

IJMA



INTERNATIONAL JOURNAL OF MEDICAL ARTS

Volume 7, Issue 4 (April 2025)



<http://ijma.journals.ekb.eg/>

P-ISSN: 2636-4174

E-ISSN: 2682-3780



Available online at Journal Website
<https://ijma.journals.ekb.eg/>
 Main Subject [Vascular Surgery]



Original Article

Compression Therapy in Lymphedema: Safety and Effectiveness

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ABSTRACT

Article information

Received: 18-01-2025

Accepted: 03-03-2025

DOI: 10.21608/ijma.2025.353835.2110

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Citation: Khereba W, Moeen O, Elimam SE, Zakaria MY, Badran AI, Emad Eldin M, Radwan AT. Compression Therapy in Lymphedema: safety and effectiveness. IJMA 2025 Apr; 7 [4]: 5583-5586. doi: 10.21608/ijma.2025.353835.2110.

Background: Lymphedema showed increased frequency all over the world. Globally, it affects > 100 million. It had unwanted impact on the patient lifestyle and productivity.

The aim of the work: This study aimed to assess the value of compression therapy for lymphedema of either upper or lower limbs regarding its safety and efficacy.

Patients and Methods: This study included 100 patients [72 females, and lower limb affection reported for 86 patients, with bilateral inclusion in 6 patients], who had primary or secondary lymphedema affecting lower and/or upper limbs. They were selected from Al-Azhar university Hospital [Damietta]. The limb circumference was recorded at different fixed 3 points before and after compression therapy. Before applications of bandaging, a local steroid combined with antifungal and antiseptics were applied over the affected limb. Then a multilayer bandage was applied [it started by gauze, mobiderm, short stretch and finally elastic bandage with compression around 30 mmHg]. This was applied for one week. Then layers were removed [except the last one] and limb was evaluated clinically after removal and weekly for the next 3 weeks. The last layer was removed during the time of bed rest at the last 3 weeks of compression therapy.

Results: The follow up duration was 1-2 months. The final clinical evaluation revealed marked and significant reduction the volume of the limb. In addition, the quality of life was improved for all patients. Furthermore, no significant complications were recorded. However, the final outcome indicated the need to wear a compression stocking.

Conclusion: Compression therapy for lymphedema of the lower or the upper limbs using multilayer bandage [by Mobiderm] could be considered as a cost-effective, fast and easily applied. It is association with resorption of lymphedema and quick improvement of fibrosed tissues.

Keywords: Lymphedema; Compression; Bandaging; Mobiderm.



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INTRODUCTION

The lymphatic vessels normal main function is to collect proteins, lipids, and water from the interstitial spaces and return it to the intravascular spaces. The lymph usually moves at about 120 milliliters/hour and about 2-4 liters of lymph are moved around the lymphatic system which usually operates at about one tenth of its maximum load. In arterial capillaries, the High hydrostatic forces protein enriched fluid into the interstitial spaces, leading to an increase of the interstitial oncotic pressure which draws extra-water^[1]. About 90% of this fluid returns to the systemic circulation via the venous capillaries. The remaining 10% is rich in its protein content of high molecular weight. These proteins are too large to enter the venous capillary, or pass through capillary walls. Thus, the way for this proteins is to flow into the lymphatic system with sub atmospheric pressure. The lymphatic capillaries can accommodate large sized proteins and the linked watery content^[2].

Lymphedema can be performed due to lymph accumulation in the interstitial spaces, mainly in the subcutaneous fatty tissues. This specifically due to failure of lymphatic drainage. Lymphedema can be formed anywhere of the body^[3]. The insufficient lymphatic function may be due primary or acquired [secondary] anomalies of lymphatic outflow leading to abnormal lymph stasis, which can lead to protein and cellular metabolites accumulation in the extracellular space^[4].

Clinically, lymphedema can be categorized into 4 stages. The first is the latent phase [clinically no apparent edema]; the second is grade I [e.g., pitting edema]; the third is grade –II [the non-pitting edema] and the fourth is grade-III [irreversible edema]^[5]. The complex decongestive therapy; also known as “complete decongestive therapy [CDT]”, is a treatment intensive plan that includes many and different treatment approaches. These approaches include “exercise, manual lymphatic drainage [MLD], multi-layer short stretch compression bandaging, compression garments, skin care and education in lymphedema self-management”. The effectiveness of these treatment approaches [collectively CDT] are effective as reported in previous literature. It leads to improvement of the clinical manifestations of lymphedema [for example, swelling and pain]^[6]. However, the cost-effectiveness and value of compression therapy is not well addressed in treatment of upper and/or lower limb lymphedema.

This work was designed to evaluate the value of compression therapy for lymphedema of either upper or lower limbs regarding its safety and efficacy.

