The Physical Treatment of Upper Limb Edema

Oliver Leduc, P.T.¹
Albert Leduc, Ph.D.¹
Pierre Bourgeois, M.D.²
Jean-Paul Belgrado, P.T.¹

¹ Academic Department, Physical Therapy, University of Brussels, Brussels, Belgium.
² Nuclear Medicine Service, St. Pierre Hospital, Brussels, Belgium.

BACKGROUND. Edema of the upper limb, without any doubt, constitutes the most invalidating complication of breast carcinoma treatment. The swelling of the limb results from decreased liquid evacuation by surgical intervention at the axillary level and also by the eventual treatment by cobaltotherapy.

METHOD. The physical treatment for edema of the limb consists of a combination of therapies that were tested for their effectiveness in laboratories on healthy students and also on patients who underwent surgery for breast carcinoma. The treatment consists of the application of manual lymphatic drainage (type Leduc), the use of multilayered bandages, and the use of intermittent pneumatic compression. The population studied was represented by 220 patients who underwent breast surgery. The authors followed their evolution during the first 2 weeks of treatment. Patients were not hospitalized. The edema was measured by using marks tattooed on the skin.

RESULTS. The limb that developed edema was compared with the healthy limb. The most important reduction was obtained in the first week. The decrease was equivalent to 50% of the average of the difference between both upper limbs. During the second week, the results obtained stabilized; however, there was a slight decrease at the end of the second week.

CONCLUSIONS. The physical treatment of edema represents the preferred therapeutic approach. However, it must answer to well-defined criteria to be efficient and for long-lasting effects. The physical treatment is used to treat outpatients, allowing them to follow a normal lifestyle. Cancer 1998;83:2835–9.

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KEYWORDS: physical treatment, edema, breast carcinoma, manual lymphatic drainage, pneumatic compression, upper extremities.

Lymphedema is characterized by the concentration of proteins caused by various physiopathological processes and, especially, by the lowering of protein resorption. So long as the proteins stagnate in the interstitial spaces, the osmotic pressure remains at a high level, and the edema is maintained. This is quite disturbing, because the protein concentration will favor the fibrous organization of the edema and will act as a stimulus, causing chronic inflammatory processes. Physical therapeutic treatment is the appropriate technique for treating edema of the upper limb. Experience has proven that the physical techniques we use are not limited to symptomatic treatment of the disease but, in many ways, are the most curative treatments.¹

Even if we insist on the necessity of an accurate diagnosis, treatment, on the other hand, is initiated based on clinical signs. These signs plus the anamnesis of the edema provide sufficient information to allow the expert practitioner to change or vary the physical treatment.

We will restrict ourselves to discuss only the physical techniques that are most appropriate in relation to insufficient drain-
The conservative (or physical) treatment is not at all contradictory to the surgical treatment: it is the first step in treatment, whereas surgery is the final step.2 Conservative treatment can be prescribed from the first signs of edema.

MATERIALS AND METHODS

Manual Drainage

Every treatment by manual lymphatic drainage (MLD) is adjusted to the individual patient. The rules we outline are a guide to proper treatment. Essentially, the therapy depends on the particular reaction of the edema in each patient. The absolute rule not to be broken is this: The manipulation must always be very superficial and extremely soft.3 MLD is effective only if there are still some lymphatics left, so that they can be activated,4 and an appearance or an increase of infiltration can be stopped.

MLD itself rarely is sufficient to evacuate edema. Thirty years of experience have shown that improvement can be maintained over the years if certain precautions are taken (i.e., prophylaxis of edema). MLD is applied without any other technique when the volume of edema is very restricted during the first period of edema formation.

Generally, MLD will be only a part of the total edema treatment. Our experiments demonstrate that MLD stimulates the resorption of proteins.4 This way MLD is part of the global therapeutic approach, as described below.

Intermittent Pneumatic Pressure

Our experiments have shown that pressotherapy essentially influences the resorption of fluids, but rarely, if at all, does it affect the resorption of proteins.5–7 Pressotherapy alone should never be used, but it is always used in conjunction with MLD. The pressure exerted never exceeds 40 mm Hg: Lymphatics collapse with pressure that is any greater.3 Manual and mechanical pressure depends on the physiological conditions of the evacuation by stimulation of the still existing lymphatics. Intermittent pneumatic pressure (IPT) is applied for 1 hour.

