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CASE REPORT

A case of donor-site lymphoedema after lymph node–superficial circumflex iliac artery perforator flap transfer

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Summary Vascularised lymph node transfer is a promising technique to treat limb lymphoedema, especially when caused by lymph node dissection. The most common approach is the transfer of superficial inguinal lymph nodes using groin flaps or superficial circumflex iliac artery perforator flaps. Lower-limb lymphatic sequelae are unexpected as these lymph nodes should drain lymph from the lower abdominal wall. Recently, Vignes *et al.* described two cases out of 26 cases of chronic lymphoedema after superficial inguinal lymph node harvest. From a series of 42 vascularised lymph node transfers performed at our centre, only one patient developed swelling in the donor thigh. The features of this patient who underwent a lymph node-containing superficial circumflex iliac artery perforator flap are reported herein. We recommend maximal accuracy in selecting the appropriate lymph nodes for transfer and provide some tips from our experience.

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Secondary chronic limb lymphoedema is a disabling side effect of groin and axillary lymph-node (LNs) surgery.[1] Patients who do not respond adequately to complex decongestive therapy can benefit from microsurgical treatment.[2]

Vascularised lymph-node transfer (LNT) is becoming quite popular in improving the defective limb lymphatic drainage after LN clearance, especially in breast cancer-related lymphoedema patients.[3] The most common approach is the transfer of superficial inguinal LNs to the axilla or wrist using groin (LN-GROIN) flaps[4] or superficial circumflex iliac artery perforator (LN—SCIP) flaps.[5] For post-mastectomy patients with arm lymphoedema, microvascular breast reconstruction using an abdominal free flap can be performed in combination with LNT.[6]

As superficial inguinal LNs drain the suprailiac region, no functional sequelae are expected in the lower limb.[6] Nevertheless, Viitanen *et al.*[7] described unexpected changes in lymphatic transport in the leg after LNT, while Vignes *et al.*[8] reported cases of irreversible iatrogenic lymphoedema.

The clinical features of a patient who developed chronic thigh swelling after an LN—SCIP flap procedure are reported herein.

Clinical details

A 52-year-old woman had a right modified radical mastectomy and axillary LN dissection (ALND) for a ductal carcinoma in June 2003 (zero positive LNs). Breast reconstruction with a latissimus dorsi (LD) myocutaneous flap and implant was performed, followed by adjuvant radiotherapy (RT), chemotherapy (CT) and hormonotherapy (HT). Third-degree[2] arm swelling was detected 8 months after the operation.

In February 2008, neo-adjuvant CT was performed for contralateral lobular cancer, followed by left mastectomy with expander placement, sentinel LN (SLN) biopsy removing two negative LNs and RT—HT. First-degree[2] left-arm lymphoedema was detected 6 months later. In May 2012, the left breast was reconstructed using an LD myocutaneous flap with implant, and the contralateral implant was exchanged.

As complex decongestive therapy gave unsatisfactory results and recurrent right-arm lymphangitis was reported, in February 2011 a left LN—SCIP flap was harvested. The flap was based on the superficial branch of the superficial circumflex iliac artery and included at least three superficial inguinal LNs embedded in the surrounding fat tissue.[5] Anastomosis was performed to the right thoracodorsal vessels after adequate axillary scar release (Figure 1).

Swelling of the left thigh appeared 3 months later, and symptoms were still present at the 24-month follow-up (Figure 2).

The patient had a 25 pack-year history of smoking. Her body mass index (BMI) was 24.0 kg m^{-2}. Family history revealed a grandmother who suffered from third-degree breast cancer-related lymphoedema.

Upper- and lower-limb evaluation

Limb circumferences were assessed with a common tape: at first preoperatively, then every 3 months for the first year and every 6 months for the second year. Reference circumferences for the upper limb were the cubital crease, point 'zero' (K), +10 cm (A) in the upper arm, −10 cm (B) and −20 cm (C) in the forearm, the wrist (D) and the base of the first finger (E).

