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Breast

Fat Grafting With Lymphedema Fat: From Trash to Treasure?

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Summary: Liposuction is a common procedure for patients with lymphedema with nonpitting adipose tissue hypertrophy. However, routinely, the lipoaspirate is discarded. Experimental studies have shown that adipose-derived stem cells in fat may enhance the regenerative and lymphangiogenic effects of the fat. Recent evidence has shown that lymphedema fat is enriched in adipose-derived stem cell populations, thus making it an interesting regenerative option. This article introduces a novel surgical technique using the lipoaspirate of a patient with lymphedema for regenerative purposes. A 42-year-old woman developed lymphedema 18 months after mastectomy and axillary lymph node dissection surgery. The patient underwent upper limb liposuction and latissimus dorsi flap reconstruction of the breast. Lipofilling of the flap and axillary area after scar release was performed using suctioned lymphedema fat. The results showed a sustained reduction in the volume of the lymphedema arm, an improved lymphatic transport index, decreased fluid extravasation, and new lymphatics in the upper arm. At 64-month follow-up, the patient had good breast symmetry, had minimal swelling of the lymphedema arm, and rarely used compression garments. This report is the first to use lymphedema fat for regenerative purposes, differentiating it from existing literature that uses healthy fat. In conclusion, successful dual-effect fat grafting with lymphedema fat presents a promising avenue for further investigation. This innovative approach addresses breast cancer-related lymphedema and offers potential benefits in regenerative and lymphangiogenic effects without the need for microsurgical expertise. This case report emphasizes the importance of exploring this novel option for future research and clinical applications. *(Plast Reconstr Surg Glob Open 2025; 13:e6447; doi: 10.1097/GOX.0000000000006447; Published online 10 January 2025.)*

INTRODUCTION

Lymphedema is a progressive state of lymphatic dysfunction that causes accumulation of interstitial fluid. The chronic fluid stasis triggers inflammation, adipose hypertrophy, and fibrotic changes. Liposuction is effective in reducing limb volume and has good functional results. However, patients are still dependent on compression garments after surgery. Routinely, the lipoaspirate is discarded.

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The latissimus dorsi (LD) flap has gained popularity since 1970 as a workhorse in breast reconstruction,[1] with many technical modifications for adding volume. It continues to be a relevant option for some patients and can be offered in hospitals without trained microsurgical staff. Fat grafting is a good option for adding volume to the flap. However, fat survival is variable.

CLINICAL CASE: METHODS

We present the idea and a case report of upper limb liposuction in breast cancer-related lymphedema combined with LD flap breast reconstruction and lipofilling of the flap and axillary scar area with lymphedema lipoaspirate. In 2016, a 44-year-old woman underwent mastectomy and axillary dissection for a triple-negative grade III invasive ductal carcinoma of the left breast followed

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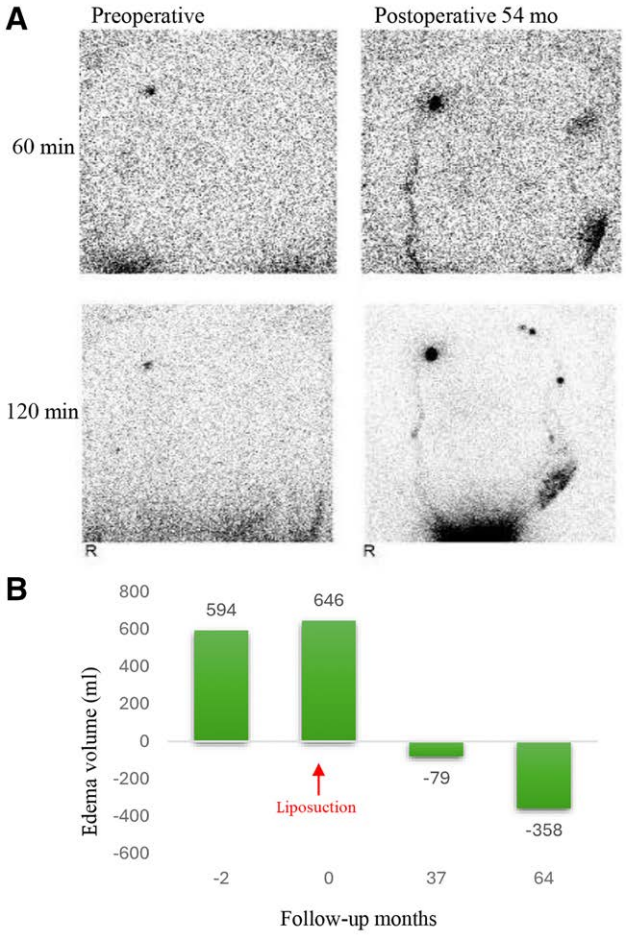

