Free Vascleralized Supraclavicular Autologous Heterotopic Lymph Node Transfers Without Skin Paddle for Lymphedema Lower Limb

Abstract
Free vascularized lymph node transfer (VLNT) is one of the new and highly efficacious procedures in the cases of lymphedema. In this case, we present a case of lower-limb lymphedema which was managed by this procedure where a supraclavicular LN was harvested and transferred to the lower leg. VLNT from the supraclavicular region is a very effective treatment for physiological restoration of the lymphatic flow in established cases of lower-limb lymphedema because of well-hidden favorable scar and minimal chances of secondary iatrogenic lymphedema in the donor region unlike other sites such as groin and axilla. The VLNT should be preferred over manual lymphatic drainage because it is very effective treatment for physiological restoration of the lymphatic flow, however, the further analytical studies are required to confirm statistically the effectiveness of the same over other modalities.

Keywords: Lymphedema, lymphogenesis, vascularized lymph node transfer

Introduction
With the advances in the understanding of anatomy and physiology of the lymphatic system and the pathophysiology of lymphedema newer surgical modalities are being explored. There has been a paradigm shift in the treatment of lymphedema from radical procedures to physiological procedures over the last few decades. Vascularized lymph node transfer (VLNT) is a surgical procedure wherein functional LN from the nonaffected sites are transferred, with micro anastomosis with vessels in the recipient area to physiologically restore the lymphatic flow in an extremity affected by lymphedema.[1-3] In this case report, we are presenting a case of lower-limb lymphedema which was treated by heterotopic VLNT from the right supraclavicular region based on transverse cervical artery (TCA) and external jugular vein (EJV) to the leg where the vessels were anastomosed with anterior tibial artery and its vena committante.

Case Report
The patient was a 17-year-old girl presented with bilateral (right > left) lower-limb edema for 3 years. There was no previous history of trauma or surgery. The patient comes from a region which is endemic for Filariasis in Uttarakhand, India. The edema first started in the foot first in the right leg 2 years ago which gradually ascended to involve her leg and thigh over the last 2 years. Six months after the onset of swelling in right limb, she also started having swelling in the left foot which gradually progressed to involve her left leg up to the knee joint. There is no history of pain or fever. The patient first came to our institute, 6 months ago where she received one course of diethylcarbamazine and was also managed by conservative measures such as limb elevation, therapeutic massage, and compression stockings for 6 months even after which there was no signs of improvement and then she was referred to the plastic surgery department. On examination, the left leg had stage 2, nonpitting, and nonreducible lymphedema after limb elevation. The right leg also had stage 3 lymphedema with same characteristics. Magnetic resonance imaging showed increased subcutaneous tissue with normal underlying muscle. Lymphoscintigram was abnormal and demonstrated impaired lymphatic flow and dermal backflow after radiotracer injection. The patient underwent first author’s modification of combined debulking and
physiological procedure in the right leg and heterotopic vascular supraclavicular LN transfer in the left leg. Doppler done every day postoperatively until the day of discharge in postoperative day 7 [Video 1] demonstrated the patency of the anastomosis. Postoperatively, the limb was kept in an elevated position and there was significant decrease in the edema in the foot and the nonpitting edema had converted to pitting type of edema. The patient was discharged on postoperative day 7, and suture removal was done on postoperative day 10 both at the donor and recipient site. There was no edema in the donor site, and the scar was well hidden by clothing. On follow-up, there was obvious change in the girth at 9 months postoperatively.

The patient underwent the first author’s modification of combined debulking and physiological procedure in the right leg which included the excision of lymphatic tissue, fascia, intermuscular septum, and burying the dermal flap in the intermuscular space created after excision of the septum.

