Case Report

Utilising the Flap Vein of a Pedicled TRAM Flap for LYMPHA: A Case Report

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ABSTRACT

Upper extremity lymphedema is a common and disabling complication of breast cancer treatment, especially following axillary lymph node dissection (ALND). Its risk may be reduced with the Lymphatic Microsurgical Preventive Healing Approach (LYMPHA) procedure, which involves anastomosis of one or more upper limb lymphatic channels to a recipient vein, usually a branch of the axillary vein within the axilla. However, these branches may sometimes be difficult to identify or even not be in suitable condition, especially if extensive electrocautery was used during ALND. If autologous breast reconstruction is performed simultaneously, a flap vein may serve as a reliable recipient vein for anastomosis. We describe a simple and potentially useful technique of utilizing the flap vein (deep inferior epigastric vein) of a pedicled transverse rectus abdominis myocutaneous flap, as a recipient vein for the lymphaticovenular anastomosis in LYMPHA.

KEYWORDS
Lymphatic Microsurgical Preventive Healing Approach; Breast reconstruction; Lymphedema

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INTRODUCTION

Upper extremity lymphedema is a common complication of axillary lymph node dissection (ALND)[1,2], performed in approximately 15% of breast cancer patients treated surgically[3]. The estimated risk of lymphedema following ALND is 25%-50%[2, 4-6], compared to sentinel lymph node biopsy alone (2%-7%)[2]. Since its first description by Boccardo, the Lymphatic Microsurgical Preventive Healing Approach (LYMPHA) has been increasingly adopted and shown to reduce the risk of lymphedema following ALND, from 25%-50% to 2%-12%[1-2, 4-6]. This procedure involves the anastomosis of upper limb lymphatic channels to a recipient vein within the axilla, usually a branch of the axillary vein. However, as with any lymphaticovenous anastomosis (LVA), identification of the recipient vein is often challenging[7,8]. The axillary vein branches may not be in suitable condition, especially if extensive electrocautery was used during ALND, resulting in procedural abandonment. In their single institution experience, 3 out of 8 unsuccessful attempts

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at LYMPHA were due to lack of a suitable vein[5]. If autologous breast reconstruction is performed simultaneously, a flap vein may serve as a reliable recipient vein for LYMPHA.

We describe a simple and potentially useful technique of utilizing the flap vein (deep inferior epigastric vein) of a pedicled transverse rectus abdominis myocutaneous (p-TRAM) flap, as a recipient vein for LYMPHA.

CASE PRESENTATION

Ethics approval and informed consent was obtained, in accordance with institutional guidelines.

A 34-year-old female patient with right breast cancer was referred to Khoo Teck Puat Hospital, Singapore, in 2024 for breast reconstruction and LYMPHA. She had cT2N1M0 invasive ductal carcinoma of the right breast, and was planned for a nipple-sparing mastectomy with ALND. After consultation regarding various options of breast reconstruction, she opted for autologous reconstruction with a p-TRAM flap (as she was not willing to accept the risk of free flap failure), with possible venous supercharging and LYMPHA.

Surgery commenced with mastectomy and ALND, and concurrent elevation of an ipsilateral p-TRAM flap. Nipple-sparing mastectomy was initially performed via an inframammary fold (IMF) incision, however the nipple had to be subsequently excised as frozen section of the nipple margin was positive for invasive carcinoma. The intervening skin bridge between the nipple and IMF was also excised due to poor perfusion.

Patent blue dye (Bleu Patenté V, Guerbet, France) and indocyanine green (ICG) (Verdye, Diagnostic Green, Ireland) were injected into the dorsum of the right hand, to aid in identifying lymphatic channels. Following ALND, the axilla was explored for suitable lymphatic vessels and veins. Two upper limb lymphatics were identified with the aid of ICG fluorescence imaging, but no suitable adjacent recipient veins could be found. Following flap transfer, the two deep inferior epigastric veins (DIEVs) and artery (DIEA) were noted to be in close proximity to the axilla (Figure 1). Hence, one DIEV was selected as a recipient vein for LYMPHA. Under microscopic magnification, venous supercharging was first performed to improve venous drainage, with end-to-end anastomosis of the larger DIEV to the right thoracodorsal vein, using nylon 9/0 sutures (ethilon, J&J MedTech). The smaller DIEV was then anastomosed to the upper limb lymphatic vessels in an end-to-end fashion with nylon 11/0 (Figure 2). As there was a vessel size mismatch (DIEA/V diameter of 2.5mm and lymphatic vessel diameter of 0.5mm), the redundant DIEV was narrowed with a small ligating clip (LIGACLIP™, Ethicon, J&J Medtech.). A schematic of the completed anastomoses and proposed flow of lymphatic drainage is shown in Figure 3. Vessel clamps were released, and anastomotic patency was confirmed with direct visualization of the passage of patent blue lymphatic fluid into the vein, without leakage