Fig. 1. A 42-year-old patient with postmastectomy lymphedema underwent upper limb liposuction and LD flap reconstruction of the left breast. Lipofilling of the flap and axillary area after scar release was performed using suctioned lymphedema fat. A small reduction mammoplasty was performed on the right breast. No further fat grafting operations were performed. A, The preoperative lymphoscintigraphy showed a transport index of 35 in the left upper limb and extravasation of fluid in the forearm as a sign of dermal backflow. At 54-month follow-up, there was a marked improvement in lymphatic transport index (12.8), decreased fluid extravasation, and new lymphatics and nodal structures in the upper arm. B, The edema volume at stated time points was measured before the operation and during follow-up. It has remained negative after liposuction, and at 64-month follow-up there was minimal swelling of the lymphedema arm with a negative volume (−358 mL and −10% volume excess) difference compared with the contralateral arm.

by radiation treatment and chemotherapy. Eighteen months after surgery, she presented with swelling of her left arm and started using daily compression garments. Lymphoscintigraphy showed a transport index of 35 in the left upper limb and extravasation of fluid in the forearm (Fig. 1A). Volumetry showed a 646-mL and 22% edema volume compared with the healthy arm (Fig. 1B) and mild pitting edema. A computed tomography image showed a postmastectomy situation with a thin-walled seroma capsule before the reconstructive operation. (**See figure, Supplemental Digital Content 1,** which displays a computed tomography image preoperatively showing a postmastectomy situation with a thin-walled seroma capsule before the reconstructive operation, **http://links.lww.com/PRSGO/D779**.)

Takeaways

Question: Can lymphedema fat be used for fat grafting for regenerative and lymphangiogenic purposes?

Findings: Our case report showed successful use of lymphedema fat for grafting in a patient with postmastectomy lymphedema. The graft survival was excellent, and objective measurements showed improvement of lymphedema with stable results.

Meaning: The regenerative and possible lymphangiogenic effects of lymphedema fat offer a novel treatment approach.

The patient opted for nonmicrosurgical breast reconstruction and surgical treatment of the lymphedema. We performed upper limb liposuction combined with LD flap breast reconstruction and lipofilling of the flap and axillary scar areas. In total, 900 mL of fat was removed. Fat suctioned using the water-assisted liposuction technique with the body-jet system (body-jet, Human Medicine; Eclipse Ltd, Dallas, TX) was used for fat grafting. After raising the LD flap with a horizontal skin paddle, multiple retrograde fat grafting passes from several different directions were performed, and 120 mL of decantated lipoaspirate was administered. Grafting was performed into the axilla, pectoralis muscle, LD muscle, and in the skin paddle of the flap. Reduction mammoplasty (resection 268 g) was performed on the right breast to aid in symmetry.

RESULTS

The postoperative lymphoscintigraphy at 54 months showed an improved transport index of 12.8 (preoperative 33) and less fluid extravasation in the forearm (Fig. 1A). Visible lymphatics and possible newly formed lymphatic nodal structures could also be seen in the upper arm as opposed to the preoperative situation (Fig. 1A). At 37 months, the volumetry measurements of the arms showed sustained reduced volume and a −74-mL and −2% edema volume in the treated arm; thus, her lymphedema arm was smaller (Fig. 1B). At 64 months, the arm volumetry showed a −358-mL and −10% volume excess (Fig. 1B), and the patient was rarely using compression garments, was exercising regularly, and could do sports requiring upper limb/body strength. The patient was satisfied, and symmetry of her breasts was excellent with no signs of pitting edema (Fig. 2A). (**See figure, Supplemental Digital Content 2,** which shows that at 64-month follow-up, clinically good symmetry and profile of the breasts was seen, **http://links.lww.com/PRSGO/D780**.)

Dynamic gadolinium-enhanced 3T magnetic resonance imaging of the breasts was performed at the end of the follow-up of 76 months (Fig. 2B). Fat was well-preserved with minimal signs of oily cysts at the medial side.