Procedure of vascularized lymph node transfer without skin paddle

A curvilinear incision was marked over the anterior compartments of the left leg after painting and draping, incision was made after infiltration was done with lignocaine 2% with adrenaline solution. Dissection was carried out in the anterior compartment. Extensor digitorum longus muscle was retracted laterally and anterior tibial artery was located. Anterior tibia artery and its venae comitantes were skeletonized. The TCA was anastomosed with the ATA, and the caliber of both these was similar increasing the ease of anastomosis and better chances of flap survival. Venous anastomosis was done between EJV and venae committantes of the ATA. Lateral skin flaps were closed over the transferred LN. Postoperatively, the limb was kept in an elevated position, and compression dressing was avoided to prevent compression at the anastomotic site. Venae comitante and anterior tibial artery anastomosed with EJV and TCA, respectively [Figure 2b]. Good pulsations in the anastomosed vessels and surface oozing from LN containing tissue observed. Skin flaps closed primarily over the transferred LN. The skin flaps in the donor site closed primarily and the resultant scar was barely discernible o follow-up.

Postoperative care

Postoperatively, the limb was kept in an elevated position, and no compression dressing was given. Compression dressing was avoided to prevent compression at the anastomosis site. There was a significant decrease in leg circumference and edema over the period of 9 months [Figure 3a-c].

Discussion

Surgery for lymphedema has tremendously advanced over the past few decades. Surgeons have gradually switched from debulking radical procedures to functional physiologic procedures. Lymphvenous bypass is performed in early cases of lymphedema but is noticed to be less effective in late cases as the lymphatics become sclerosed.[4] In such cases, VLNT is a better option in that it restores the physiologic lymphatic flow. It also has been noticed that these procedures substantially reduce the incidence of frequent episodes of cellulitis through local immunomodulation.[5] This was an ideal case for VLNT

![Figure 1: (a) Donor site with flap and incision marked. Depicts the posterior triangle of neck bounded anteriorly by Sternotcleidomastoid muscle, posteriorly by the anterior boarder of trapezius muscle and inferiorly by clavicle. External jugular vein is inspected and marked parallel to the SCM, transverse cervical artery vessels running parallel to clavicle a finger breadth above and artery confirmed by Doppler probe. (b) Harvested supraclavicular lymph node: Shows the supraclavicular lymph node basin harvested with supplying transverse cervical artery and draining transverse cervical vein and external jugular vein](image)

![Figure 2: (a) Curvilinear incision on left leg: Shows the curvilinear incision over the anterior compartment of the left leg to explore the donor anterior tibial artery and it’s vena committante for anastomosis. (b) Lymph node transferred to left leg: Shows the lymph node transfer to the left leg and vascular anastomosis between ATA and transverse cervical artery is pointed out by the green arrow](image)
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because there was significant segmental dermal backflow with very few functional lymphatic vessels on imaging by lymphoscintigraphy. There are various options for donor sites for VLNT’s such as the groin, supraclavicular region, axilla, submental region, lateral thoracic region, jejunal mesentery, and greater omentum. Out of these, the LN in the supraclavicular region is preferable due to many reasons. These LN belong to level Vb of the neck nodes and they drain the lung, thyroid, and esophagus, but their removal is barely of any consequence as it is observed that they are routinely removed in oncological cases where neck dissections are done and their removal does not cause significant lymphedema in the neck region.\(^7\) Furthermore, the resultant scar at the donor site is barely discernible and can be concealed easily by the clothing. Unlike groin and axillary regions, there is minimal secondary iatrogenic lymphedema in the donor region unlike other sites such as the groin and axilla. However, the LN transfer without skin paddle is possible if tension-free closure of soft tissue is done and hence no compression of vascular flow. The VLNT should be preferred over manual lymphatic drainage because it is very effective treatment for physiological restoration of the lymphatic flow, however, the further analytical studies are required to confirm statistically the effectiveness of the same over other modalities.

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Conflicts of interest

There are no conflicts of interest.

Level of evidence: V.

Patient consent

A written informed consent for surgery, clinical photography and publication for academic purposes taken from the patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published, and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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