PATIENT AND METHODS

This study included 100 subjects, who had primary or secondary lymphedema of the lower and/or upper limbs. The study completed between November 2011 to October 2018. All were selected from Al-Azhar university Hospital [New Damietta], Egypt. Of those 100 patients, there were 86 with lower lymphedema [17 had bilateral lymphedema] and 14 had upper limb lymphedema [2 had bilateral lymphedema]. Again, patients with primary or secondary lymphedema were included. However, infected, ulcerative or ischemic limbs were excluded from the study.

The commonest cause of lymphedema was recurrent cellulitis [54 subjects], then primary lymphedema [27] followed by lipolymphedema [12 subjects]. Then, post-mastectomy, radiotherapy, leukemia, and trial of right lower limb lymphangiography were the causes of lymphedema in 3, 2, 1 and 1 subjects, respectively.

Substances and equipment: Mobiderm [Figure 1]: It is formed of adhesive nonwoven fabric [open cell foam blocks between 2 layers of nonwoven material]. It is available in the form of bandage, plate or made to measure garments. The difference in pressure between the zone of pressing blocks and the surrounding area provokes tissue mobilization which is visually regarded as small depressions on the skin. Maryvonne Chardon-Bras [Kinesiotherapeute cadre de santé] is the inventor of mobiderm [Unite de Lymphologie Hopital Saint- Eloi CHU de Montpellier]. It creates a pressure differences between the contact zone below the foam cubes constituting the system and their surrounding area, leading to shear effect on the treated subcutaneous tissues. The application of protective bandage between mobiderm and the skin is recommended and was done in all cases [skin cream and gauze bandage].

Biflex [Figure 2]: It is graduated bandage using a simple fitting indicator system. At therapeutic pressure, the rectangles become squares, which are easy to see. This indicates that the tension is at its optimum, with no risk of excessive tightening. The graduation system thereby enables accurate control of the amount of pressure exerted on the limb.

The medical treatment received during compression therapy for all patients composed of intramuscular injection of long actin penicillin 1200000 IU/month after exclusion of drug sensitivity, Ca dobesilate 500 mg capsules every 8 hours and combination of amilobride 5 mg with hydrochlorothiazide 50mg once daily before breakfast. After compression therapy this treatment was continued with only antifungal and long actin penicillin with follow up in the maintenance phase.



Figure [1]: Mobiderm, open cell foam bandage to mobilize the subcutaneous tissue

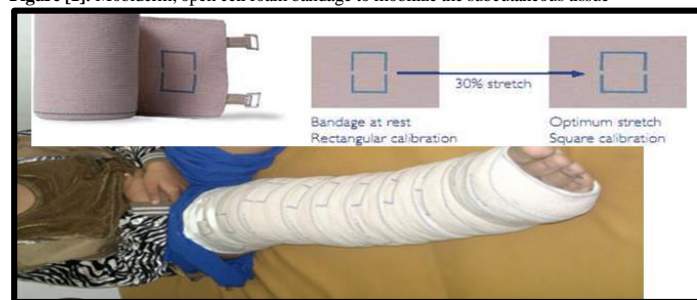


Figure [2]: Biflex: It is graduated bandage with simple fitting indicator system

Protocol of multi-layer compression therapy- Multilayer short stretch up to inelastic bandage: This can be summarized by the following four actions [Protection / drainage / retention / compression]. These four actions are the essential pillars of treatment initiation phase of any lymphedema.

The reduction phase [intensive decongestive treatment]: reduce the edema as much as possible until the volume of the limb is as close as possible to its required values. The maintenance phase consisted of wearing a definitive compression orthotic [made-to-measure or standard,

of flat knitted type]. This phase was initiated once a satisfactory volume reduction had been achieved. The limb then washed by normal saline and the sound and edematous limb circumferences were measured and recorded at 3 different fixed points [simple surface measurement points] before application and after removal of bandage. In addition, photos were obtained after patient's consent for subjective assessment. A combination of local steroids, antifungal and antiseptic cream was applied before bandaging [Figure 3]. This was applied all over the limb and then covered. Then multilayer bandaging starting by gauze, mobiderm, short stretch bandage and elastic bandage [compression was around 30 mmHg], were applied continuously for one week, then all layers except the last one were removed and clinical revaluation was performed at the first time and weekly at the next 3 weeks. The last layer was removed after the first week of compression therapy at bed time at night only. Figures 4 to 6 showed three cases of compression therapy for lower limb lymphedema, while figure [7] showed follow up of lower limb lymph edema after compression therapy. Figure [8] showed a case of upper limb edema after compression therapy.



Figure [3]: Cream applications



Figure [4]: Compression therapy of right lower limb lymphedema, in female child presented by leukemia.



