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Review

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Treatment of Leg and Foot Edema in Women

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ABSTRACT

Several body systems, including the circulatory system, lymphatic system and kidneys, help maintain the appropriate balance of fluids in the body. A problem with any of these systems can contribute to the retention of fluid. Leg and foot edema, caused by the accumulation of fluids in tissue, is known as peripheral edema. Many women have been suffering from leg and foot edema reportedly. In the present review, we describe several methods of treating leg and foot edema in women, such as leg elevation, water immersion, bandage, stocking, foot massage, intermittent pneumatic compression, taking rutoside, reflexology and monitoring the interstitial fluid movement.

KEY WORDS: Foot edema; Legs elevation; Water immersion; Bandage; Stocking; Foot massage; Intermittent pneumatic compression; Rutoside; Reflexology.

INTRODUCTION

Leg and foot edema is caused by the abnormal fluid retention in the tissues of the lower extremities. The medical terminology for leg and foot swelling caused by excessive fluid collection is edema. This edema, caused by the accumulation of fluids in tissues, is known as peripheral edema. Due to the effects of gravity, edema occurs mainly in the lower extremities. Problems with the circulatory system, the kidneys or the lymphatic systems can contribute to the retention of fluids.

Leg and foot edema is a frequent and unpleasant accompaniment to pregnancy, causing pain on foot strike in severe cases. Though leg and foot edema arising solely from venous insufficiency is not in itself dangerous, it can lead to symptoms in women such as pain, feeling of heaviness, night cramps and paraesthesia leading to anxiety and ultimately seeking treatment. Chronic lymphedema is considered to be a progressive condition regardless of it being classified as primary or secondary which cannot simply be described as an accumulation of protein-rich fluid. Lymphedema progresses through stages (stage 0: also known as latent stage or subclinical stage of lymphedema, stage I: also known as pitting or reversible stage, stage II: also known as spontaneously-irreversible stage, stage III: also known as lymphostatic elephantiasis), and treatment intervention in early stages (stage 0 and stage I) has been shown to result in very good treatment outcomes if managed appropriately.[1]

In this article, we describe several methods for treating subcutaneous edema in the legs and feet of women. Therefore, we need to know the treatment mechanisms to select a better one. Therefore, these treatments focus on recognizing and treating the cause of the fluid accumulation or on moving the fluid from the extravascular spaces of subcutaneous tissues.

TREATMENTS

Leg Elevation

If a woman with no obvious disease experiences swelling of the legs and feet, she should el-

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evate her legs above the level of her heart to keep the swelling down using gravity.[2,3] For swollen legs and feet caused by pregnancy, pregnant women should also elevate their legs and avoid lying on their back in order to help improve the blood flow and reduce the swelling. The subcutaneous extravascular fluid in the legs and feet should then move toward the pelvis.

Water Immersion

Hydrostatic force is proportional to the depth of immersion. As the pressure gradient increases with depth, this hydrostatic pressure causes an inward and upward squeezing action on the body. It is this mechanism that causes the effects of buoyancy. The buoyancy reduces the gravitational load on the body, meaning objects such as the human body weigh less when in water.[4] Therefore, deep immersion compresses the leg and foot skin and acts on the fluid in the extravascular spaces uniformly from all sides. Subcutaneous edema fluid is pushed from the extravascular space into the venous system, and extravascular fluid can be moved by water aerobics.[5,6] Kent et al[7] experimented on pregnant women standing in water up to the axilla (static immersion) or in low-intensity water aerobics class, also with immersion up to the axilla. They reported no marked difference in the diuretic effects of static immersion and water aerobics. Water aerobics and static immersion had similar effects on the urine specific gravity. This result implies that a water aerobics class will offer the same diuretic and edema-reducing benefits as simple immersion in the same depth of water.

Hartmann and Huch also researched the response of pregnancy leg edema to a single immersion exercise session.[8] They concluded that a single immersion exercise session was a simple and cost-effective method of treating and preventing the unpleasant but common, symptom of pregnancy edema. However, the duration of the volume-reduction effect of immersion exercise is unclear. Further studies are necessary to investigate the duration of its effect.

Bandages

Bandages can exert high pressure on the subcutaneous tissues of swollen legs and feet.[9,10] Mosti and Partsch[11] reported that an inelastic bandage exerted about 60 mmHg compression. Such compression can quickly reduce edema by pushing the subcutaneous edema fluid from the extravascular space into the venous system. In order to maintain the edema alleviating effect, after being treated with a non-stretchable dressing, women should wear elastic stockings, as inelastic bandages lose pressure in the supine position very quickly, mainly as a result of edema reduction.[12] In contrast to inelastic bandage, an elastic bandage has a high resting pressure and a high working pressure.[13] Elastic systems are not safe for coexisting arterial diseases. Little pressure is lost over time.

