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CASE REPORT

Reconstructive

Five-year Follow-up Outcome of Total Omental Lymph Node Flap Transfer in Primary Lymphedema Patient

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Summary: Lymphedemas are caused by the accumulation of protein-rich fluid in the interstitial space, resulting from lymphatic system obstruction. In recent years, omentum flap transfer has gained popularity as a treatment for lymphedema due to its immunogenic and lymphangiogenic properties, which aid in reducing infection rate and volume. Moreover, omental flaps have angiogenesis capabilities, which can aid in successful chronic wound covering. Using a flow-through procedure after omental flap transfer can help reduce complications including venous congestion and steal phenomenon at the recipient site. We present a long-term follow-up of a case of primary lymphedema treated with omental flap transfer with flow-through figuration, demonstrating a gradual decrease in volume, reduced infection rate, and chronic wound coverage. This case report illustrates intriguing postoperative compartment effect and vascular concerns. *(Plast Reconstr Surg Glob Open 2023; 11:e4769; doi: 10.1097/GOX.0000000000004769; Published online 13 January 2023.)*

Vascularized lymph node transfer is a physiological surgical procedure to improve lymphatic drainage at the affected area. A lymphatic pumping mechanism or lymphangiogenesis has been proposed to explain how this flap works. The preferred donor sites include inguinal, supraclavicular, submental, and omentum nodes. Nowadays, laparoscopic harvesting of the omentum is used extensively since results from previous retrospective cohort studies show it leads to less postoperative pain, shorter hospital stays, and a quick return of gastric function[1] and wound coverage.[2]

Venous congestion is a common complication after omental flap microvascular anastomosis.[3] The flow-through configuration in the omental flap creates a natural vasculature flow and reduced venous congestion.[4] The purpose of this study was to demonstrate our experience in total omental flow-through flap in lower extremity lymphedema. Additionally, we discuss our scientific observations regarding the nature of flaps over time.

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Received for publication July 19, 2022; accepted November 21, 2022.

DOI: 10.1097/GOX.0000000000004769

CASE PRESENTATION

A 58-year-old woman who had edema in the left leg for 30 years was referred to our clinic. She had a history of recurrent cellulitis and a chronic wound on her left calf requiring monthly hospitalization (Fig. 1A). She had no history of cancer or leg trauma, so alternate etiology of lymphedema was evaluated using Giemsa staining for filariasis and abdominal computed tomography, which revealed no abnormalities. The previous hospital's treatment consisted of multiple ablative operations and regular pressure garments, with no improvement. A lymphoscintigraphy showed severe dermal backflow at the entire left lower extremity without the visible lymphatic tract or inguinal lymph node. Therefore, the patient was diagnosed with primary lymphedema of the left lower extremity. A preoperative examination revealed severe lymphedema (The International Society of Lymphology stage III) with lymphatic leakage and a nonhealing wound. The omental free flap was selected after consultation with the patient for two purposes: (1) resurfacing the nonhealing wound and (2) combating the patient's lymphedema.

The omental flap was harvested laparoscopically by the minimally invasive surgery team. While the nonhealing wound and fibrotic tissue on the medial side of the calf were excised, the omentum flap, which had a size of about

Disclosure: *The authors have no financial interest to declare in relation to the content of this article.*

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Fig. 1. Comparison of preoperative and 3-year postoperative photographs. A, Preoperative photograph. B, Three-year postoperative photograph.

20 × 35 cm, was harvested together with gastroepiploic lymph node that was collected. (**See figure, Supplemental Digital Content** 1, which displays demonstration of total omental lymph node transfer with flow-through procedure, **http://links.lww.com/PRSGO/C351**.) Next, the deep fascia was opened, and the posterior tibial and medial sural vessels were dissected. Proximally, the left gastroepiploic artery was anastomosed to the medial sural artery. Meanwhile, the right gastroepiploic was anastomosed end to end to the posterior tibial artery at the distal end, creating a flow-through network. Due to concerns about venous congestion, five venous anastomoses were created. The pair of right gastroepiploic veins were end-to-end anastomosed to the posterior tibial veins distally, and the left pair of gastroepiploic veins were coupled to the medial sural veins. Another vein in the omentum's arcade was end-to-side anastomosed to the posterior tibial vein. Finally, a split-thickness skin graft was harvested to cover and monitor the flap. There were no complications, including venous congestion in the postoperative period.

