

Immediate Lymphovenous Bypass Treated Donor Site Lymphedema during Phalloplasty for Gender Dysphoria

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Summary: Demand for gender-affirming phalloplasty continues to grow worldwide, and the extended radial forearm flap phalloplasty remains one of the most commonly performed techniques. One potential morbidity that has emerged is postoperative donor site lymphedema, which was susceptible to develop after harvest of extended radial forearm flap. In the setting of preventative or immediate lymphovenous bypass (LVB) with axillary lymph node dissection for the treatment of breast cancer, it is possible that a subset of patients undergoing gender-affirmation surgery would benefit from immediate lymphatic reconstruction at the time of primary phalloplasty. Here, we report a case in which intraoperative indocyanine green lymphography demonstrated lymphatic obstruction within the left donor hand after flap harvest, and was treated with immediate LVB at the time of extended radial forearm phalloplasty. Two surgical teams operated simultaneously: the reconstructive urology team performed the vaginectomy, perineal urethral lengthening, scrotoplasty, and perineal reconstruction; and the microsurgery team harvested the extended radial forearm, constructed the penile urethra, shaped the phallus, and performed the immediate LVB. Lymphography showed no dermal backflow at 5 months follow-up; at 13 months, the patient demonstrated no signs or symptoms of lymphedema in the left forearm or hand. To the authors' best knowledge, this is the first report of confirmed donor site lymphedema following extended radial forearm flap harvest, which was successfully treated with immediate LVB. Careful evaluation of lymphatic vessels with indocyanine green lymphography in the forearm before and after extended flap harvest may be warranted. (*Plast Reconstr Surg Glob Open* 2021;9:e3822; doi: [10.1097/GOX.0000000000003822](https://doi.org/10.1097/GOX.0000000000003822); Published online 17 September 2021.)

The extended radial forearm flap has become one of the most popular options for providing an aesthetic phalloplasty with excellent sensation while permitting standing micturition and penetrative sexual function. During flap harvest, preservation of a 3–5 cm strip of native ulnar forearm skin is generally recommended to prevent hand lymphedema.¹ However, the common

tube-within-a-tube design² requires an extended skin paddle that compromises major lymphatic vessels along a significant circumference of the forearm.

Susceptible patients may present with pitting edema, tightness, heaviness, and achiness in the dorsal hand typically within the first 4 months postoperatively. Postoperative indocyanine green (ICG) lymphography demonstrated severe dermal backflow within the dorsal hand, with near-complete absence of flow at the level of the skin graft (Fig. 1). Here, we present a patient identified to have impaired lymphatic drainage intraoperatively after flap harvest, which was treated with prophylactic immediate lymphatic reconstruction using a lymphovenous bypass (LVB) at the time of phalloplasty.

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Fig. 1. Indocyanine green lymphography with diffuse dermal backflow in a previous patient with donor site lymphedema post extended radial forearm flap phalloplasty.

Case Presentation

A 37-year-old female-to-male transgender patient started hormone therapy and transitioned socially in December 2007. He changed his legal identity after total laparoscopic hysterectomy in December 2011. Two mental health physicians confirmed the patient's gender dysphoria and recommended gender-affirmation surgery, after meeting the guidelines of the World Professional Association for Transgender Health. The preoperative evaluation and Allen's test were normal.

After counseling, the patient elected to proceed with a left radial forearm phalloplasty. Two surgical teams with four surgeons performed three major procedures, operating simultaneously as follows:

1. Vaginectomy, urethral lengthening, scrotoplasty, and perineal reconstruction;
2. Extended radial forearm flap harvest and phalloplasty;
3. ICG lymphography and LVB.

(See [Video 1 \[online\]](#), which displays the vaginectomy, perineal urethral lengthening, scrotoplasty, and perineal reconstruction.)

After suprapubic catheter placement, vaginectomy was performed, followed by neourethra reconstruction using labia minora flaps.^{3,4} The clitoris was subsequently de-epithelialized to expose the right dorsal clitoral nerve for coaptation to the phalloplasty flap lateral antebrachial cutaneous nerve.

The tissue overlying the pubic symphysis was excised, and the denuded clitoris, neourethral meatus, and nerve were translocated to the infrapubic position. The scrotum was created using bilateral labia majora flaps. Perineal reconstruction was then undertaken by closing the bulbospongiosus tissue, adipofascial, and skin layers.

The neophallus was transferred to the pubic position, and the urethral anastomosis was then completed. A proximal adipofascial flap was then secured around the urethral anastomosis.

Extended Radial Forearm Flap Harvest and Phalloplasty

Preoperatively, 0.1 mL of ICG (Daiichi-Sankyo Propharma, Tokyo, Japan) was injected into the left second and fourth web spaces. Lymphatic vessels were identified with a custom infrared system (Osler 2000; Chang Gung Medical, Taipei, Taiwan) and camcorder (Sony HD Handycam, New York, N.Y.) in the forearm. (See [Video 2 \[online\]](#), which displays indocyanine green lymphography revealed preoperatively, after the elevation of extended radial forearm flap, immediately after lymphovenous bypass, and at 5 months postoperatively.) Larger lymphatic vessels were marked, and a few minor lymphatic vessels obliquely crossed the ulnar skin bridge ([Fig. 2](#)).

