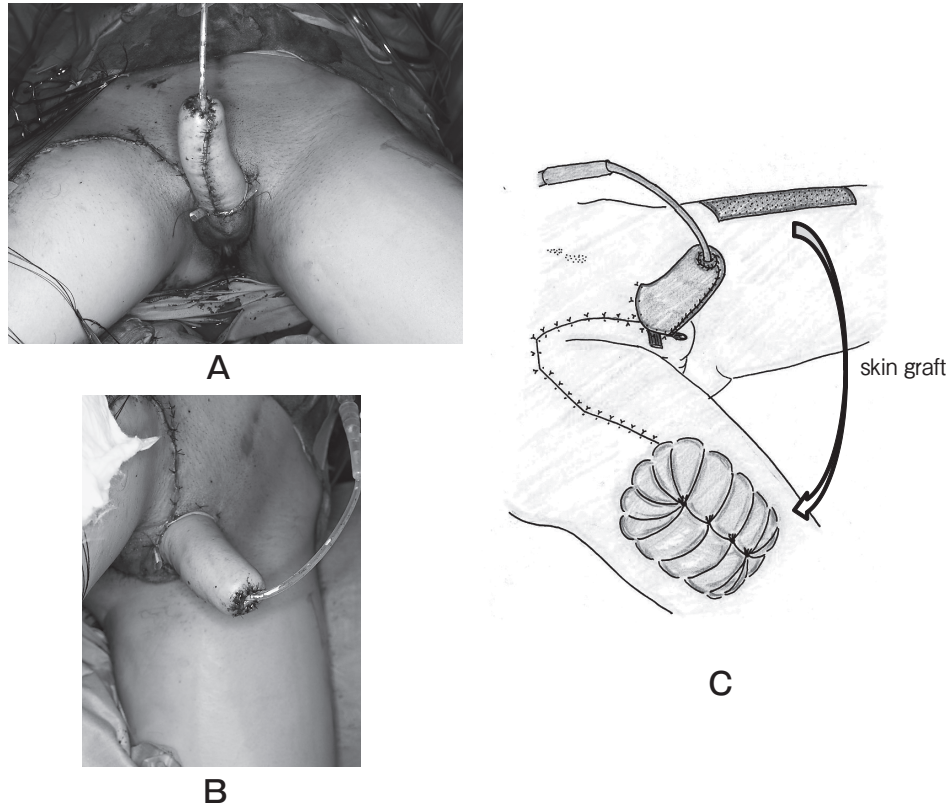


Fig. 6 The patient's condition immediately after surgery. **A**, frontal view; **B**, lateral view; **C**, the flap donor site was covered with a split-thickness skin graft taken from the contralateral thigh.

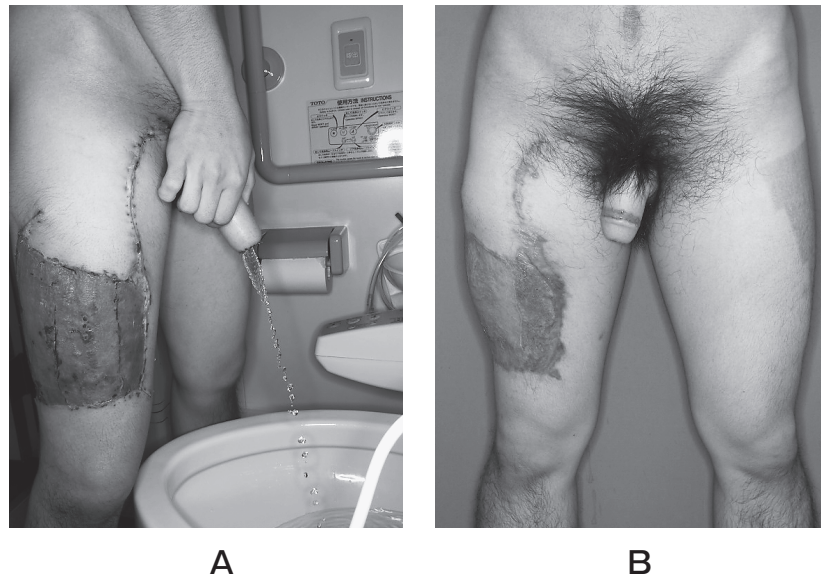


Fig. 7 Postoperative course. **A**, the patient's condition 3 weeks after surgery. The patient became able to urinate in the standing position; **B**, the patient's condition 11 months after surgery. Sculpturing of the neoglans was additionally performed 10 months after the surgery.

additionally performed, and an aesthetically good penis was constructed (Fig. 7B).