At the 2-year follow-up, the patient reported only one episode of infection, and only the posterior compartment of her leg had decreased in size. Therefore, a subcutaneous tunnel with omentum placement was created from the posteromedial portion to the lateral leg. After this, her leg edema volume steadily decreased by 1100 mL in all compartments over the course of 5 years (Fig. 1). (**See figure, Supplemental Digital Content** 2, which displays comparison of preoperative and postoperative left leg circumference at 6 months, 1 year, 2 years, 3 years, and 5 years, **http://links.lww.com/PRSGO/C352**.) A postoperative lymphoscintigraphy at 1 month, 3 months, and 2 years showed an improvement in lymphatic obstruction in the left leg. The infection rate also decreased until there was no infection (Fig. 2).

This observation contained an intriguing point. We discovered that early enhancement of the venous system in the arterial phase of the postoperative CT scan was shown in the entire omentum flap vessel, the great saphenous vein, and the deep venous system of the leg (Fig. 3).

DISCUSSION

In our case, omental flap transfer resulted in a significant reduction in infection, resolution of the wound, and a gradual decrease in limb volume over 5 years of follow-up. The vascularized omentum transfers contain lymphoreticular bodies known as milky spots,[5] which drain fluid from the interstitial space[6] The omentum possesses immunologic and angiogenesis capabilities as well. Forte et al[7] noticed a 30%–70% volume reduction within 0.5–4 years. Due to its unique characteristics, the omental flap can aid in wound healing and reduce infection rate.[2]

In this patient, we also observed a distinct reduction in compartment volume of the extremities, although this process requires time. Selecting a proximal or distal inset recipient site results in the same reduction of the entire leg,[8] whereas placing the omentum in a single compartment results in a different reduction. However, compartmentalization issues were not addressed in the prior study. Finding a correlation is a fascinating topic that requires a larger clinical study.

Bidirectional vein drainage also occurs in the omental flap. If the gastroepiploic vein is divided, it may result