An extended radial forearm flap was harvested using a tube-within-a-tube design. After flap harvest, the neourethra was fashioned by tubularizing the ulnar-sided flap skin paddle. The neophallus was shaped, and glansplasty was performed. The forearm flap was transferred to the recipient site for microsurgical anastomoses. After the urethral anastomosis was completed, the vascular anastomoses of

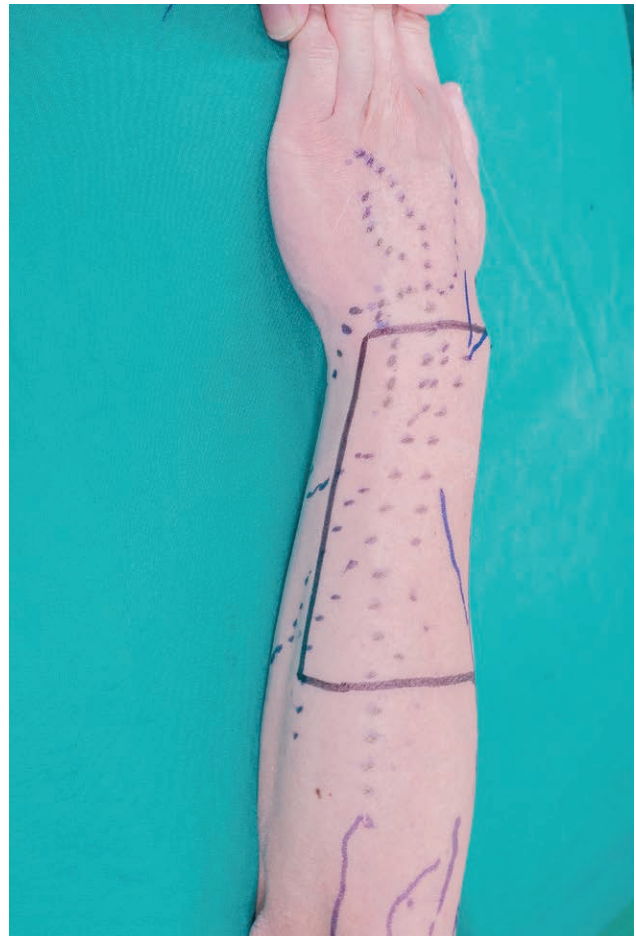


Fig. 2. Preoperative photograph of a 37-year-old female-to-male transgender patient planned phalloplasty using an extended radial forearm flap. Markings of preoperative indocyanine green lymphography revealed several major lymphatic vessels located on the radial side of the forearm.

the radial artery to the right femoral artery (end-to-side), cephalic vein to saphenous vein, and radial comitant vein to a branch of the saphenous vein were uneventfully performed. Two branches of the dorsal clitoral nerve were coapted to two antebrachial cutaneous nerve branches. The phalloplasty flap was inset in layers. The forearm donor site was closed with a 0.012-inch split-thickness skin graft.

ICG Lymphography and LVB

Repeat intraoperative ICG lymphography revealed diffuse dermal backflow within the left dorsal hand after the forearm flap harvest, consistent with suspected impaired lymphatic outflow. (See Video 2 [online]). At this point, the authors decided that immediate LVB would be beneficial. A skin incision of 3-cm on the left dorsal hand was made. A lymphatic vessel 0.5 mm in diameter and a subdermal venule 0.95 mm in diameter were dissected under the 42 x Mitaka MM50 microscope (Kohki Co, Ltd., Tokyo, Japan). A side-to-end LVB using 11-0 Nylon was performed (Fig. 3).^{5,6} The ICG showed the immediate patency of the LVB. (See Video 2 [online]).

