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CASE REPORT

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Omental vascularized lymph node transplant for the treatment of breast lymphedema: A case report

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Abstract

Breast lymphedema is a type of breast cancer related lymphedema that leads to significant discomfort and negative impact on body image. Conservative therapy and lymphovenous bypass have been previously described as possible treatment methods for breast lymphedema, however, a unified approach to treatment is lacking. The current report describes a case of breast lymphedema successfully treated with vascularized lymph node transfer (VLNT) after failed attempt at management with conservative therapy. The patient is a 48-year-old female with right-sided breast cancer who underwent breast conservation therapy in 2015 and subsequently developed pain and swelling of the right breast. The diagnosis of breast lymphedema was supported by clinical evaluation as well as MRI, lymphoscintigraphy, and lymphography. In consultation with a breast surgeon, breast lymphedema was determined not to be an indication for mastectomy. The patient was offered and underwent an omental VLNT to the right breast. A 20 cm segment of omentum with associated gastroepiploic vessels and lymph nodes was harvested, transferred to the right axilla and gastroepiploic vessels were anastomosed to the recipient thoracodorsal vessels. The patient tolerated the procedure well and there were no complications. Additional donor sites were considered, such as the groin and submental regions, but an omental flap was favored in this case because of the lower risk of donor site lymphedema. In the years following, the patient reported significant improvement in symptoms as well as objective reduction of edema on MRI. We propose the consideration of VLNT for breast lymphedema refractory to other methods of management.

1 | INTRODUCTION

Breast lymphedema is a common but under-recognized condition that arises due to disruption of lymphatics during oncologic procedures. Breast lymphedema is characterized by diffuse edema, erythema, and dermal thickening around the breast, and is associated with pain, tightness, and heaviness (Kerrigan et al., 2021). Breast lymphedema affects up to 70% of patients following breast cancer treatment, however, its incidence largely depends on diagnostic criteria which have yet to be fully established (Heydon-White et al., 2020). Risk factors for breast lymphedema have been described including high body mass index, larger breast size, tumor location, and dose of radiotherapy (Boughey et al., 2014; Ganju et al., 2019). Breast lymphedema is correlated with greater levels of discomfort when compared to upper extremity lymphedema (Sierla et al., 2013), possibly due to the greater distance of the breast from the muscle fascia and therefore, drainage of fluid from the breast has less assistance from surrounding muscle pumps when compared to that of the extremity (Jahr et al., 2008).

Despite the significant incidence and impact of breast lymphedema, a unified approach to treatment is lacking. Conservative therapy may include compression garments, supportive bras, and manual drainage. Additionally, a few reports have described utilizing lymphovenous anastomosis for the treatment of breast lymphedema (Ayestaray & Chrelias, 2018; Giacalone et al., 2019; Scaglioni et al., 2021; Yamamoto et al., 2016). In this case report, we describe successful application of vascularized lymph node transfer (VLNT) for the treatment of recalcitrant breast lymphedema.

2 | CASE REPORT

The patient is a 48-year-old female with a BMI of 31 kg/m^2 and a history of invasive ductal carcinoma of the right upper outer breast. In December 2015, the patient underwent breast-conservation (BCT) therapy with needle localized lumpectomy and sentinel lymph node biopsy. The patient subsequently completed radiotherapy and did not undergo any form of breast reconstruction or chemotherapy.

Less than 1 year after her initial operation, the patient developed fatigue, pain, tightness, heaviness, and swelling in the right breast, most notably above the nipple and beneath the axilla. The patient worked as a teacher for children with autism and was trained to hug students close to her chest when they posed a threat to themselves or others. The patient found herself guarding her chest due to her symptoms and was unable to take care of her students in a way she was accustomed. Moreover, the patient had difficulty hugging her own family members.

The patient was initially treated with physical therapy at an outside hospital including manual lymphatic drainage, a compression bra, and range of motion exercises. The patient had excellent compliance and noted minimal improvement. Unfortunately, her healthcare coverage expired after 90 days of therapy, precluding her from continuing treatment which resulted in an immediate worsening of symptoms.

At time of her initial evaluation at our lymphatic center, the patient presented with edema and erythema over the inferior aspect of the right breast. The patient elicited tenderness at the periareolar incision at 12 o'clock and beneath the right axilla. Skin changes secondary to radiation were also noted throughout the right breast.