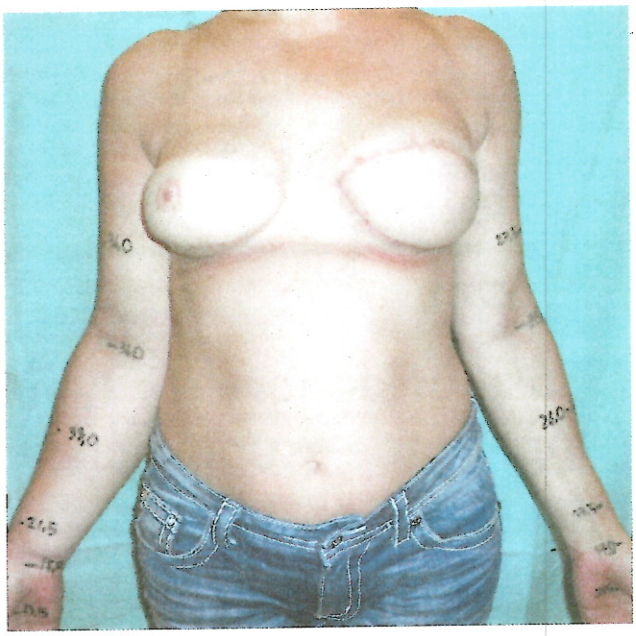

Figure 1 Frontal view of the patient at 24-month follow-up after LN—SCIP flap surgery for right upper limb lymphoedema (third-degree). Bilateral breast reconstruction was performed with LD myocutaneous flap with implant. Left upper limb lymphoedema (first-degree) was treated with complex decongestive therapy.

Reference points for the leg were the popliteal crease, point 'zero' (K), +30 cm (A), +20 cm (B), +10 cm (C) in the thigh, −10 cm (D), −20 cm (E), −30 cm (F) in the lower leg and 10 cm proximal from the tip of the first toe (G).

Using those measurements, upper limb as well as thigh (points A to C) and leg (points A to G) volume were calculated.

Postoperative lymphoscintigraphy (LS) was performed to assess upper- and lower-limb lymphatic function. 99mTc-Labelled human serum albumin (37 MBq, 0.1 ml volume) was administered subcutaneously in the second and fourth interdigital space. Images were taken immediately and 180 min after the injection.

Results

Preoperative leg circumferences showed no difference between the left and the right leg. At the 24-month follow-up, upper- and lower-limb measurements were compared to the preoperative values. A 2-cm enlargement of the left thigh circumferences at points A, B and C was detected (Figure 2). The percentage increase of the affected thigh was 8.5% and 6.2% considering the whole leg.

Immediate LS images showed tracer migration only in the healthy right leg (Figure 3). Later images confirmed

