

## Liposuction as a Modality in Management of Lower Limb Lymphedema

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### ABSTRACT

**Background:** Treatment of lymphedema is challenging and multidisciplinary in nature, even with the best outcome it is still costly and time consuming. Currently, there is no cure for lymphedema, even the use of free lymph node transfer which is promising but it is a major procedure with its results still under investigations. Liposuction is an efficient modality for treatment of lymphedema but it requires proper patient selection to achieve the best results.

**Aim of Study:** The aim of this study is to assess the efficacy of liposuction as a modality used in treatment of lymphedema of lower limbs.

**Patients and Methods:** The study included 20 patients diagnosed with lymphedema (stages 2-3), all study subjects received 10 sessions of pneumatic compression therapy (at one week interval), to be followed by assessment for fitness for liposuction in the form of transformation of pitting oedema to non pitting and limb circumference measurements. Only 10 out of the 20 patients were fit for surgery.

**Conclusion:** The misconception between clinicians that chronic lymphedema is just accumulation of solely lymph must be changed. The treatment must be directed towards both lymph and fat or trying to correct the cause of the disease. Liposuction is one of the modalities used in the treatment of lymphedema with promising results if proper patient selection was done.

**Keywords:** *Lymphedema – Liposuction – Fat – Compression therapy – Pitting edema.*

### INTRODUCTION

Lymphedema is defined as a pathological condition of lymphatic system where there is interstitial accumulation of lymph (protein rich fluid) with subsequent inflammation, hypertrophy of the adipose tissue and finally fibrosis with significant morbidities to the patient [1]. Many theories explained the pathophysiology of adipose tissue hypertrophy in lymphedema. The most accepted one is imbalance of blood flow and lymphatic drainage, resulting in impairment of lipid clearance and uptake by macrophages especially that fat cell must not be considered only as fat container but as an endocrine organ and an activated cytokine

cell playing a role in chronic inflammatory process [2]. For this reason the misconception between clinicians that chronic lymphedema is just accumulation of solely lymph must be changed and the treatment must be directed towards both lymph and fat [3].

Lymphedema is an exciting field with many unanswered questions even when up to 250 million people worldwide suffer from lymphedema yet there is no gold standard treatment that works in all cases [4]. There are two major treatment arms for lymphedema: Non-surgical and surgical [5]. Liposuction, or suction-assisted lipectomy, can be used alone or in combination with other procedures to treat lymphedema [6]. Unfortunately, it carries risks of hematoma, seroma, further damage to the lymphatic system, and also does not alleviate the need for continuous compressive therapy postoperatively. Despite these complications, liposuction remains a major tool in treatment of lymphedema. Liposuction sharply decreased edema as well as infection rates in the lymphedematous extremity with good long-term follow-up [7,8].

### PATIENTS AND METHODS

This study was conducted on 20 patients who presented to Kasr Al-Ainy Cairo University Hospital with lower limb lymphedema in the period between September 2015 and September 2016. The patients that fulfilled the inclusion criteria were enrolled in the management protocol suggested for treatment of lower limb lymphedema. Lymphoscintigraphy was done for all patients.

*Inclusion criteria:*

- 1- Lower limb lymphedema stage 2 and 3.
- 2- All ages and sexes were included.
- 3- Patients fit for surgery.
- 4- Patients with lymphedema for less than 5 years.

*Exclusion criteria:*

- Patients with chronic disease or medications resulting in lower limb edema.
- Patients in active cellulitis.
- Skin ulceration.
- Previous lower limb lymphedema surgery.

*Protocol used in this study was as follow:*

All patients received 10 session of pneumatic compression therapy with one-week intervals an outpatient procedure before any surgical intervention was planned. Compression was achieved using the compression stockings that started the inflation at the level of the foot followed by the leg and thigh. Deflation followed the same sequence starting at the foot followed by the leg and thigh. Each session lasted for 30 minutes at a pressure of 280 mmHg. All patients were instructed to use moisturizing creams post compression session for 3 times per day for one week. Medical therapy in the form of long acting penicillin 1.2 million units orally or IM injection was prescribed to all patients. Compression garments were used post session day and night. The limb circumference was recorded pre-sessions and post sessions in fixed points and compared with the normal leg. Limb circumference was measured at knee level, mid leg level and immediately above the ankle with the patient in a standing position. Pre-compression session and post sessions photos were obtained and compared.

According to the post session measurements of limb circumference the patients who had the following criteria were chosen for liposuction:

- If there is stationary or no decrease in the circumference detected by both measurement and photography.
- Change from pitting pattern to non-pitting soft lymphedema, as this means that the lymph is washed but the residual volume is due to the fat deposition.

Out of the 20 patients enrolled in this study only 10 patients followed the criteria of being fit for liposuction.

*Surgical technique:*

Full history, examination and informative consent were obtained from all patients. The targeted area was marked and drawn in standing position.

