Surgical Management of Chronic Lymphedema; Introducing an Innovative Procedure

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Abstract

Objective: Lymphedema is the result of impaired lymphatic drainage from the affected organ. This abnormality can be primary or secondary. Different nonoperative and operative approaches have been introduced to treat chronic lymphedema. In this study, we describe a new surgical technique and compare its results with other more commonplace methods.

Methods: Fifty-nine patients with the diagnosis of chronic lower extremity lymphedema who had not responded to nonoperative management for at least 6 months, were included in the study. They were collected during 15 years between March 1987 and March 2002. Doppler ultrasonography of deep venous system to confirm its patency was routinely performed in the most of patients. Then, they underwent surgery and were followed for at least 1 year postoperatively.

Findings: All the patients were operated by our new technique which is a modified form of the Homans. The outcome was excellent and 89.2% of patients were devoid of complication. A 10.8% total complication rate was inevitable. The most common complication was wound seroma.

Conclusion: According to the difficulties with treatment of chronic lymphedema and variety of surgical options, our method can be an excellent and even the standard operative procedure to treat intractable forms of disease.

Key Words: Lymphedema; Flap; Seroma; Praecox; Excisional techniques

Introduction

Lymphoedema, refractory to non-operative management, may require surgical treatment. Potential indications include impaired limb function, recurrent episodes of cellulitis and lymphangitis, intractable pain, lymphangiosarcoma and cosmesis (patient
unwilling to undergo more conservative treatment and willing to proceed even with experimental operations. The principle of excisional operations is to remove excess tissue to decrease volume of the extremity[1]. The blood vascular and the lymphatic system play complementary roles in tissue perfusion and fluid reabsorption. Despite its critical role in mediating tissue fluid homeostasis, intestinal lipid absorption, and the immune response, the lymphatic system has not received as much attention as the blood vascular system, largely due to a lack of lymphatic-specific markers and to the dearth of knowledge about the molecular regulation of lymphatic development and function.

Not only disfiguring, lymphedema is disabling and distressing. Furthermore, it is associated with serious complications such as bacterial and fungal infection, chronic inflammation, wasting, immunodeficiency and malignancy[2].

Primary lymphedema is a rare condition and 1.15 out of 100000 are affected. It occurs more frequently in females and peaks between 12-16 years of age[3]. The most common cause of secondary acquired lymphedema universally, is parasitic infection by filariasis[4]. In developed countries, the cause is iatrogenic, due to surgical or radiation induced lymph node injury.

The disease has a vast clinical spectrum from a limited partially pitting slowly progressive swelling of the distal end of the extremity (e.g squaring of the toes or Stimmer’s sign and dorsal foot buffalo hump) to severe and complicating chronic edema with fibrotic changes and consequently the nonpitting type of the whole limb[5].

There is rarely serious problems with the mild form of the disease but in severe ones, limb heaviness, restricted movements and the resultant disability are common complaints[6]. Despite considerable advances into the understanding of lymphedema, cure in human race is impossible[7]. Ninety five percent of lymphedema patients can be managed nonoperatively[8]. These measures comprise preventive activities, pharmacologic therapy and mechanical reduction of limb size. Unless the patient can be managed easily and effectively after 6 months of conservative therapy, they are candidates for surgery[9].

There are various surgical options in treatment of lymphedema. lymphovenous shunting[10], lymphadenovenous shunting[15], skin flap transplantation[10], free or pediculated greater omentum flap[10,11], pedicled myocutaneous flap[12], lymphangioplasty or Thompson's procedure[13], and excisional techniques such as Homans'[13], Servell's[14], Miller’s[15,16], and Pflug's[17].

Russian authors have introduced a newer resectional technique, i.e. stepped resection-aspiration-autodermoplasty of the effected limb[18]. We are going to introduce another resectional option with low morbidity and very low complication rate which is discussed along.

Subjects & Methods

The study was prospective and accomplished on 59 patients from March 1987 to March 2002. Nearly all of them had primary lower extremity lymphedema praecox (onset 1 to 35 years of age) Permission for operation was obtained from university ethical committee. Age distribution of the patients was between 2-15 years with onset of the disease between 1-3 years of age. The diagnosis was based on history and physical examination including nonpitting swelling of the affected lower extremity with distal to proximal progression and Doppler ultrasonography of deep venous system revealing patency and disseminated soft tissue edema in almost all of patients. 8 patients (13/5%) had been admitted several times because of lymphangitis or cellulitis with an irreversible swelling exacerbation in any episode of infection. All of the patients were treated nonoperatively for at least 6 months with insufficient response and a significant disabling edema. Infection free patients with the aforementioned conditions were candidates of surgery admitted the day before operation. We continued antibiotic therapy for one month after operation.
**Surgical technique:** The operative technique was innovative. We performed staged subcutaneous excision beneath flaps in two or sometimes four stages but in a different manner from theHomans,[13] Servell,[14] Miller,[15,16] and Pflug[17] procedures.

The patients were put in supine position under general anesthesia. A tourniquet was fastened around the highest part of the thigh (if possible). The affected limb was prepared and draped, so the whole extremity was exposed. After limb exsanguination by elevation and rubber bandage, tourniquet was inflated. Incision line was marked beforehand (Fig 1a, 1b) in sagittal approach. The incision area included forefoot, ankle and the whole calf from malleolus to a point at the same level of tibial tuberosity and extended to upper knee and thigh at the first stage beginning from medial part. Medial and lateral sides of forefoot were excised with the same part of the calf.

Forefoot incision line was 2-4 cm apart from metatarsophalangeal joints, 1 cm posterior to the malleolus and extended through the midsagittal plane of the calf (medial or lateral) (Fig 1b).

