



# Simultaneous Bilateral Submental Lymph Node Flaps for Lower Limb Lymphedema Post Leg Charles Procedure

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**Summary:** We summarize the case of a 59-year-old woman with left lower limb lymphedema for 4 years post hysterectomy, pelvic lymph node dissection, radiation therapy, and chemotherapy for endometrial cancer. She underwent the Charles procedure on her left leg 2 years before being referred to our hospital and developed several cellulitis episodes and progressive lymphedema affecting her left toes and thigh. Bilateral vascularized submental lymph node flaps were transferred to her left ankle and thigh, respectively. After a 5-month follow-up, the leg became softer and lighter without relapsing cellulites, and the circumferential reduction rates at 15 cm above knee, 15 cm below knee, and 10 cm above ankle were 23.3%, 50%, and 22.2%, respectively. The patient was satisfied with the functional recovery and discontinued use of compression garment postoperatively. (*Plast Reconstr Surg Glob Open* 2015;3:e513; doi: 10.1097/GOX.0000000000000489; Published online 15 September 2015.)

A 59-year-old woman had developed lower limb lymphedema for 4 years post hysterectomy, pelvic lymph node dissection, radiation therapy, and chemotherapy for endometrial cancer. Despite complete decongestive therapy with an elastic stocking for a year, lymphedema gradually progressed and cellulitis in her left lower limb recurred every 3–4 months. She had undergone the Charles procedure of left leg at another hospital 2 years before she was referred to our hospital for further treatment. The circumferential differentiation values on

the left lower limb at 15 cm above knee, 15 cm below knee, and 10 cm above ankle were 22.2%, –34.7%, and 77.8%, respectively. Her left lower leg and foot had chronic infection and cellulitis. Lymphoscintigraphy revealed total lymphatic obstruction of the left lower limb (Fig. 1).

## SURGICAL TECHNIQUE

A skin paddle (9×2.5 cm) with a vascularized submental lymph node (VSLN) flap was designed on the left side and transferred to her left ankle according to a previously published technique.<sup>1</sup> The left facial artery and vein were anastomosed with posterior tibial artery and vein in end-to-side and end-to-end fashions, respectively. The right VSLN flap was harvested in the same fashion and transferred to her left thigh. The right facial artery and vein were anastomosed with the descending branch of lateral cir-

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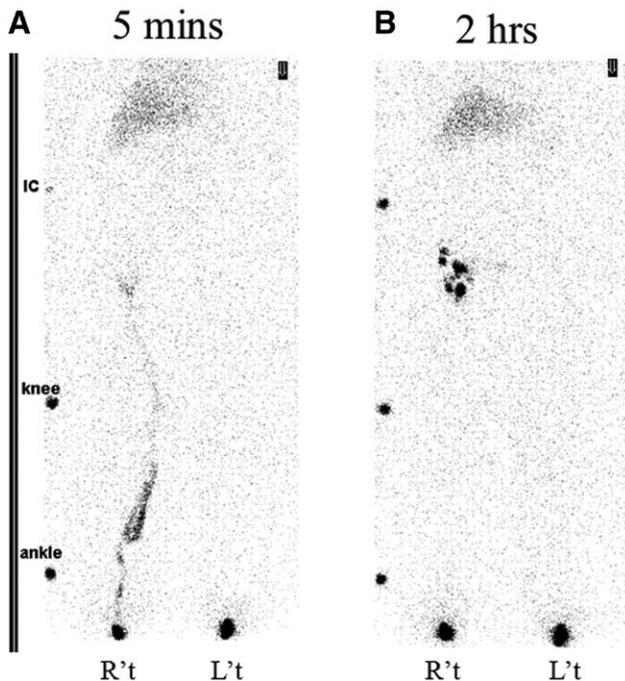
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**Fig. 1.** Lymphoscintigraphy demonstrated multiple right inguinal lymph nodes 2 hours after subcutaneous injection of technetium-99 on the first web space, but no left inguinal lymph node was noted up to 2 hours after injection. Lymphoscintigraphy revealed total occlusion of lymphatic drainage and the absence of left groin lymph nodes at 5 minutes (A) and 2 hours (B) after Technetium-99 injection.

cumflex femoral artery and vein in end-to-side and end-to-end fashions, respectively.