Bandages have been shown to be well tolerated and produce no pain. Mosti and Partsch[11] concluded that the edema reduction effect of bandages was equal to that of double stockings.

Stockings

The pressure of an elastic stocking on the swelling skin is less than that of a bandage. At rest, stockings generate an almost constant pressure known as the resting pressure, and with movement, such as when walking, the stockings generate variations in pressure.[14] Mosti and Partsch[11] reported the following: in patients with venous leg edema, a compression pressure of around 20 mmHg exerted by a stocking led to a reduction in edema comparable to that achieved by an inelastic bandage applied with a pressure of around 60 mmHg when both systems were worn day and night for 1 week. External compression increasing the tissue pressure may reduce the capillary filtration. A stocking with a very low pressure may therefore be sufficient to obtain an effect of reducing the capillary filtration.

In addition, Carvalho et al[15] reported that using elastic stockings during the entire day reduces the edema and pain in patients with signs and symptoms of chronic venous disease classified as a Clinical, Etiology, Anatomy and Pathophysiology (CEAP) classification of C3 (swollen ankles edema due to varicose veins or hidden varicose veins-venous reflux).

Foot Massage

Foot massage is an example of an intervention can be used for specific conditions, such as leg and foot edema, as it moves extravascular fluid without disturbing the intravascular fluid.[16,17] However, some subcutaneous edema fluid may be pushed from the extravascular space into the venous system. Foot massage involves the manipulation of the soft tissue of the foot and is more general and does not focus on specific areas that correlate with other body parts, in contrast to reflexology.[16,18] In their study, Çoban and Şirin[19] found that a 20 min foot massage daily for 5 days significantly reduced the physiological lower leg edema during late pregnancy.

Manual Lymph Drainage (MLD) massage is often helpful in reducing edema because it stimulates blood flow, fluid movement and lymphatic system function (detoxifying our bodies). MLD massage strokes are often made in upward motions toward the heart to encourage the lymph movement.[20]

Intermittent Pneumatic Compression

In advanced stages of lymphedema, tissue fluid spaces can also be found in thickened perimuscular fascia. Since there are no forces capable of mobilizing and propelling stagnant fluid to the regions where lymphatics can absorb them, this task should be performed by external massage. The most effective method is sequential intermittent pneumatic compression (IPC).[21] Since the lymphatic collectors are obliterated, fluid cannot be pushed into these points, and alternative paths must be created. Olszewski et

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al[22] showed that, in lymphedema, high external forces move fluid along anatomical structure, but not lymphatics. Zaleska et al[23] said that stagnant fluid should be propelled toward the root of the limb. IPC generates effective transmural pressures, overcoming the low hydraulic conductivity of the subcutaneous tissue, securing unidirectional proximal flow, and preventing backflow. Zaleska et al[24] also found that long-term external limb compression using an IPC device resulted in an increase in the tissue channel cross surface area in the thigh, with a concurrent decrease in the circumference of calf. Their observations suggest that the new channels developed in such areas as the upper thigh, hip, and lumbar with a normal lymphatic drainage. Those authors then hypothesized that IPC replaces the missing lymphatic function by providing a fluid-moving force, subsequently enhancing the channel formation process and, in effect, facilitating the evacuation of fluid containing excess cytokines, including those that upregulate collagen synthesis.

Rutoside

Rutosides are a group of compounds derived from the horse chestnut (*Aesculus hippocastanum*), a traditional herbal remedy for treating edema formation in chronic venous insufficiency.[25] Cesarone et al evaluated the effects of hydroxyethyl rutoside at a dose of 1 g/day on the prevention and control of flight microangiopathy and edema in subjects with varicose veins and moderate chronic venous insufficiency when flying for more 11 h.[26] They concluded that hydroxyethyl rutoside (at 1 g/day) was useful and effective in reducing the increased capillary filtration and in controlling leg edema in patients with venous hypertension on long-haul flights. In brief, hydroxyethyl rutoside controls distal edema in venous hypertension and also improves the microcirculation by improving the venoarteriolar response and by controlling the capillary filtration rate.

Bergstein[27] investigated the effect of hydroxyethyl rutoside in pregnant women with varicose veins. The number of patients reporting subjective improvement in the active drug group was significantly greater than in the placebo group. The patients receiving hydroxyethyl rutoside had a decreased leg circumference at the end of the study. Throughout the eight-week period of the trial, there were only minimal side-effects, and healthy babies with good Apgar-scores were delivered.

Reflexology

Reflexology involves the application of pressure to reflex areas of the hands or feet to produce specific effects in other parts of the body. The thumb and finger technique used differs from massage and resembles a caterpillar-like movement (Figure 1). Reflexology is not a new therapy, and evidence exists to suggest it was used for healing by the early Chinese, Egyptians and North American Indian tribes.[28] Early in the 20th century, a United States ear, nose and throat specialist, Dr. William Fitzgerald, observed that applying pressure to specific areas of the hands and feet resulted in an anaesthetizing effect on other specific areas of the body.[29] Using these findings, he divided the body into 10 longitudinal zones (5 on each side of the body) terminating in the toes and fingers and suggested that a direct link existed between these areas and the organs of the body within a given zone.