The patient underwent several diagnostic studies including an MRI revealing extensive skin thickening and edema involving the right breast and lateral thoracic chest wall (Figure 1a). A lymphoscintigraphy showed absent migration of tracer from either of the four periareolar injection sites of the right breast. ICG lymphography was performed. Intradermal injections of 0.1 cc of stock ICG solution with 25 mg albumin per cc were administered. Specifically, four injections were given per breast: 2 injections were performed 2 cm apart at the 12 o'clock and 6 o'clock positions of the nipple-areolar complex. ICG revealed a diffuse pattern throughout the right breast versus on the left where linear channels were noted draining to the left axilla.

The patient's clinical presentation and imaging were consistent with a diagnosis of breast lymphedema. The patient was evaluated by the acute pain service and neuropathic pain related to edema was considered, as well as myofascial pain. The patient underwent right shoulder and cervical paraspinal trigger point injections with bupivacaine and was also treated with tizanidine, gabapentin, and diclofenac gel without symptomatic relief. Physical therapy was trialed for a 90-day period, which provided mild relief, but resulted in immediate relapse and worsening of symptoms upon discontinuation.

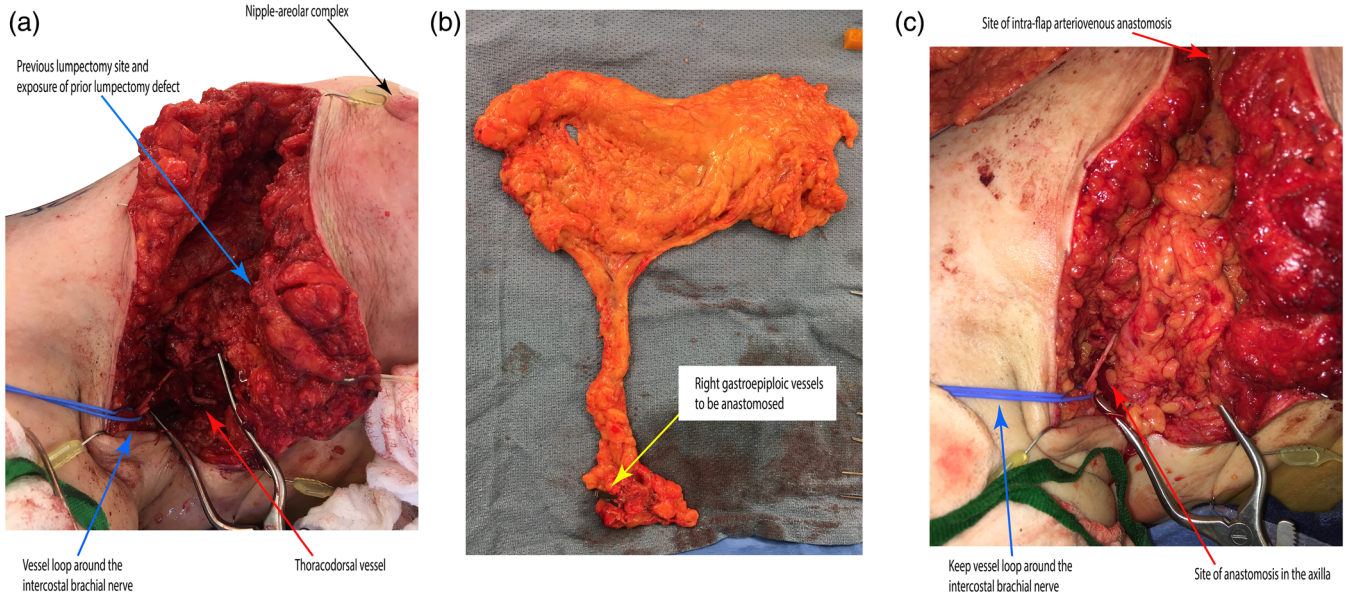

FIGURE 1 VLNT recipient site prepared and harvested omental flap inset. (a) The recipient site in the right axilla was prepared for the transfer, with exposure of prior lumpectomy defect and isolation of the thoracodorsal vessels (b) Harvested omental flap with associated lymph nodes and gastroepiploic vessels (c) completed VLNT with omental flap inset in the right axilla