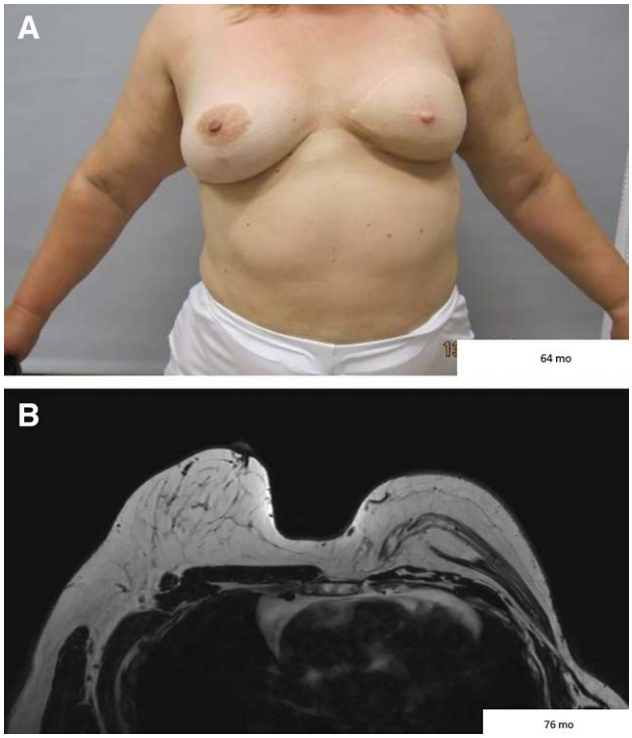

Fig. 2. Volume retention. A, At 64-month follow-up, clinically good symmetry of the breasts was seen and the patient was satisfied. B, Dynamic gadolinium-enhanced 3T magnetic resonance imaging of the breasts with a dedicated breast coil was performed at 76 months. A transaxial T1-weighted Dixon image of the left breast showing the LD flap and well-preserved grafted adipose tissue on the left side. An estimate of breast volumes was calculated using a semiellipsoid formula $V = (2/3) \times \pi \times A \times B \times C$, where A, B, and C are the axes of the semiellipsoid. Volumes were 505 mL for the left and 576 mL for the right breast. The thicknesses of the fat layers of the left breast were: anterior of the LD flap 2.7 cm, posterior to the LD flap 2.7 cm, 3.8 cm caudal of the LD flap, and 2.1 cm cranial of the LD flap.

DISCUSSION

To the best of our knowledge, this is the first report describing the use of fat from lymphedema limbs for fat grafting. The graft survival was excellent, and objective measurements showed improvement of lymphedema with stable results.

It has been reported that administration of adipose-derived stem cells (ADSCs) promotes lymphatic vascular network formation and improves lymphedema symptoms in rodent models of secondary lymphedema. ADSCs are suggested to secrete not only vascular endothelial growth factor C but also other lymphangiogenic growth factors with synergistic effects. In our patient, there were no visible lymphatics or lymph nodes in the axilla in the preoperative lymphoscintigraphy, highlighting an extremely difficult disruption of the lymphatic flow. According to the author's experience,[2] the postoperative improvement in lymphoscintigraphy is of the same magnitude as one can assume after a vascularized lymph node transfer with very good results.

The relative proportion of ADSC in lymphedema is higher than that in control adipose tissues.[3] In their extensive single-cell RNA sequencing analysis of lower limb lymphedema adipose tissue, the authors found 2 ADSC populations that were enriched in the lymphedema samples compared with controls.[3] Lymphedema adipose tissue also exhibits a proinflammatory environment and a lack of anti-inflammatory macrophages but an abundance of T cells. These differences might contribute to the enhanced regenerative, angiogenic, and lymphangiogenic effects of the lymphedema fat graft.

The theory of fat graft survival has long been based on observations by Carbaneda et al and Peer.[4,5] In their studies, human autologous fat grafts survived as adipose tissue after receiving blood circulation.[5] New theories (host- and graft replacement theories) have proposed an emerging role of ADSCs in graft survival[6] also through secretion of angiogenic factors.[7] The exceptionally good survival of the adipose tissue in our patient might be due to the differences in stem cell populations. A limitation of this case report is the lack of magnetic resonance imaging images from different follow-up time points.

The use of fat from lymphedema limbs for fat grafting has not been previously reported. Our technique addresses the limitations of current treatments for lymphedema, particularly for patients in later stages who may not respond well to conservative therapies or single-modality surgical interventions. By combining upper limb liposuction and LD flap breast reconstruction with the innovative use of suctioned lymphedema fat for fat grafting, we present a comprehensive solution that addresses aesthetic, reconstructive, and functional aspects of postmastectomy lymphedema management.

In conclusion, we present a case report of successful dual-effect fat grafting with lymphedema fat and hope that it will open up new possibilities to further investigate this option for possible lymphangiogenic properties and enhanced fat survival.

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DISCLOSURES

Dr. Hartiala has received honoraria for participating in advisory boards of Herantis Pharma, Plc. The other authors have no financial interest to declare in relation to the content of this article.

PATIENT CONSENT

The patient gave written informed consent to use her photographs and data in the study.

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