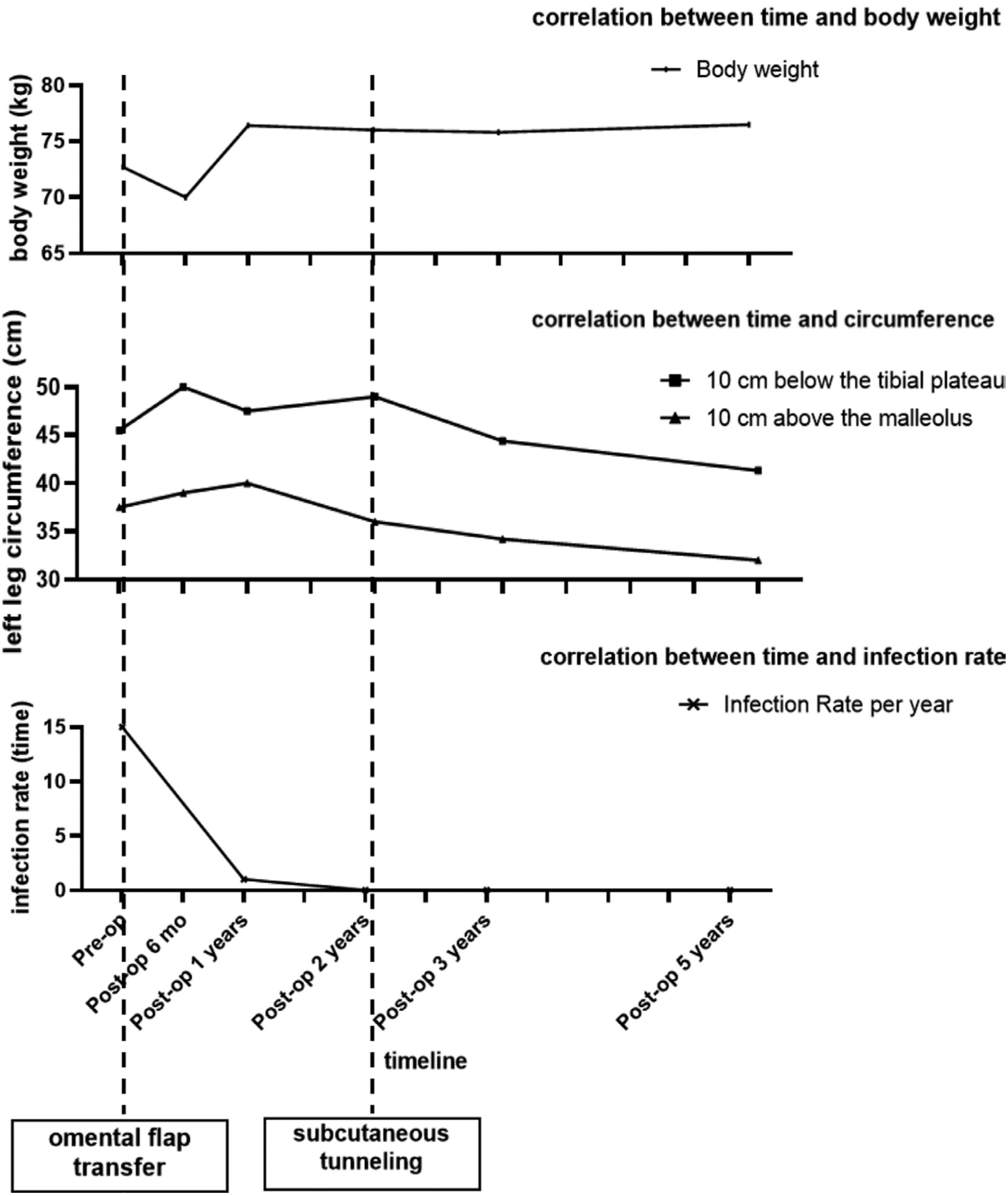

Fig. 2. The graph shows the correlation between time and body weight, left leg circumference, and infection rate per year.

in venous pressure backflow. By decreasing flap inflow and increasing flap outflow, the omental flow-through approach resolves this issue.[3] In this case, we used the flow-through method and discovered no postoperative venous hypertension or stealing effect. However, during the arterial phase of the postoperative CT scan, an early enhancement of the omental and limb venous system was observed. We hypothesized that the omentum possessed either

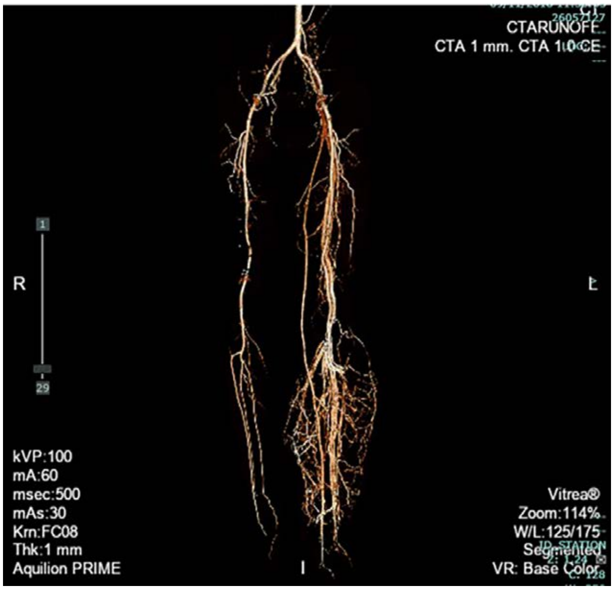

Fig. 3. Postoperative computed tomography angiogram after 1 year with great saphenous vein, omental arcade vessel, and deep venous system enhancement in the arterial phase.

an internal shunt or low capillary resistance. This may increase arterial flow to the omentum, leading to venous hypertension.[9] By analyzing the hemodynamics of the pig model, the researchers observed a decrease in omental peripheral resistance and an increase in distal bypass flow.[4] This evidence supports the use of flow-through procedures to decrease the likelihood of developing venous hypertension.

By transferring a total omental flap with the flow-through technique, the limb's volume can be gradually reduced while minimizing recipient and donor site complications. As demonstrated in this case, there is an intriguing issue regarding compartment reduction and the placement of the total volume of the omental flap, which is advantageous for resolving these additional issues.

CONCLUSIONS

This case report demonstrates successful gradual reduction of limb circumference, reduced infection rate, and chronic wound coverage through total omentum flap transfer with flow-through figuration. This method shows how this flap can be used in various ways to meet two needs at once.

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ACKNOWLEDGMENT

The authors thank Inthuon Sothon from the Division of Plastic Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand.

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