## Discussion

The first literature report of phalloplasty was made by Bogoras in 1936, who constructed a penis with a pedicled abdominal tubed flap implanted with rib cartilage [3]. Thereafter, in 1946, Maltz introduced the concept of inserting an outside-in tubed flap within a tubed abdominal pedicle graft to reconstruct the phallus with a urethra [4]. This method was later improved and popularized by Gillies and Harrison [5]. In 1971, Kaplan and Wasser were the first to report a method for the construction of a sensitive penis; they used a scrotal flap to construct a urethra and a medial thigh flap to construct the penile shaft [6].

In 1982, Puckett *et al.* reported free flap phalloplasty using a microsurgical technique [7], and researchers have subsequently reported phalloplasty using various free flaps [8–10]. In particular, Chang and Hwang reported phalloplasty with a radial forearm free flap using the “tube within a tube” technique in 1984, which is an excellent method from both an aesthetic and functional perspective [8]. Gilbert *et al.* [10] and Hage and Graaf [11] have reported the characteristics of an ideal phalloplasty as follows: (1) one-stage operation; (2) capacity to urinate in the standing position; (3) tactile and erogenous sensibility; (4) enough bulk to tolerate the insertion of a penile prosthesis; (5) aesthetic acceptability; (6) a small and inconspicuous scar at the flap donor site; and (7) no functional loss in the flap donor area. Although forearm flaps are considered to be almost ideal for phalloplasty, there is the problem of leaving a conspicuous scar on the forearm. Phalloplasty with various flaps has been reported even after the report of Chang and Hwang [12–15], such as that with an island-pedicled [14] or free [15] anterolateral thigh flap; the present case, we performed phalloplasty with an innervated island-pedicled anterolateral thigh flap using the “tube within a tube” technique [17] in a female-to-male transsexual.

When compared to forearm flaps, this procedure has the following advantages in phalloplasty: 1) no need for a microsurgical technique; 2) no scars at noticeable sites; 3) small functional loss in the flap donor area; 4) no sacrifice of major blood vessels. On

the other hand, it has the disadvantages of 1) high anatomical variability in ALT flap perforators, and 2) thick flaps are obtained from obese patients. Based on these findings, it is considered that this procedure is appropriate for patients with a negative Allen test and for those who do not wish to have the flap taken from the forearm; furthermore, a preoperative search for ALT flap perforators is necessary not only by acoustic Doppler flowmetry, but also by color Doppler ultrasonography and MDCT angiography. In addition, it should be kept in mind that if no dominant perforators are found intraoperatively, there is an option to use other flaps [15]. Thus far we have used deep inferior epigastric artery perforator flaps [12] and superficial circumflex iliac artery flaps [16] as island-pedicled flaps that do not require a microsurgical technique for patients with a negative result of the Allen test and for those not wishing to have the flap taken from the forearm for cosmetic reasons. These flaps have the disadvantage of not being innervated, while they have the advantage that the flap donor site can usually be sutured in a one-stage operation. Medial thigh flaps are among the pedicled flaps that can be used as innervated flaps [6], but to the best of our knowledge, there have been no reports of phalloplasty with a medial thigh flap using the “tube within a tube” technique. Although more clinical experience is needed in the future, this procedure seems to be a useful alternative for phallic reconstruction.

At present in Japan, SRS for patients with gender identity disorder is not covered by medical insurance, and the patients have to pay for all surgery costs. At our facility, there are no differences in surgical costs between island-pedicled flap phalloplasty and free-flap phalloplasty for FTMTS. In the future, when SRS is covered by medical insurance, the medical cost of island-pedicled flap phalloplasty is expected to become lower than that of free-flap phalloplasty by approximately 300,000 yen.

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