Reflexology is a complimentary natural healing therapy that can help the body, mind and soul on many levels and can definitely help in reducing swelling in the feet as the reflexes of the feet receive acupressure treatment during their session.[30]

The lymphatic reflexology technique can be used to treat specific conditions, such as leg, foot and generalized edema, as it moves extravascular fluid without disturbing the intra-

Figure 1: Reflexology is the Gentle Manipulation or Pressing of Certain Parts of the Foot to Produce an Effect Elsewhere in the Body.

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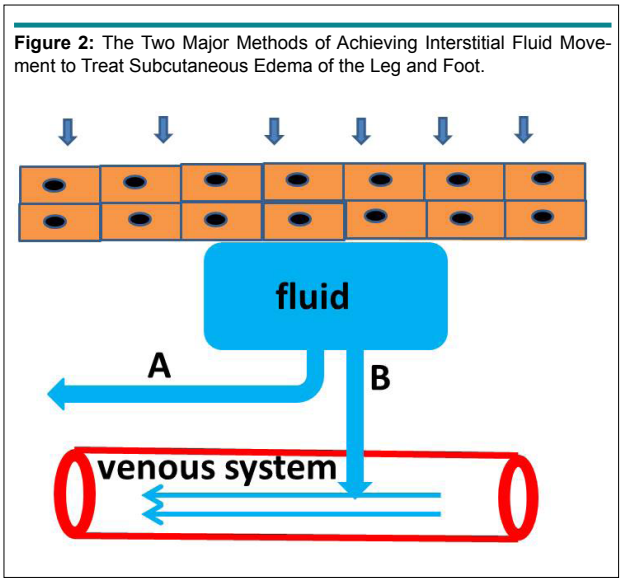
Figure 2: The Two Major Methods of Achieving Interstitial Fluid Movement to Treat Subcutaneous Edema of the Leg and Foot.



vascular fluid.[31,32] The technique mimics the lymphatic drainage action of the body, i.e. interstitial fluid moves from the lymphatic capillaries to the lymphatic veins and trunks and returns to the circulatory system at the subclavian vein.[32]

Mollart[33] studied the effects of lymphatic reflexology techniques, relaxing reflexology techniques and a period of rest on ankle and foot edema in late pregnancy. The finding indicate that the lymphatic reflexology techniques (and to a lesser extent relaxing reflexology techniques) have a non-significant clinical effect on reducing ankle and foot edema compared with a period of rest. However, participants perceived the lymphatic reflexology technique as being more effective in symptom relief than relaxing reflexology or a period of rest. A large percentage of lymphatic reflexology technique recipients have reported noticing less swelling and tightness in their feet after a session than relaxing reflexology recipients and rest recipients. Reflexology significantly assisted women in coping with symptoms in late pregnancy with a reduction in the levels of stress, tension, anxiety, discomfort, irritability, pain, and tiredness.

Here is an effective edema protocol that Moshe shared at the recent Reflexology Association of America conference.[34] It is a good preventative procedure for pregnant women and excellent when edema exists for any reason. If the edema is a result of an injury to the foot, then be very careful with the first two steps. Move the joints slowly and only so much as to not inflict pain on the individual. 1: Many repetitions of Pump – fast dorsiflexion. 2: Rotate the ankle joint, many times in both directions. Take through the full range of motion. 3: Specific attention has to be paid to the urinary, lymphatic and colon reflexes. Lymphatic reflexes are worked distal to proximal.

Botting showed that a few studies of reflexology have been performed abroad, but English translations of the full research reports are not readily available to allow for a critical analysis of their methodology.[29] In addition, studies reported in the 'gray literature' (gray literature: "That which is produced on all levels of government, academics, business and industry in print and electronic formats, but which is not controlled by commercial publishers") suggest that reflexology may be an effective treatment, but these are small-scale studies with inadequate description of the details of the methodology. Therefore, collaboration between reflexologists and experienced researchers should be encouraged, as good-quality studies are required to determine the effectiveness of reflexology.

CONCLUSIONS

We have roughly described two major ways of achieving interstitial fluid movement in the treatment of subcutaneous edema of the leg and foot (Figure 2). One way involves fluid movement in the extravascular space (Figure 2-A). Another involves fluid movement from the extravascular space into the venous system (Figure 2-B). The methods of leg elevation, foot massage, intermittent pneumatic compression and reflexology mainly move interstitial fluid in the extravascular space. In contrast, the methods of water immersion, bandage, stockings and taking rutoside mainly move interstitial fluid from the extravascular space into the venous system. All of these approaches can result in diuresis. Knowing these mechanisms, the effects depend upon the thoughtful selection of the best available treatment.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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