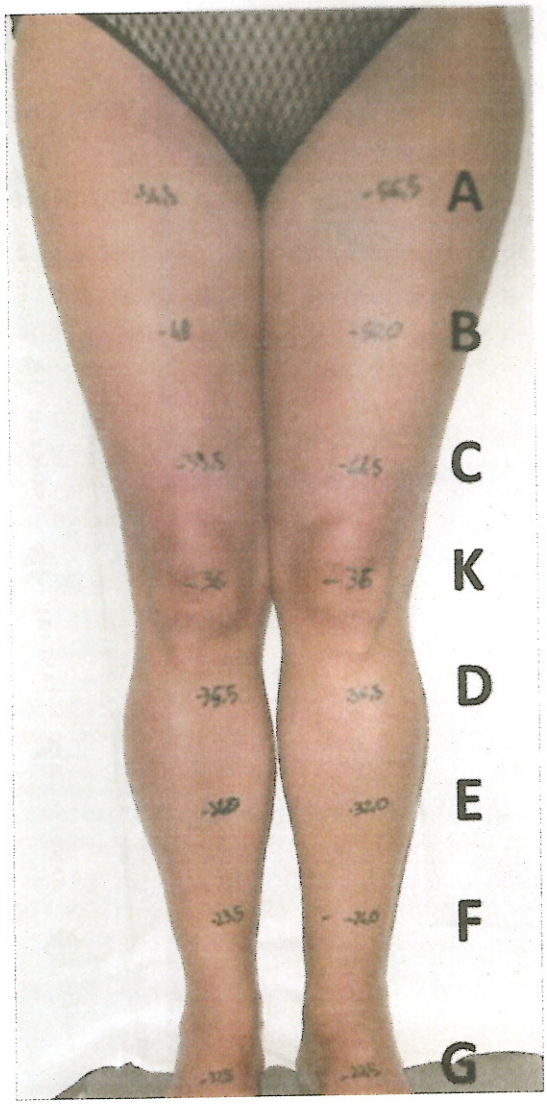

Figure 2 Frontal view of lower limbs at 24-month follow-up after left LN–SCIP flap harvest, showing two cm enlargement of the left thigh circumferences at points A, B and C compared to the preoperative assessment. No pain or functional impairment were referred. No significant differences in lower leg circumferences were detected, although slight ankle swelling was evident.

normal lymphatic flow in the right limb and delayed drainage in the left limb, with no dermal backflow. Findings were judged compatible with left superficial inguinal LN harvest and compatible with the results of Viitanen *et al.*,[7] assessed by experienced nuclear medicine physicians.

Right-arm lymphoedema improved an average of 1.5 cm and volume decrease was 9.8%, while lymphoscintigraphic images showed two functioning transplanted LNs in the right axilla, which were absent preoperatively.

Discussion

In our surgical experience based on a series of 42 vascularised LNTs (22 lymph-deep inferior epigastric perforator (LN-DIEP) flaps and 20 LN–SCIP or LN-GROIN flaps) for which moderate objective and significant subjective clinical improvements have been achieved, only one patient developed chronic swelling in the donor thigh after LN–SCIP flap transfer.

The vascularised LNT is a well-described procedure.[3–6] Despite the fact that preliminary results in reducing limb lymphoedema seem attractive, further evidences are needed to prove its complete safety and efficacy.[4,6] Although superficial inguinal LNs should drain lymph from the lower abdominal wall,[6] Viitanen *et al.*[7] observed minor postoperative lymphoscintigraphic changes in the lower limb after LNTs of 6/10 patients and abnormal flow in 2/10 patients. However, no cases of donor-site lymphoedema have been described in the few series reported to date.[3–7] Recently, Vignes *et al.*[8] published a single-centre surgical experience including 2/26 patients suffering from inferior limb persisting iatrogenic lymphoedema.

In our patient, LS showed lymph flow delay in the affected lower limb, in the absence of transport insufficiency and the lymphoscintigraphic images were comparable to the findings of Viitanen *et al.*[7] Nevertheless, clinical evaluation revealed a 2-cm difference between the preoperative and postoperative affected thigh, while the difference in volume was 8.5%. Although there are no standard cut-off values for the diagnosis of lymphoedema, we considered as significant an increase of 2 cm. The assessment of leg circumferences over time (Table 1) demonstrated that swelling began early in the proximal third of the thigh, then extended to its distal segment. Lymphoedema stabilisation occurred after 12 months.

The relationship between the number of LNs excised and donor-site lymphatic sequelae is well known; however, other parameters should be considered.[7]

Interestingly, the patient developed bilateral arm lymphoedema of the first and third degree, 6 and 8 months respectively after surgery. Family history revealed that the patient's grandmother also had third-degree breast cancer-related lymphoedema. Constitutional predisposition and susceptibility to develop lymphoedema were thus supposed.[9] The patient refused genetic analysis.

Anatomical studies have shown that 5%[7]–10%[10] of lower-limb SLNs are located superolateral to the femoral artery. As we approach this anatomical region surgically, extreme accuracy is recommended to avoid unnecessary scarring around the remaining LNs.[6,7]

In order to identify suitable LNs for the harvest, other methods may be adopted together with conventional intradermal suprailiac injection of Patent Blue dye.[6]

Koshima *et al.*[5] suggested preoperatory indocyanine green (ICG) lymphography to detect the dominant leg LNs that will not be harvested. Furthermore, information provided by abdominal radiotracer injection to detect superficial inguinal LNs could also be added.