Flap thickness and length is different proportional to each part of the limb undergoing the procedure. Flap thickness is increased gradually from distal to proximal and 5 mm in forefoot, 6 mm in ankle, 8 mm in midcalf, 10 mm near the knee and 15 mm in the thigh (Fig 1c).

Flap length in both anterior and posterior directions is calculated as 1/6 of limb circumference measured before the incision is made, so 1/3 of limb perimeter is flapped during each period of surgery to minimize flap ischemia (Fig 2b). All subcutaneous tissue beneath the flaps is removed including deep fascia of the calf covering muscles (Fig 2b).

After tourniquet deflation and hemostasis, redundant skin from the flap edges is resected, closed suction drains are inserted beneath each flap, subcutaneous tissues are approximated by absorbable vicryl sutures and the skin closed using subcuticular technique with absorbable strings (Fig 2d).

We continue antibiotic therapy for one month and don’t immobilize the limb but use wrapped elastic bandage. After 8-9 days, drains are removed and the patient mobilized with natural rubber antivaricose stockings.

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**Fig 1-** a,b: Design of incisions and borders of skin flaps

**c,d:** Gradual increment in flap thickness

**Fig 2-** a,b,c: Complete resection of subcutaneous tissue including deep fascia

**d:** Closure of the incision after resection of redundant skin
Three months later, the second stage for lateral part is performed. Such stages can be done for thigh. Because the great saphenous vein is sacrificed during the medial side operation, deep venous patency must be confirmed in all of the patients preoperatively. After one year follow-up the results are acceptable (Fig 3).

**Findings**

In 10 (17%) of 59 patients, bilateral involvement was significant and surgery was indicated for both of the limbs. In 49 (83%) patients, only unilateral involvement was found. 35 (60.81%) male and 14 (39.18%) female patients were included in this study, so the male:female ratio was 3.2.

After one year follow-up, 52 (87.83%) patients were symptom and complaint free with minimal limb swelling and without disability. 7 (11.8%) patients had acceptable results and became socially active but a disfiguring edema remained.

The most common complication of our procedure was seroma that developed in 4 (6.6%) patients and was alleviated by repeated aspirations. Wound infection during early postoperative period was rare and occurred in 3 (5%) patients. Flap ischemia was also very rare and was distinguished in 2 (3.3%) patients and was managed conservatively without problem. Final limb circumference reduction was ascertained in 3 levels at two follow-up visits as it is described in table 1.

<table>
<thead>
<tr>
<th>Limb level</th>
<th>Follow up exam time after surgery</th>
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<tbody>
<tr>
<td></td>
<td>6 months</td>
</tr>
<tr>
<td>Supramalleolar</td>
<td>19%</td>
</tr>
<tr>
<td>Midcalf</td>
<td>29%</td>
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<tr>
<td>Midthigh</td>
<td>23%</td>
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**Discussion**

As mentioned earlier, the main treatment strategy for lymphedema is nonoperative. After at least 6 months of conservative management based on compression stockings with class III compression, if predominant swelling and disability remained, surgical therapy was considered. Surgical treatment and indications include impaired limb function, recurrent episodes of cellulitis and lymphangitis, intractable pain, lymphangiosarcoma and cosmesis.19
The principle of excisional operations is to remove excess tissue to decrease volume of the extremity\[20\]. The staged excision of skin and subcutaneous tissue, the Charles procedure and the dermal flap by Thompson are still the most popular techniques in the United States\[21\]. The role of surgery is more prominent when a primary chylous disorder is encountered\[22\]. Potential indications include impaired limb function, recurrent episodes of cellulitis and lymphangitis, intractable pain, angiosarcoma and patient preference for cosmesis\[22\].

Physiologic operations have been aimed at restoring lymphatic transport capacity most frequently with lymphovenous anastomoses. Long term patency rates have been reported but poor functional alleviation and limited experience and expertise have made their use to be controversial\[22\].

Staged excisions of the edematous subcutaneous tissue beneath skin flaps have been successful in dealing with the symptoms of this condition. No episodes of postoperative cellulitis occurred in these patients. Normal function of the extremity has been achieved, and the contour preserved. It appears at this time that excision of the subcutaneous tissue is the most important aspect of the surgical management of lymphedema\[23\].

The chief complication has been the occurrence of localized areas of necrosis, chiefly at the edges of the flaps. It is not a serious complication but has sometimes prolonged the stay in hospital\[24\]. In our study, the complication of post operative wound infections, hematomas, and necrosis of skin flaps, was similar to those reported from Mayo Clinic\[25\]. We have a few cases of hypertrophic scars on the dorsum of the foot and also haven’t congenital type to compare study by Fonkulusrund 28 from 67 children and infants had lymphedema \[26\]. The best limb volume reduction is achieved by staged resection of the subcutaneous tissues but, poor wound healing, long surgical scars, sensory nerve loss and residual edema of the foot and ankle are the main complications that limit its appliance\[21\].

Axial and myocutaneous flaps and microsurgical bypass procedures are currently under investigation and may hold promise after additional study. Future experimental and clinical studies should concentrate on long term follow-up study with objective clinical and roentgenenographic documentation of improvement\[27\].

The limitations of this technique are in two groups of lymphedema (I and IV). because group I not indication for surgical resection group IV it has skin reaction and not good candidate for our study. More surveys with much more samples and long term follow-up are suggested to confirm the priorities of our procedure and to be able to compare it with the results of other resectional techniques. We recommend a combined medical, surgical, and physiotherapeutic approach in patients with marked lymphedema.

**Conclusion**

Our study demonstrates that resectional technique can be modified to a more cosmetic and volume reducing one with less disfiguring scars, better functional results low rate of wound complication to compare other techniques. Our method can be an excellent and even the standard operative procedure to treat intractable forms of disease.

**References**