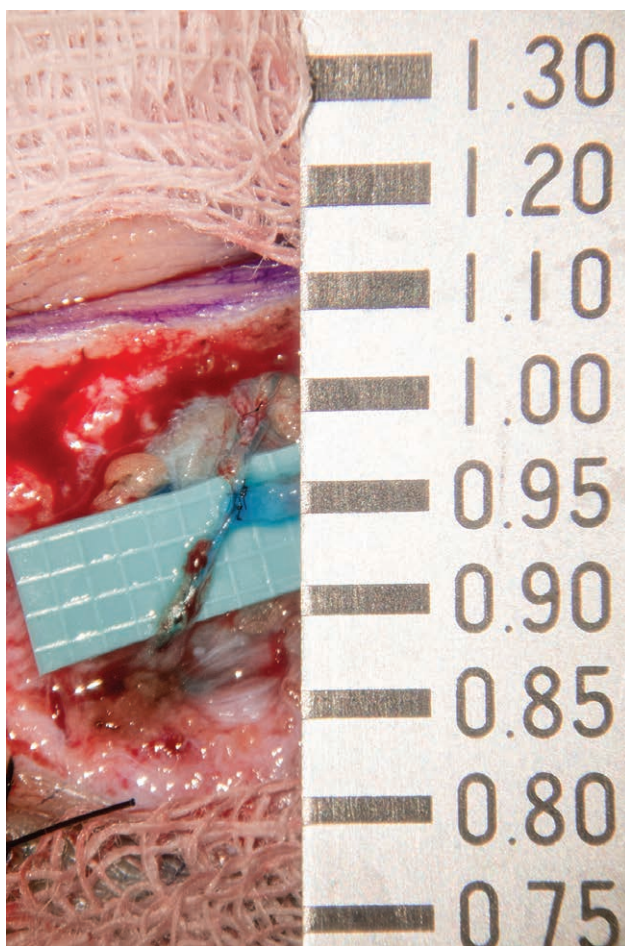


Fig. 3. A side-to-end lymphovenous anastomosis between a lymphatic vessel 0.5 mm in diameter and a subdermal venule 0.95 mm in diameter.

RESULTS

The flap survived uneventfully but required minor urethral revision 4 months postoperatively. Postoperative ICG lymphography showed no dermal backflow on the left hand at 5 months (see Video 2 [online]). At a follow-up of 13 months, the patient confirmed the absence of signs or symptoms of lymphedema following immediate LVB in the left forearm and hand (Fig. 4).

DISCUSSION

Although the donor site may be conspicuous, the extended radial forearm flap consistently achieves desired outcomes with a combination of aesthetics, sensory innervation, implant-based sexual function, and urinary function with acceptable complication rates.

Boccardo et al initially reported lymphatic microsurgical preventive healing approach for prevention of breast cancer-related lymphedema simultaneously with the axillary lymph node dissection.⁷ Johnson et al reported that lymphatic microsurgical preventive healing approach could significantly reduce the incidence of breast cancer-related lymphedema in axillary lymph node dissection with or without subsequent radiation.^{8,9} A preventive approach may also be applied to radial forearm phalloplasty.

Dermal backflow is typically observed several months to years after treatment in cases of secondary cancer-related lymphedema. In this case, most of the segmental lymphatic

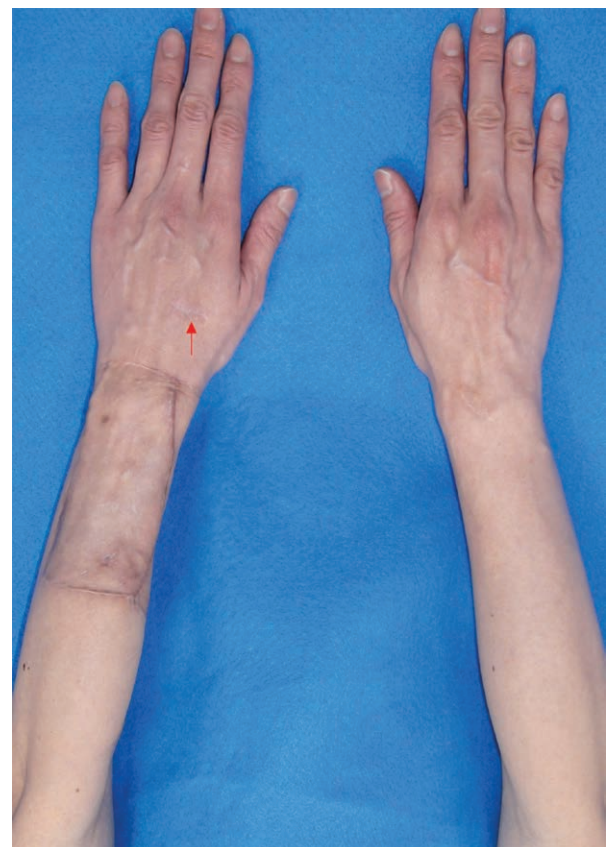


Fig. 4. Postoperative photograph showed no hand or forearm lymphedema at 13 months of follow-up.

vessels between the wrist and the forearm were surgically disrupted, and therefore the diffuse lymphatic leakage (or dermal backflow) can be visualized with ICG lymphography immediately intraoperatively. The exact incidence and clinical course of donor site lymphedema following forearm flap phalloplasty requires further investigation, but we believe it affects a small but significant subset of patients and thus appropriate management is required.

To the best of our knowledge, this is the first report of confirmed intraoperative donor hand lymphedema after extended radial forearm flap elevation that was successfully treated with immediate prophylactic LVB. A careful evaluation of lymphatic drainage in the hand and forearm before and after extended radial forearm flap harvest is recommended. In the appropriate candidate patient, it is feasible to perform simultaneous reconstructions of the phalloplasty and immediate prophylactic LVB for the prevention of donor site lymphedema.

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