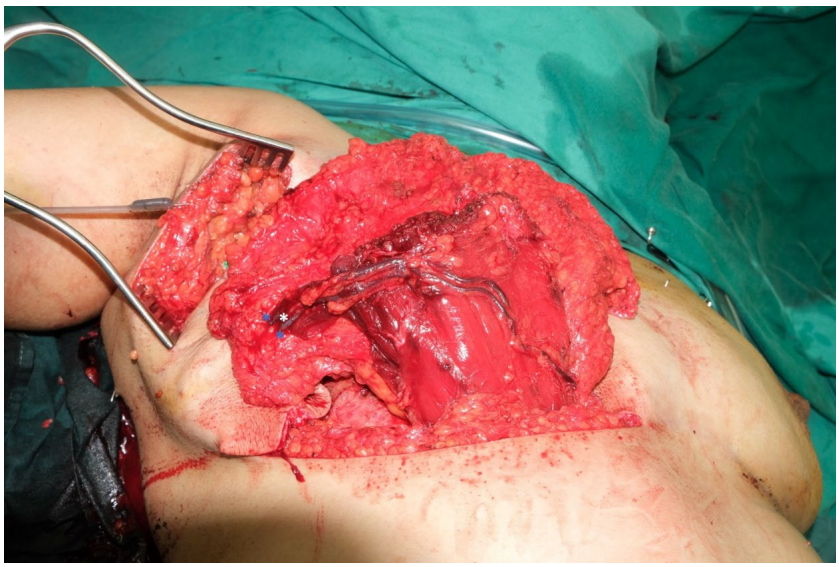

Figure 1: Transverse rectus abdominis myocutaneous (TRAM) flap following tunnelling and transfer, showing close proximity of the deep inferior epigastric veins (DIEVs, blue asterisks) and artery (DIEA, orange asterisk) to the axilla

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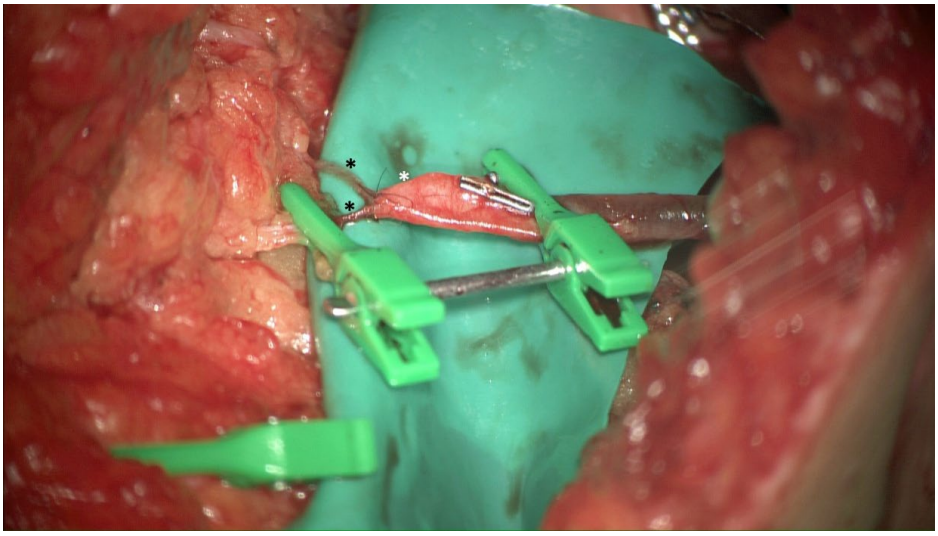

Figure 2: Completed lymphaticovenous anastomosis, between 2 upper limb lymphatic vessels (black asterisks) and deep inferior epigastric vein (white asterisk)