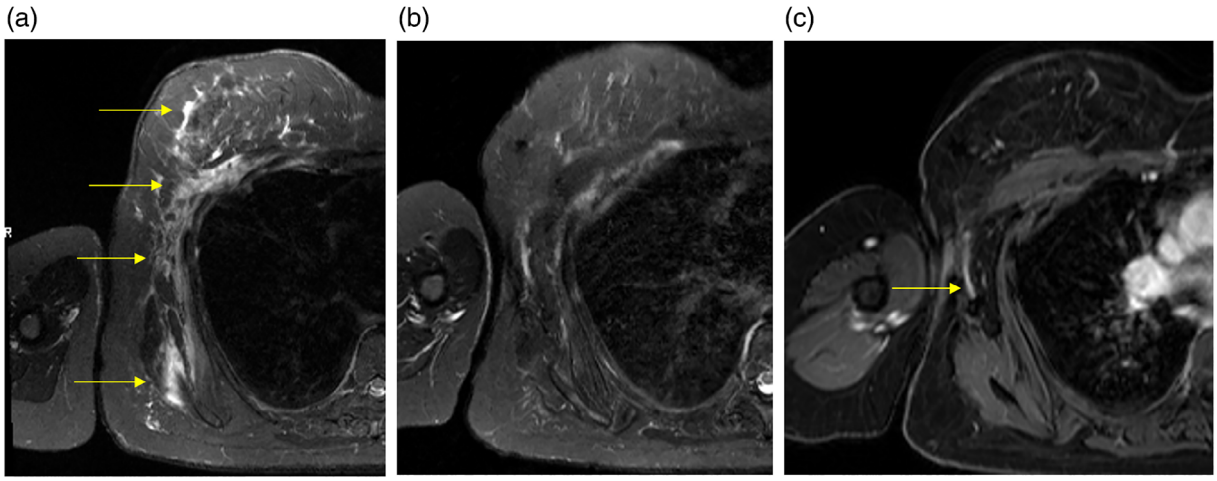

FIGURE 2 Reduction of right breast and chest wall edema following VLNT. (a) Preoperative axial T2-weighted short-tau inversion recovery (STIR) magnetic resonance (MR) image demonstrated moderate edema throughout the right breast and chest wall, denoted by hyperintense areas (arrows). (b) Two-year postoperative axial STIR image showed only trace edema. (c) Post-contrast axial T1-weighted gradient recall echo (GRE) MR image showed patent vascular pedicle (arrow).

FIGURE 3 Preoperative (left panel) photo of breast lymphedema demonstrated diffuse erythema and edema of the right breast. Three years postoperative (right) following vascularized lymph node transfer, with notable improvement of symptoms.

The patient simultaneously presented to her breast surgeon for breast lymphedema management. The breast surgeon, in concert with review at tumor board and discussion with expert colleagues at other institutions, believed that breast lymphedema was not an indication for mastectomy. The breast team's reasoning for this stance was that the pathophysiology of lymphedema was related in part to disruption of dermal lymphatics and thus by performing mastectomy, the edema would not be addressed and might even worsen.

The patient was ultimately offered a VLNT and underwent the procedure in July 2017. An omental/gastric lymph node flap was harvested by the general surgery and plastic surgery teams. Utilizing a 12-centimeter vertical supraumbilical incision, the peritoneum was entered and the lymph nodes were localized along the gastroepiploic vessels utilizing both intraoperative ultrasound and ICG lymphography. Twenty centimeters of the gastroepiploic vessels and associated omentum was harvested with four confirmed lymph nodes by intraoperative ultrasound. The flap was then transferred to the right axilla and breast. The prior transverse incision of the axilla was opened and the thoracodorsal vessels were exposed. The serratus branch of the thoracodorsal artery was localized. Significant scar from the prior surgery and radiation precluded our identification of the serratus vein branch. Our attention then turned to the right chest wall where the prior lumpectomy incision was opened and the breast soft tissue was dissected down to the fascia with severe edema and radiation changes noted. Breast tissue at the prior lumpectomy defect identified by the presence of Ethibond sutures was excised (75 grams), thereby recreating the lumpectomy defect. The axillary and lumpectomy surgical beds were then connected, and our omental flap was inset (Figure 1). The right gastroepiploic artery was then anastomosed to the serratus artery branch and the right gastroepiploic vein was anastomosed to thoracodorsal vein utilizing a 2.5 mm coupler. Given significant venous flow through the left gastroepiploic vein, an intraflap arteriovenous fistula was created between the left gastroepiploic artery and vein utilizing a 1.5 mm coupler. The arteriovenous fistula

helps to offload venous congestion and reduce venous hypertension (Yamamoto & Yamamoto, 2022). Excellent perfusion to the flap was noted. Surgical drains were placed and the incisions were closed.