Preoperative identification of lower-limb lymphatic flow abnormalities in sub-clinical lymphoedematous patients is becoming a relevant issue. Semiquantitative analysis of the dynamic LS could provide valuable data regarding the increased risk of developing lymphoedema after surgery.[7] Similarly, ICG lymphography can detect possible dermal backflow patterns corresponding to lymphatic flow dysfunction.[11] These techniques, either

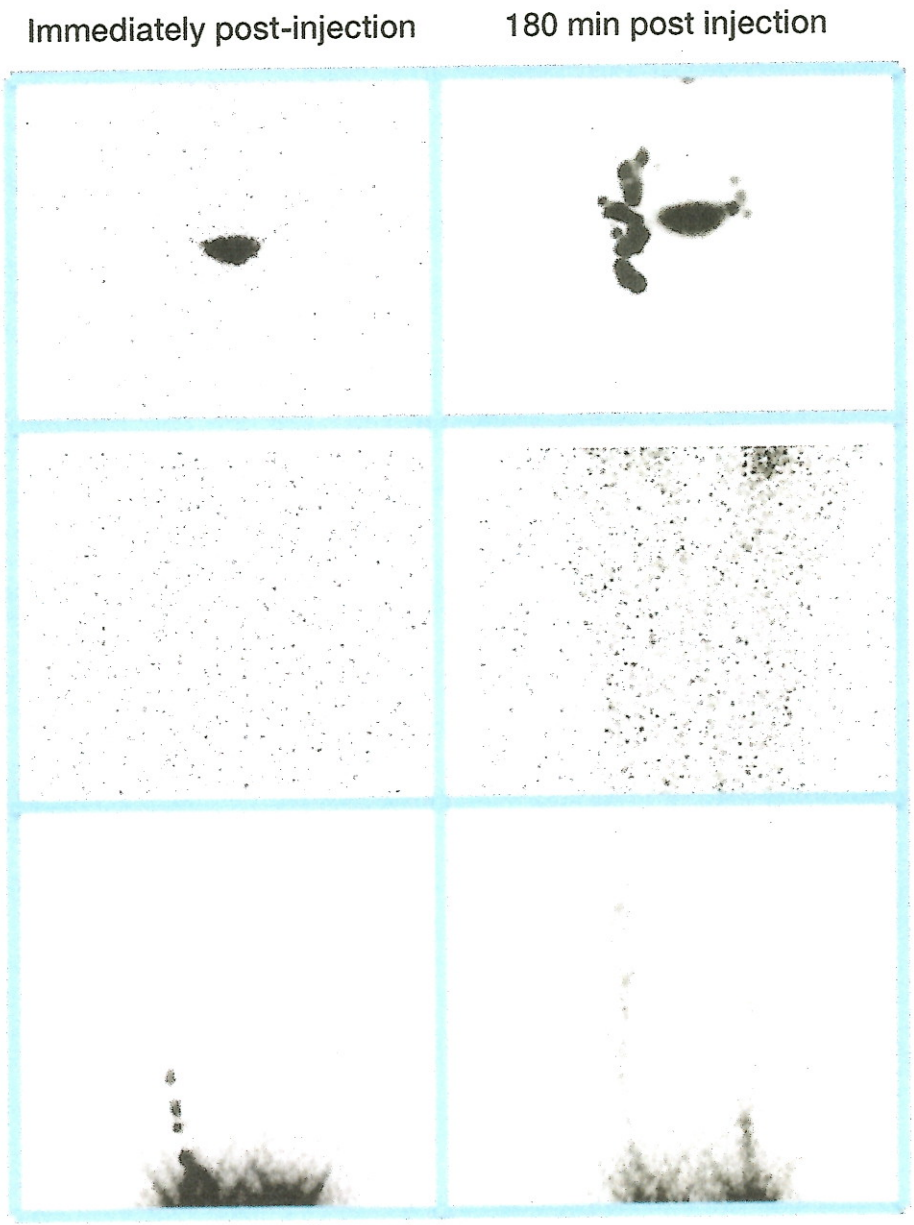

Figure 3 Immediate LS revealed tracer migration only in the right lower limb. Images acquired 180 min after the injection showed normal right ilioinguinal groin LNs drainage. Reduced drainage was assessed in the left lower limb with prevalence of inguinal groin LNs and only a few iliac LNs. No dermal backflow was detected.