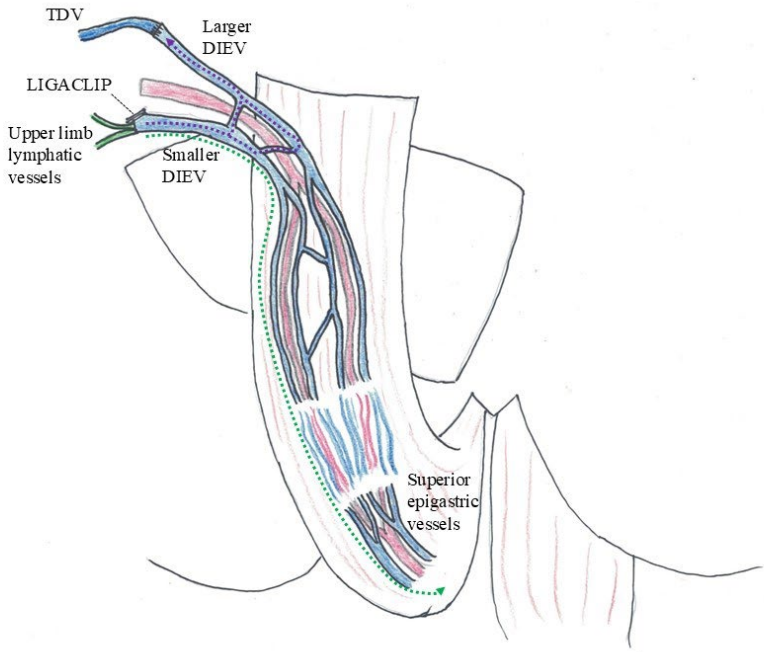

Figure 3: Schematic of completed anastomoses and proposed direction of lymphatic flow. The basis of our technique is the establishment of retrograde flow following ligation and division of the DIEV, through choke vessels/collaterals to the superior epigastric venous system (green dotted arrow), as well as venous connections to the supercharged 1st DIEV (blue dotted arrow). TDV: thoracodorsal vein

of fluid from the anastomosis. Drains were inserted to the breast pocket and axilla, and flap inset was completed.

Post-operative recovery was uneventful, and the patient was discharged on the seventh post-operative day (due to issues with pain control and nausea). The axillary drain was removed just before discharge. She was otherwise well at her most recent clinic review, at four weeks post-surgery.

DISCUSSION

The idea of using a flap vein as a recipient vessel for LVA has been reported in recent years, mainly in the groin and thigh[9,10]. To our knowledge, its use for LYMPHA in the breast reconstruction has yet to be reported. This case represents our first and early experience with the technique of using the flap vein as a recipient vessel for LYMPHA. Its main advantage

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is in a situation where there is no other suitable recipient vein, which is not uncommon following ALND, especially if extensive electrocautery is used. Flap veins are likely more reliable than axillary vein branches, as they are larger in caliber and can also be dissected in a controlled and atraumatic technique by the plastic surgeon raising the flap. There is also minimal additional operative time required – in this case, LYMPHA was performed in about 30 min. This is not much longer than a standard LYMPHA procedure, which is about 20 min in experienced hands[2]. A potential challenge of using the flap vein is increased vessel size mismatch, as the flap vein is larger than the usual axillary vein branch. This may be easily mitigated by the use of a vessel clip to narrow the redundant flap vein excess, as in this case.

The main limitations of our report are (1) short follow-up period of one month, and (2) lack of intra-operative confirmation of anastomotic patency with ICG fluorescence imaging, unfortunately not performed following LVA in our case. Nonetheless, there was direct visualization of the passage of patent blue lymphatic fluid into the vein, without leakage of fluid from the anastomosis. In addition, we noticed that the axillary drain output was low – the drain was removed at 7 d post-surgery (with single digit outputs by the fourth day), as compared to about 10-14 d in the usual case of flap reconstruction with ALND without LYMPHA, based on our anecdotal experience. This is similar to reports by Boccardo et al, who also noticed a decrease in axillary drain output following LYMPHA attributed to reduction in local lymphatic hypertension[1], and had drains removed after 7-12 d[2].

Another potential concern of anastomosis to the flap DIEV is that the direction of flow is opposite to that of the native DIEV. The basis of our technique is the establishment of retrograde flow following ligation and division of the DIEV, through choke vessels/collaterals to the superior epigastric venous system, as well as venous connections to the supercharged 1st DIEV (Figure 3).

The p-TRAM flap may be ideal for our technique, as the DIEVs are ideally situated close to the axilla. Nonetheless, the idea may also be applied to other flaps, as long as there is a suitable flap vein. For instance, in a free deep inferior epigastric artery perforator (DIEP) flap, the superficial inferior epigastric vein (SIEV) or superficial circumflex iliac vein (SCIV) may be used for LYMPHA if there is sufficient length. Short inadequacies may be addressed with vein grafts, which are readily available for harvest from the contralateral abdominal wall (e.g. contralateral SIEV/SCIV). In a pedicled latissimus dorsi flap, a branch of the thoracodorsal vein may also be used for LYMPHA, if present.

CONCLUSION

In patients undergoing ALND with simultaneous autologous breast reconstruction, the flap vein may be a useful option as a recipient vessel for LYMPHA, especially if there are no other suitable recipient veins in the axilla.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare in relation to the content of this article.

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