Figure [5]: Compression therapy of left lower limb lymphedema, showing foam skin prints.



Figure [6]: Compression therapy of left lower limb, bilateral lipolymphedema



Figure [7]: Left lower limb primary lymphedema



Figure [8]: Right Upper limb primary lymphedema

ESULTS

In the current work, 100 patients were included. Females were 72 patients [13 of them had lipolymphoedema], and 28 were males. The lower limbs [83 cases] were affected more than the upper one [83 vs 17 cases]. The commonest cause was the recurrent cellulitis with presence of tenia pedis.

Regarding complications, 2 cases showed pressure ulcers and completely improved by conservative management. Lipolymphoedematous cases were bilateral at the lower limbs, except unilateral one at the left lower limb with history of cellulitis.

This type of bandaging enables the patient to wear his/her shoes and cannot hinder his movement or sports activities. In spite of the big volume of this bandage, it's still relatively light and comfortable especially for cooperating patients. The resting pressure in this case is 20 mmHg which can increase to 40 mmHg if the patient is active. The alternation between low-resting and high-working pressures in the interstitial spaces under the bandages creates a form of interstitial pump-like action, which improves the movement of interstitial fluid into the circulation.

The maximum response occurred in the first one week of compression therapy, which is usually very effective especially in grade II of lymphedema and this is actually observed by the patient especially in unilateral lymphedema, as their reduction of oversized volume up to 90%.

Following achievement of maximal volume reduction [average within 3 weeks], the patient should be fitted with a compress garment. Costume flat knitted garments were made specifically for the individuals who could not fit a ready-made garment.

DISCUSSION

Lymphedema is a rather neglected condition which, once diagnosed, is frequently dismissed. It is a frequent disease as nowadays, > 100 million suffer from this pathological problem worldwide. It remains a serious and complex management challenge for clinicians and patients alike. Morbid lymphedema can affect the daily activities of the patient up to be handicapped [7]. The lymphedema treatment mainly aimed to prevent the progress of the disease and potential complications. In addition to reduce

the swelling of the limb to relieve the symptoms and prevent infections, improves the movement and the patient ability to perform the usual daily activities. This in turn, improves the overall wellbeing of the patient on both the physical and psychological levels ^[1,8,9].

Lymphedema is a time-consuming from the treatment point of view, which leads to high-cost. In addition, it may need a multidisciplinary treatment approaches, to prevent, detect and manage it ^[8]. Thus, prevention of lymphedema and risk reduction is very important matter ^[9].

The reduction of the lymphedema volume is the main target in the lymphedema treatment and may contribute to the improvement of quality of life ^[10].

Foldi E, et al. ^[11] treated lymphedema by manual lymphatic drainage [MLD] and medical compression. The compression is made by using reducing bandages from the beginning of the intensive treatment and final orthotic compression during maintenance phase. But here in this study, no role of MLD without significant clinical difference and with satisfactory result. **Mestre et al.** ^[12] conducted a study to evaluate the value of the auto-adjustable nighttime arm sleeve [MOBIDERM® Autofit] on lymphedema during the maintenance phase. They concluded that, MOBIDERM® Autofit provides a clinical benefit during the maintenance phase of the treatment of lymphedema and enhances patient's self-management and improves the quality of life. **Cho SC, et al.** ^[13] conducted a pilot study to evaluate the clinical effectiveness of compression bandages [Mobiderm® bandages] in patients with secondary lymphedema after cancer treatment. They included two groups, one for Mobiderm and the other for classical bandage. They concluded that, Mobiderm and classical bandages decreased the circumference of limb. Thus, Mobiderm may be a useful alternative modality to control secondary lymphedema after cancer therapy. In a case series, **Mazur et al.** ^[14] evaluated the Mobiderm Autofit bandage and reported that, the use Mobiderm was associated with significant volume reduction of the edematous upper limb after 12 days of treatment. In addition, the bandage was well-tolerated with no complications, and the treatment approach was highly appreciated by the patient and physicians. Moreover, **Dhar et al.** ^[15] addressed the safety and efficacy of the multilayer compression bandage and concluded that, it showed a benefit in reduction of lymphedema and alleviation of the functional symptoms and pain in patients with breast cancer-related lymphedema.

In conclusion, the multilayer bandages as a compression therapy is effective and relatively safe treatment option for lymphedema. However, it should be individualized according to clinical condition to achieve the greatest reduction of the swelling. However, additional studies are required to compare this treatment option to other available option, mainly the surgical approaches. In addition, due to limiting step of small sample size, the results must be interpreted in caution.

Financial and non-financial activities and relationships of interest:

None

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INTERNATIONAL JOURNAL OF MEDICAL ARTS

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<http://ijma.journals.ekb.eg/>

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E-ISSN: 2682-3780