After an uneventful postoperative course, the patient was discharged home on postoperative day 5. At 5 months postoperatively, the patient reported improvement in range of motion and pain. The patient was able to discontinue physical therapy without worsening of symptoms. At 6 months postoperatively, the patient underwent an MRI demonstrating decreased skin thickening and decreased breast edema. At 9 months postoperatively, the patient noted continued improvement in symptoms. One year postoperatively, the patient underwent a left breast reduction for asymmetry. MRIs continued to show reduction in breast edema with viable transplanted lymph nodes at 2 years (Figure 2b,c). Comparison of pre- and postoperative breast volumes confirmed a decrease in volumetry from 925 to 550 cc. ICG lymphography was repeated 3 years after VLNT and showed a stardust pattern in the right breast. The patient also had symptomatic and clinical improvement at 3 years postoperatively (Figure 3). The patient reported her pain and functional status significantly improved since undergoing VLNT and that she was able to hug her students and family members without discomfort.

3 | DISCUSSION

In the current report, we describe our experience performing omental VLNT for the treatment of breast lymphedema following unsuccessful attempts with conservative management. As is appropriate, conservative measures should be utilized first and optimized in the management of breast lymphedema. In the years following VLNT, the patient showed persistent clinical improvement and objective reduction of breast edema on MRI with decreased postoperative volume.

The first step in evaluating a case of breast lymphedema is diagnosis. In the absence of clear diagnostic criteria, breast lymphedema often goes underrecognized and consequently, patients do not receive adequate treatment. Advances in diagnostic methods include improvement in MRI techniques, ICG lymphography, ultrasonography, and validated staging systems (Collins et al., 1991; Fishman et al., 2022; Fu, 2014). MRI volumetry allowed for objective characterization of breast lymphedema in the current report.

There is no established cure for breast lymphedema. Treatment options range from complete decongestive therapy (CDT) to pharmacology or surgery (Arsenault et al., 2011). CDT is the predominant management strategy and includes manual lymph drainage, compression bandaging, gentle exercise, and elastic compression garments (Badger et al., 2004; Fu, 2010; Lasinski et al., 2012). Long-term volume reduction with CDT is as high as 63%, but it is time-consuming and requires lifelong adherence to prevent disease progression (Fu, 2010; Lasinski et al., 2012). Pharmacological options for lymphedema are limited and systematic investigations are lacking (Yamamoto et al., 2021).

Surgical approaches for lymphedema aim to provide lymph flow restoration (LFR). The three main techniques for lymphatic reconstruction are lymphovenous bypass, in which lymphatics are anastomosed to local veins to reinstate LFR, VLNT, which can take many forms depending on graft donor site, and lymph-interpositional-flap transfer (LIFT) (Akita et al., 2016; Cheng et al., 2014). Each procedure confers unique benefits. Choice of procedure must take into account the surgeon's expertise and patient preference based on a thorough discussion of options, risks, and benefits. For example, VLNT involves harvesting lymph nodes, which could lead to donor-site lymphedema (Cheng et al., 2014). LIFT is more recent and with fewer published outcomes but may reinstate LFR without requiring supermicrosurgery or lymph node harvest (Akita et al., 2016).

Transplanted lymph node flaps function as a lymphatic pump, aiding in the drainage of interstitial fluid (Becker et al., 2012). Additionally, VLNT promotes lymphangiogenesis, allowing for potential restoration of lymphatic networks (Becker et al., 2012; Slavin et al., 1997). For these reasons, VLNT is a treatment option for secondary lymphedema of the extremities. For breast lymphedema, we believe that patients that have failed conservative management who show persistent and worsening symptoms should be considered for lymphatic surgery interventions including potentially VLNT.

VLNT was ultimately offered to this patient because she was deemed not to be a candidate for a mastectomy. In retrospect, had the patient undergone mastectomy with possible deep inferior epigastric perforator (DIEP) flap reconstruction, the patient may have achieved an improved aesthetic outcome. Moreover, this could have afforded us the opportunity for debulking of the breast while simultaneously introducing healthy lymphatics from the DIEP flap. However, as previously noted, breast lymphedema is not a standard indication for mastectomy. Continued discussion between breast and plastic surgery teams, as well as other oncologic providers in the context of a multidisciplinary conference, is encouraged in these challenging cases to optimize clinical outcomes. Referral to a specialty academic center with a team who has significant knowledge and experience in managing advanced lymphedema is paramount to achieving optimal clinical outcomes and quality of life in these complex cases.

As the field of lymphatic surgery continues to advance, novel application of microsurgical approaches for breast lymphedema will be beneficial to address the unmet needs of this patient population. Advanced lymphatic surgical procedures may be employed. As lymphovenous bypass has been previously utilized as a therapeutic approach for breast lymphedema, consideration of VLNT will be a natural next step in addressing breast lymphedema.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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