*Intraoperative:*

A single dose of prophylactic antibiotic was administered 15 minutes before the skin incision and urinary catheter was inserted. Spinal anesthesia was used in all patients and application of tourniquet at the level of the thigh without inflation. Injecting tumescent fluid (500ml saline 0.9%, 10ml xylocaine and 1ml adrenaline) according to the estimated liposuction volume and the patient's weight. Despite the absence of blood loss, proper fluid replacement was done during the surgery.



Fig. (1): Showing pre-, immediately postoperative and lipo-aspirate.

Limb elevation and using sterile crepe bandages for compression followed by inflation of the already applied tourniquet. A 6mm cannula was used in lines parallel to the limb to avoid further damage to the lymphatic vessels then compression garments were applied before the deflation of the tourniquet to minimize bleeding.

#### *Postoperative:*

All patients were hospitalized for the first 48 hours and early ambulation was encouraged. Antibiotics and anti-inflammatory drugs were prescribed and patients were discharged and scheduled for fixed postoperative visits after 3 days, one week, 2 weeks, then monthly for 6 months.

*In each visit patients were evaluated regarding:*

- Limb circumference measurements.
- Patient's satisfaction.
- Improvement of life style.
- Presence of complications.

## RESULTS

Out of the 20 patients involved in this study 17 were females and 3 males. Age ranged from 12 to 60 years old. Only 10 of those patients were fit for the criteria of the study.

Clinically, there was marked improvement in limb circumference noticed by the patients and by photography. All patients were satisfied by the results. However the decreased limb circumference made the level of satisfaction higher than expected. No skin complications were detected in all cases apart from one patient who developed skin ulceration due to improper padding of the crepe bandage and was treated conservatively. It was also noticed marked decrease in the frequency of the attacks of cellulitis.

Deep venous thrombosis was not encountered in any of the cases despite the lack of use of anticoagulant. Operative time ranged from 120 to 160 minutes from induction of anesthesia to the application of the garment.

The 10 patients showed marked decreased in limb circumference and significant reduction per-

centage starting from day one post-operative and was maintained during there-evaluating in the 3 and 6 months postoperative visits. The reduction percentages ranged from 1.82 to 23.3%. The 1.82% occurred in the patient that developed ulceration and was attributed to the prolonged inflammatory process produced by the ulcer.

The *p*-value of reduction percentage of limb circumference was significant at knee and mid leg levels of measurements while the *p*-value wasn't significant at ankle level. The knee level showed reduction percentage of a mean of  $10.26 \pm 4.65$ cm at 6 months, while the mid leg level showed reduction percentage of a mean of  $13.45 \pm 9.88$ cm at 6 months. The mean of percentage of reduction circumference at above ankle level at 6 months was  $9.73 \pm 6.14$ .

The increase in circumference that was seen in some cases within 6 months of evaluation was mostly due to the increase of patient activities that lead to accumulation of lymph fluid and also due to lack of patient's compliance to garments, limb exercise and elevation.

In addition to volumetric reduction there was also decrease in the incidence of cellulitis attacks and even when it occurred, it happened in a less frequent pattern.

At 3 months postoperative, the maximum reduction was, at knee level from 60 to 53cm (7cm), mid leg 75 to 69cm (6cm) while it was only from 52 to 50cm (2cm) at above ankle level. At 6 months postoperative, the maximum reduction was, at knee level from 60 to 52cm (8cm), mid leg 75 to 71cm (4cm) while it was only from 52 to 51cm (1cm) at above ankle level.

Table (1): Percentage of reduction of circumference at different levels.

Reduction %	At 3 months	At 6 months	<i>p</i> value
Knee level	$7.05 \pm 5.24$	$10.26 \pm 4.65$	0.043
Mid leg level	$15.97 \pm 6.57$	$13.45 \pm 9.88$	0.043
Above ankle level	$10.03 \pm 4.51$	$9.73 \pm 6.14$	1.000



Fig. (2): Showing preoperative pictures of case 1.



Fig. (3): Postoperative pictures of case 1.



Fig. (4): Shows preoperative pictures of case 2.



Fig. (5): Showing second day post-operative pictures of case 2.



Fig. (6): Showing 3 months post-operative pictures of case 2.