### SURGICAL OUTCOME

Both VSLN flaps survived well. The operation time was approximately 10 hours. A minor complication was noted with partial skin loss of the dorsal foot due to insufficient blood nutrition over the previous skin graft scar, which required an additional debridement and skin grafting 1 month postoperatively. In addition, liposuction of the left medial thigh was simultaneously performed to improve lymphedema and soften the fat tissue. Indocyanine green was directly injected into the lymph nodes of both the thigh-VSLN and the ankle-VSLN flaps to prove that the lymph was draining into the pedicle vein. The existence and potency of lymphaticovenous connections in the lymph node were verified (See Video 1, Supplemental Digital Content 1, which demonstrates the fluorescence draining into the pedicle vein, <http://links.lww.com/PRSGO/A127>). After a 5-month follow-up, symptomatic improvement in her left lower limb was observed, and the circumferential reduction rates at 15 cm above knee, 15 cm below knee, and 10 cm above ankle were 23.3%, 50%, and 22.2%, respectively (Fig. 2). The



**Video Graphic 1.** See Video 1, Supplemental Digital Content 1. Indocyanine green was directly injected into the lymph nodes of the flap. The arrow indicates that the fluorescence drained into the pedicle vein, <http://links.lww.com/PRSGO/A127>.

patient returned to normal life without any compression garment use. There was no donor-site morbidity, including lymphedema of the face or retraction of the lower lip associated with marginal mandibular nerve injury (Fig. 3).

### DISCUSSION

The Charles procedure was modified as ablative surgery for lower limb lymphedema, which consists of radical circumferential excision of the subcutaneous tissue and part of the fibrotic fascia of the lymphedematous limb as well as resurfacing with split-thickness skin grafts by Sistrunk, Homans, and Macey.<sup>2-5</sup> Although successful outcomes after the Charles procedure have been reported,<sup>6-8</sup> the complications of this procedure are the recurrence of the lymphedema, especially at the foot, necessitating resurfacing and regrafting as well as amputation of the toes due to chronic infection, ulcerations, recurrent cellulitis episodes of the thigh and the leg, and poor cosmetic results, such as verrucous and hyperkeratotic nodular exophytic skin. Therefore, further procedures might be subsequently required to save lymphedema patients who have undergone the Charles procedure with these negative effects.

In this case, all skin and soft tissue above the deep fascia in the left leg had been resected with the Charles procedure. The lymphedema on her left toes and upper thigh were progressively worsened and her lower leg had been affected by chronic infection. After bilateral VSLN flaps transfers, significant improvement in both the subjective symptoms and objective signs was achieved in the early postoperative period, with lasting improvement during the follow-up period. The use of a compressive garment was discontinued after this surgery. To the best of our knowledge, this is the first report of bilateral



**Fig. 2.** Images at the preoperative period (A) and 1 and 5 months (B and C) postoperatively. The preoperative circumferential differentiation values in the left lower limb at 15 cm above knee, 15 cm below knee, and 10 cm above ankle were 22.2%, -34.7%, and 77.8%, respectively. After the 1-month follow-up, the circumferential reduction rates at 15 cm above knee, 15 cm below knee, and 10 cm above ankle were 7%, 12%, and 22%, respectively. After the 5-month follow-up, the circumferential reduction rates at 15 cm above knee, 15 cm below knee, and 10 cm above ankle were 23.3%, 50%, and 22.2%, respectively.



**Fig. 3.** Minimal donor-site morbidity of both necks was noted at 5 months postoperatively.

VSLN flaps transfers for a single severe lymphedematous limb following the Charles procedure. The left VSLN flap transfer to the ankle following the Charles procedure can decrease the cellulitis and avoid further amputation of the toes and foot due to fungus infection and cellulitis.<sup>6-8</sup> Right VSLN flap transfer to the thigh can help to drain lymph around the thigh area, from the knee to the hip, which can decrease not only the loading of the lower leg but also the cellulitis episodes.

The mechanism of VSLN flap transfer has not been fully understood,<sup>9</sup> and an animal model and clinical study were conducted to evaluate lymphedema with this procedure.<sup>10</sup> Intrinsic lymphovenous connections within the transferred lymph nodes allow for drainage of lymph from the local interstitium into the venous system. Once these lymphatic pumps

are placed in the dependent site of the lymphedematous limb, they provide an alternative pathway of interstitial fluid shunting into the venous system for optimal lymph clearance. This new pathway of lymphatic drainage was demonstrated by direct visualization of fluorescence in the recipient vein immediately after the injection of indocyanine green into the transferred lymph nodes after pedicle anastomosis.<sup>10</sup> Initially, the lymph is driven by interstitial pressure gradients between the edematous limb and the lymph node flap, which is followed by the catchment and gravity effects.<sup>10-12</sup>

The submental and groin lymph node flaps are the most preferable donor sites because they include a higher quantity and density of lymph nodes.<sup>13</sup> The groin lymph node flap is still popular among surgeons because of its anatomical reliabil-

ity and familiarity.<sup>9,12,14–19</sup> In the setting of unilateral lower limb lymphedema, patients always refuse to use the contralateral groin lymph node transfer because they have concerns about donor-site lymphedema. Considering these characteristics of donor lymph node basins, bilateral VSLN flaps transfers seem to be the most desirable surgery for treating severe lower limb lymphedema following the Charles procedure.

### CONCLUSION

Simultaneous bilateral VSLN flaps transfers to the ankle and the thigh is feasible and effective for progressive lower limb lymphedema following the Charles procedure of the leg.

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