

Combined Volume Reduction Surgery and Lymphaticovenular Anastomosis for Treatment of Lower Leg Lymphedema

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Summary: Much has been reported in the past regarding obesity as a risk factor for the origin of lymphedema. There are also reports of surgical treatments for obesity-related lymphedema. We have previously reported on the effectiveness of lymphaticovenular anastomosis in reducing chronic inflammation, and we believe that lymphaticovenular anastomosis is a very useful surgical approach in patients with recurrent cellulitis. In this report, we describe a case of a severely obese patient with a body mass index over 50 who developed lymphedema in both lower extremities due to pressure from sagging abdominal fat accompanied by frequent episodes of cellulitis. (*Plast Reconstr Surg Glob Open* 2023; 11:e4870; doi: 10.1097/GOX.0000000000004870; Published online 3 March 2023.)

The patient in this case was a 69-year-old woman. She had stage-3 secondary lymphedema of both lower extremities associated with severe obesity. We performed abdominal volume reduction surgery, including abdominal wall plasty and lymphaticovenular anastomosis (LVA) in four locations on both lower extremities. Skin erosion occurred postoperatively. At 3 months postoperatively, the preoperative monthly onset of cellulitis had disappeared, as had the findings of chronic inflammation in the lower legs. The technique is considered to be one of the effective surgical approaches for refractory lymphedema and cellulitis associated with severe obesity.

The diagnosis of obesity by body mass index (BMI)¹ is one of the most objective and comprehensible indicators, although this index presents some problems such as bias due to body composition, which does not account for skeletal structure and muscle-to-fat ratio.² In particular, patients with BMI 35 and above are defined as severely obese patients. Compared with normal obese patients, severely obese patients have been reported to have various adverse effects such as cardiac disease and limited daily activities due to the load burden on their hip and knee joints.^{3,4}

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LVA is a highly versatile technique for improving lymphatic flow. Surgical fat reduction is also used to improve severe obesity. Conversely, LVA cannot remove already deposited adipose tissue. In this report, we describe a case of a severely obese patient with a BMI over 50 who developed lymphedema in both lower extremities due to pressure from sagging abdominal fat accompanied by frequent episodes of cellulitis, who underwent abdominal fat reduction and lymphatic venous anastomosis in both lower legs with good results.

CASE REPORT

The patient in this case is a 69-year-old woman who has been obese since childhood, but whose weight increased rapidly after her 30s. Multiple attempts at dieting had been unsuccessful. The weight gain made daily activities difficult, which in turn caused further weight gain, resulting in a negative cycle. Edema, especially in both lower legs, became prominent, prompting the patient to use a compression brace for lymphedema treatment. Obesity limited the mobility of the extremities and made other self-care activities difficult. Although her symptoms improved when she started using the orthosis, the edema gradually worsened, and she contracted recurrent cellulitis on a monthly basis. The patient was referred to our department for treatment. At the time of the initial visit, the patient was 154 cm tall, weighed 128 kg, and had a BMI of 54.0 (Fig. 1). Screening for other conditions that could cause obesity did not reveal any obvious problems.

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Moreover, bariatric surgery was suggested, but the patient declined at that time.

The diameters of the right lower extremity prior to our referral are shown in Table 1. Computed tomography demonstrated that the abdominal cavity was also completely filled with adipose tissue (Fig. 1). Both lower legs were severely edematous and graded as stage 3 on the International Society of Lymphology lymphedema staging. The bilateral lower extremities and thighs also showed evidence of chronic cutaneous inflammation. Preoperative lymphoscintigraphy showed lymphatic stasis in both lower extremities. We decided to perform combined fat reduction surgery on the thoracoabdominal region and LVA on the bilateral lower extremities to initiate treatment.



Fig. 1. On initial visit: Fat from the chest and abdomen hangs caudally and compresses the lymphatic channels in the inguinal region. Both lower limbs are highly fibrotic, and chronic inflammation is seen in both lower legs.