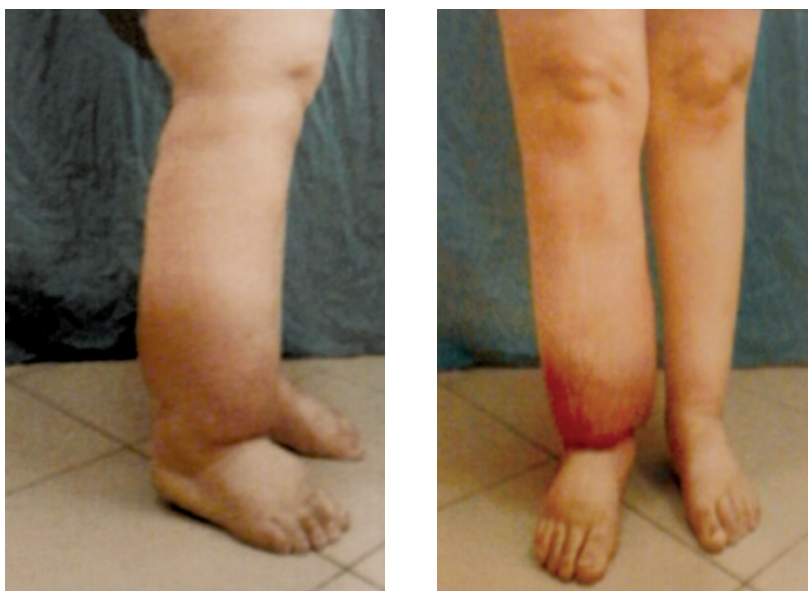


Fig. (7): Showing 6 months post-operative pictures of case 2.

## DISCUSSION

The goal of lymphedema therapy is to restore function, reduce both physical, and psychological suffering and preventing the development of infection [9].

The treatment of lymphedema is difficult and multidisciplinary in nature and even when the best outcome is achieved, it is costly and time consuming. Currently, there is no cure for lymph edema, even the use of free lymph node transfer, which is promising, but it is major procedure and its results are still under investigations. Previous surgical regimen as debulking or total excision with skin grafting rarely achieved acceptable cosmetic and functional results [10]. Although, microsurgical reconstruction by lymph venous shunt or free lymph node transfer appear like an attractive idea but it showed a lot of complications and cannot remove the hypertrophied subcutaneous tissue with fat deposition in patients with non-pitting lymphedema. Therefore liposuction is an effective tool with good results with proper patient selection [11].

Most of the studies in literature are concerned with lymphedema of the upper limb with few studies emphasizing on liposuction as a treatment modality for the lymphedema of the lower limbs. Most of the studies targeting lower limb lymphedema were case studies with one or two cases.

Sando and Nahi [12] advocated liposuction as a mean to reduce flap loss by reducing the flap fat content after skin excision, Greene et al., [13] hypothesized that the success of liposuction on treating upper limb extremity could be translated to lower limb lymphedema and applied it in one patient with spina bifida, hydrocephalus and lower limb lymphedema they achieved 75% reduction in the limb volume, Brorson et al., [14]. Used liposuction in treating one case of secondary lower limb lymphedema post orchiectomy and radiotherapy with marked improvement and reduction in limb circumference.

In the current study 10 patients proceeded for lymph liposuction of lower limbs combined with previous compression therapy with reduction percentage 1.88% to 23.33%. While Damstra et al., reported [15] a 118% volume reduction of the upper extremity after mastectomy at one year following suction-assisted lipectomy. The difference between literature and this study results was due to the difference between the grades of lymphedema and the functional and characteristic differences between the upper and the lower limbs. In literature the patients were in stage 2, with smaller limb

volume than those used in this study which was done on patients in stages 2 and 3. Also the circumference difference between the upper and lower limbs thus explaining the difference in reduction percentage obtained from both studies.

An added on advantage, aside from volume reduction, was the increased skin blood flow which may decrease the incidence of cellulitis [16] this was in harmony with the results of the current study.

One of the theoretical risks is further damage of the already existing lymphatics. However, cadaveric dissection showed that performing liposuction in longitudinal pattern minimize that damage, furthermore, impairment of the already delayed transport of lymphatic fluid does not occur [16]. This theory was adopted in this study and liposuction was performed in such a manner to minimize any harmful effect on the existing lymphatics.

Treatment of lymphedema with circumferential liposuction is safe and associated with quicker recovery when compared with other modalities of treatment. Complications were minimal and usually related to wounds healing, paraesthesia and blood loss in the aspirate. However, using the tumescent technique decreased the amount of blood loss in the aspirate [13]. The same findings was concluded in the current study, stressing on the need of proper padding and absence of any folds in the garments to avoid any ulcerations. The use of tourniquet also diminished the blood volume in the aspirate.

Anticoagulation in the current study population had no role; with early foot exercise from day 1 with limb elevation. Anticoagulant increased bruises and risk of hematoma and no thrombo-embolic complications were encountered. However the small samples size maybe a limiting factor. In contrary to the literature they used to give the patients anticoagulants till ambulation especially that liposuction in literature was always associated with another procedure as lymphovenous anastomosis [17].

### Conclusion:

The misconception between clinicians that chronic lymphedema is just accumulation of solely lymph must be changed. The treatment must be directed towards both lymph and fat or trying to correct the cause of the disease. Liposuction is one of the modalities used in the treatment of lymphedema of upper limb with promising results. The application of the same principles in the lower limbs shows similar results with proper patient selection but needs more studies.

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