Table 1 Inferior limb circumferences (cm) during follow-up.

(cm)	Pre-operatory	3 months	6 months	9 months	12 months	18 months	24 months
A(+30)[a]	54.5	55.5	55.5	56.5	56.5	56.5	56.5
B(+20)[a]	48.0	48.0	49.0	49.0	50.0	50.0	50.0
C(+10)[a]	39.5	39.5	40.0	41.5	41.5	41.5	41.5
K(0)[a] popliteal crease	36.0	36.5	36.0	36.0	36.0	36.0	36.0
D(−10)[a]	35.5	36.0	36.5	36.5	36.5	36.5	36.5
E(−20)[a]	34.0	34.0	33.5	33.5	32.5	32.0	32.0
F(−30)[a]	23.5	23.5	23.5	23.5	24.0	24.0	24.0
G(+10 on foot)[a]	22.5	23.0	23.0	23.0	22.5	22.5	22.5

[a] Reference points on leg.

individually or in combination, may provide an effective contribution to the prevention of lymphatic changes or lymphoedema at the donor site. However, patients should always be alerted to the fact that LNT is not a risk-free procedure.[8]

Ethical approved

Not required.

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Conflict of interest statement

None of the authors has a financial interest in any of the products, devices, drugs or procedures mentioned in this manuscript.

References

1. Erickson VS, Pearson ML, Ganz PA, Adams J, Kahn KL. Arm edema in breast cancer patients. *J Natl Cancer Inst* 2001;**93**: 96–111.
2. International Society of Lymphology. The diagnosis and treatment of peripheral lymphedema. 2009 Consensus Document of the International Society of Lymphology. *Lymphology* 2009;**42**:51–60.
3. Becker C, Assouad J, Riquet M, Hidden G. Postmastectomy lymphedema: long-term results, following microsurgical lymph node transplantation. *Ann Surg* 2006;**243**:313–5.
4. Lin CH, Ali R, Chen SC, et al. Vascularized groin lymph node transfer using the wrist as a, recipient site for management of postmastectomy upper extremity lymphedema. *Plast Reconstr Surg* 2009;**123**:1265–75.
5. Mihara M, Iida T, Hara H, et al. Autologous groin lymph node transfer for "sentinel lymph, network" reconstruction after head-and-neck cancer resection and neck lymph node dissection: a case report. *Microsurgery* 2012;**32**:153–7.
6. Saaristo AM, Niemi TS, Viitanen TP, Tervala TV, Hartiala P, Suominen EA. Microvascular, breast reconstruction and lymph node transfer for postmastectomy lymphedema patients. *Ann Surg* 2012;**255**:468–73.
7. Viitanen TP, Mäki MT, Seppänen MP, Suominen EA, Saaristo AM. Donor-site lymphatic, function after microvascular lymph node transfer. *Plast Reconstr Surg* 2012;**130**:1246–53.
8. Vignes S, Blanchard M, Yannoutsos A, Arrault M. Complications of Autologous lymph-node, transplantation for limb lymphoedema. *Eur J Vasc Endovasc Surg* 2013;**45**:516–20.
9. Newman B, Lose F, Kedda MA, et al. Possible genetic predisposition to lymphedema after, breast cancer. *Lymphat Res Biol* 2012;**10**:2–13.
10. Van der Ploeg IM, Kroon BB, Valdés Olmos RA, Nieweg OE. Evaluation of lymphatic, drainage patterns to the groin and implications for the extent of groin dissection in melanoma, patients. *Ann Surg Oncol* 2009;**16**:2994–9.
11. Azuma S, Yamamoto T, Koshima I. Donor-site lymphatic function after microvascular lymph, node transfer should be followed using indocyanine green lymphography. *Plast Reconstr Surg* 2013;**131**:443e–4e.