Multilayered Bandages

The bandages used in the treatment of lymphedema (see Fig. 1) behave as a nonelastic envelope. Muscle contractions cause pressure in the limb, and the inner pressure varies as a result of changes in volume related to the contraction intensity.8 If we apply a rigid bandage around the limb, then the effect of the contractions will increase considerably in the limb.8
There is probably some relation between the effect of the pressure and the mechanical quality of the dressing. Thus, a nonelastic tissue that is resistant to stretching during muscle contraction undoubtedly will receive higher pressure than an elastic tissue that allows stretching.

The massage effect can be defined as the difference between maximum and minimum pressure values at the borderline of skin and bandages during muscle activity. We studied several bandages in laboratory situations on simulated limbs as well as on patients. Superposition of several bandages, as in the case of multilayered bandages (MLB), results, at the borderline of skin and bandages, in pressures lower than when the normal elastic bandages are used. The use of MLB increases the lymph flow. Isodynamic muscle contraction under MLB results in a significant increase in the resorption of the edema. These experiments all involved the upper limbs.

A cotton tube stretch bandage embraces the limb, protecting the skin against full contact with the latex bandage (Fig. 1, left; type Komprex Binde; Lohmann). The latex bandage is placed so that it is half-covering the limb without any tension. The nonelastic bandages (Durelast; Lohmann) also are applied on the limb from the distal region toward the proximal region (Fig. 1, right). Note that we used several bandages, so that we could apply them in a criss-cross pattern to provide axial rotation of the whole MLB. The application of the MLB ended proximally.

Measurements
We used tattooed reference markings on the patient’s skin. These markings were localized at 20, 30, 40, 50, and 60 cm from the distal extremity of the middle finger. Perimeter measurements were taken before each treatment during the first 2 weeks. The patients were treated five times per week. Each treatment lasted 2 hours. Measurements were taken on the side of the edema and on the healthy side. The different values for each limb were totaled and then divided by the number of measures (5 measures). The averages of the difference between the 2 values were compared (Fig. 2). This statistical study was limited to the first 2 weeks of treatment (10 treatments): The treatment during these 2 weeks was followed by another treatment in which the permanent, custom-made sleeve replaced the MLB.

Population
The population consisted of 220 women who underwent surgery for breast carcinoma (one breast). The patients’ ages ranged from 35 to 77 years. The patients were not hospitalized and they led normal, everyday lives. Follow-up was organized over several months and even several years. However, the statistical study was limited to the first 2 weeks of physical treatment. No medicine had been administered to the study population.

RESULTS
The most important reduction in the edematous limb was registered during the first treatment week and, more specifically, on the second day (Fig. 2). This important decrease between the first and second treatment undoubtedly is the result of massive elimination of fluids by the veins. This hypothesis is confirmed by the fact that patients who present with heart failure withstand a little more difficulty on this first day treatment. The reduction observed at the end of the second week (10th treatment), compared with the fifth treatment, is significant but is relative to the results obtained (Fig. 3a–c). It is at this time that we modified the treatment by replacing the MLB with a custom-made, low-stretch elastic sleeve.

CONCLUSIONS
The measurements obtained from the first treatment show a very important reaction of the edema in association with these different therapeutic approaches used simultaneously. This first therapeutic step is followed by another during which the MLB is replaced by a custom-made sleeve. This sleeve, at first, is worn day and night and then only during the day. On the other hand, the MLD and IPT treatment is administrated five times weekly and diminishes progressively to twice weekly, then once weekly, and finally is discontinued. Certain patients are treated once more after several months, once a week, to maintain results (Fig. 3d). In the majority of cases, the treatment can be interrupted after a progressive decrease of the treatment frequency. However, we must take into consideration that, in accordance with the handicap gravity...
of drainage (veinous and lymphatic), certain patients will have to undergo treatment for several months to maintain the results acquired during the first 2 weeks. Finally, results show that the edema has never totally disappeared. It is exceptional to reduce the edema entirely and to return the treated limb to its healthy

FIGURE 3. Photographs showing edema of the upper limb postmastectomy in one patient before treatment (a), after 6 days (b), after 10 days (c), and after 7 months (d).
state aspect (Fig. 4a,b). Generally, upper limb edema is reduced significantly, but a difference in the two limbs remains noticeable when both limbs are placed side by side. One of the essential aspects of the therapy is that the patients studied have not received any medication, and none of them has been hospitalized for physical treatment. This physical therapeutic approach allows the patients to be treated while benefiting from a normal professional, social, and family lifestyle.

REFERENCES