LVA was performed after abdominal manipulation. First, a simple panniculectomy was performed as an abdominal debulking surgery. Thoracic to abdominal fat was resected along the natural suprapubic plane under general anesthesia. As for the lateral aspect, resection was performed from the supine position to the lateral aspect as far as resectable edges can be obtained. A flap was then created and placed over the fascia in the vertical direction from the resection release edge for single-stage wound suturing. The umbilicus was dissected with a dissection width of approximately 5 cm in diameter, and the umbilicus was moved as far cephalad as possible. To close the abdominal wound, suturing was accomplished while adjusting the length of the upper and lower transection edges, as their lengths varied. The amount of fat removed at the time of surgery was 6.0 kg. Next, LVA was performed on both lower legs. Because fibrosis and dermatosclerosis were present on the anterior part of the leg, anastomosis was performed on the dorsal aspect of the foot. One anastomosis was performed in the right dorsal region, two anastomoses in the left dorsal region, and one anastomosis near the left ankle joint⁵ (Fig. 2). The lymphatic vessels that were anastomosed were all very stenotic, and the internal pressure in the lymphatic vessels was highly elevated. The surgery lasted 3 hours and 43 minutes and was performed by four plastic surgeons. Two negative pressure drains were placed in the abdomen and removed approximately 2 weeks later.

Postoperatively, the thin skin near the pubic symphysis was pulled by the suture of the wound, resulting in extensive skin erosion, which was resolved with conservative treatment. The patient's weight reduction from 128 kg on initial visit to 120 kg on admission, and to 106.5 kg at discharge, was a result of dietary guidance, complex physical therapy, thoracoabdominal fat reduction, and operation on the lower extremities. Swelling on the lower limbs decreased subsequently. In addition, symptoms of chronic inflammation, such as warmth and erythema, which had been observed in both lower legs, were alleviated. The umbilical region developed epidermal necrosis, but this improved with conservative treatment. The patient was discharged from the hospital on the 19th postoperative day. Compression therapy was resumed after discharge. After surgery, the patient had no further incidents of cellulitis, which had occurred repeatedly every month before surgery. The diameters of the right lower extremity at the time of discharge are shown in Table 1. A weight loss of 13.5 kg was observed at the time of discharge. [See figure, Supplemental Digital Content 1, which displays (A) Pre-discharge condition: the adipose tissue hanging from the chest to the abdomen has been completely lifted, and there are no tenderness findings in the inguinal region. In addition, erythema on both lower legs has decreased and the signs and symptoms of chronic inflammation have improved. (B) Six months postoperatively: the abdominal wound has healed. Both lower extremities are in good condition and have not developed postoperative cellulitis. <http://links.lww.com/PRSGO/C448>.]

Table 1. Changes in Body Weight and Limb Volume

		Diameter (cm)					Body Weight (kg)
		Dorsalis Pedis	Ankle	10 cm below the Knee Joint	Knee Joint	10 cm above the Knee Joint	
		Initial consultation	Right	24.5	32.5	46.5	
	Left	25.0	39.0	56.0	49.5	60.0	
At discharge	Right	26.2	25.8	43.3	44.6	58.5	106.5
	Left	27.0	27.0	44.0	47.5	59.0	
Six months postoperative	Right	24.9	27.0	41.7	41.7	52.7	98.0
	Left	25.0	28.5	43.0	43.5	52.0	

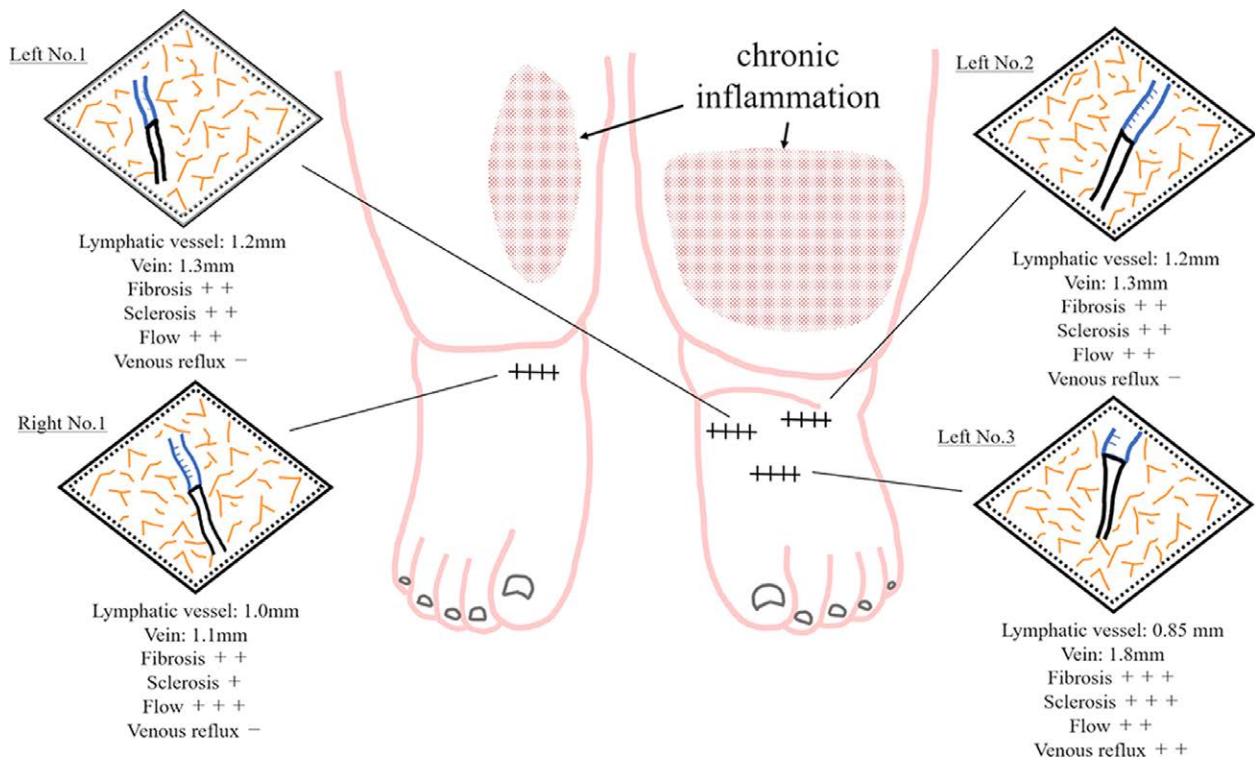


Fig. 2. Intraoperative schema of the LVA. Findings of chronic inflammation in both peripheral lower legs. The diameter of the lymphatic vessels and veins, the condition of the lymphatic vessels, and the degree of venous reflux are assessed.

Six months postoperatively, the patient weighed 98 kg. The measurements for the right lower extremity diameter are listed in Table 1. Circumferential diameter improved markedly, especially on the thighs, and there was no inflammation (Table 1). [See figure, Supplemental Digital Content 1, which displays (A) Pre-discharge condition: The adipose tissue hanging from the chest to the abdomen has been completely lifted, and there are no tenderness findings in the inguinal region. In addition, erythema on both lower legs had decreased and the signs and symptoms of chronic inflammation have improved. B) Six months postoperatively: The abdominal wound has healed. Both lower extremities are in good condition and have not developed postoperative cellulitis. <http://links.lww.com/PRSGO/C448>.]

DISCUSSION

Much has been reported in the past regarding obesity as a risk factor for the origin of lymphedema.⁶⁻¹³ There are also reports of surgical treatments for obesity-related lymphedema.^{14,15} LVA, along with fat reduction procedures such as liposuction, has been well documented.^{16,17} Conversely, there is no report of combined volume reduction surgery and LVA to improve lymphatic flow in a severely obese patient. The slight decrease in weight after hospitalization may have been due to the restricted caloric intake of the inpatient, which is thought to have resulted from the release of the pressure on the lymphatic channels, which had been compressed in the groin due to the excess fat impinging on the chest and abdomen. Moreover, excretion of fluid in the third space of the bilateral lower

legs by LVA through the veins may also have contributed, because weight loss and decreased circumference of the lower extremities continued to occur over the 6 months after surgery.

We have previously reported on the effectiveness of LVA in reducing chronic inflammation, and we believe that LVA is a very useful surgical approach in a patient with recurrent cellulitis.¹⁸ In this case, both LVA and fat reduction surgery were effective surgical techniques. We reported on the combined surgical treatment of fat volume reduction surgery and LVA for leg lymphedema associated with severe obesity. The technique is considered to be one of the effective surgical approaches for refractory lymphedema and associated cellulitis linked to severe obesity. The problem with this case is that the operative time was limited due to the high risk of general anesthesia in a severely obese patient, and it was not possible to perform a severely number of anastomoses in the LVA. However, the lymphatic vessels that underwent anastomosis have a high flow rate, and are considered effective.

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