

Timely management of a primary lower-limb lymphoedema through the combination of the complete decongestive therapy and the pneumatic compression device: a 4-day treatment

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Key words

Case Reports, drainage, lymphoedema, manual lymphatic, rehabilitation

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Abstract

Background: This case study concerns a 44-year-old man who suffered from primary lymphoedema in the left lower limb. This particular patient visited the author's centre to receive treatment for the lower limb. However, immediately after the start of the sessions, an emergent professional obligation forced him to go abroad immediately for a month. This development meant that the time available for treatments with that particular patient was much shorter than expected. So, it was decided to do double sessions for 4 days to combine the Complete Decongestive Treatment (CDT) with the application of the Intermittent Pneumatic Compression (IPC) device, which the patient applied in the treatment centre for 40 minutes the same afternoon. **Method:** The method used was a single-subject case report. Written consent was obtained from the patient's representative. **Results:** Within 4 days, there was a very large reduction in the circumference of the patient's foot, to the extent that the skin could not adapt to this reduction and created folds. **Discussion:** The usual treatment time for primary lymphoedema ranges from 10 to 15 days. However, using the specific treatment regimen showed positive results for the patient in a much shorter period of time. **Conclusion:** This combination could have the desired effect in a much shorter period of time in other patients with primary lower-limb lymphoedema.

Primary lymphoedema is caused by the underdevelopment of the lymphatic system (Zuther and Norton, 2013). This deformity of the lymphatic system may be related to either underdeveloped lymphatic vessels (hypoplasia) or overgrown ones (hyperplasia) (Pritschow and Schuchhardt, 2010). Primary lymphoedema can occur either immediately after birth or during the course of a person's life (Kerchner, et al, 2008; Hansen, 2015). Many times, the triggering conditions for the onset of primary lymphoedema are unknown. A small injury or a bite from an insect often causes the lymphatic system to overload and fatigue, thus contributing to the manifestation of the condition (Kerchner, et al, 2008; Myers, 2012).

When primary lymphoedemas occur, they are treated in the same way as secondary ones, since the therapeutic approach to primary lymphoedemas is no different from that of secondary ones (Pritschow and Schuchhardt, 2010). The treatment of choice for physiotherapeutic care includes the Complete Decongestive Therapy (CDT) consisting of lymphatic drainage with the hands through Vodder-type massage manipulations (Manual Lymph Drainage; MLD), bandaging the limb with special short-stretch elastic bandages, compression therapy (CT), skin care and gentle exercises (International Lymphoedema Framework, 2006; Pritschow and Schuchhardt, 2010; Moffatt et al, 2012). There are two phases treatment phases: during the first stage,

the decongestion of the limb is completed, where with daily treatments maintaining the bandage for a period of 10 to 15 days, the drainage of the lymphatic fluid is achieved and the circumference of the foot is reduced. The second phase of treatment includes the application of a custom-made stocking, which the person with lymphoedema is instructed to wear for the rest of their life throughout the day, while at night during sleep the stocking is removed (Pritschow and Schuchhardt, 2010). The stocking should be replaced at regular intervals (twice a year depending on the manufacturer) (Pritschow and Schuchhardt, 2010). Another option as a means of treating primary lymphoedema is the intermittent pneumatic compression (IPC) devices (Feldman et al, 2012).

According to many studies, external compression is perhaps the most important part of treatment (Moffatt et al, 2012; Hansen, 2015; Tambour et al, 2018). One of the most promising methods of treating lymphedema is IPC (Feldman et al, 2012; Myers, 2012; Zuther and Norton, 2013). The very high number of cases, estimated by the World Health Organization (WHO) at around 300 million (Zaleska et al, 2014), has led to the need for adequate simple, inexpensive and easily accessible compression devices around the world (Zaleska et al, 2014).

The purpose of this case report is to describe the immediate positive effect of the therapeutic combination of the CDT and IPC with double daily sessions within 4 days in treating a primary lower-limb lymphoedema. Normally, this type of lymphoedema management requires 10 to 15 days for adjustment. Bandaging and daily sessions often tire the patient. Thus, this case was considered to be worth recording.

Case description

The case involved a 44-year-old man who, apart from being obese (Body mass index, BMI: 42.02), did not have any other health problems. This particular patient suffered a second degree sprain to the left ankle some 16 months previous, which immobilised him for 15 days. The patient's gait returned to normal about 4 months after the injury, whereas the swelling in the ankle did not subside. In the last 12 months the patient gained extra weight (BMI: 45.52, increased by 8.32%) and the circumference of his ankle increased sharply. Although previously he had not paid much attention to this, the large swelling of his foot led him to visit a doctor, where he was diagnosed with primary lymphoedema. This patient was experiencing functional limitations as he had difficulty wearing his trousers and shoes.

He came to the physiotherapy studio to ask for help in managing and treating his lymphoedema. The usual treatment for is the application of the CDT which, as mentioned above, is performed in two phases. For the first phase (decongestion phase) the amount of time needed depends on the amount of swelling and tissue firmness (Pritschow and Schuchhardt, 2010). Based on previous cases in the author's centre and his and his colleagues' clinical estimation, about 10 to 15 days are

Circumferences in cm		Length of body part K-T in cm			
left	right				
		front			
		back			
		Length measurements in cm			
		left right			
		∅T	∅T		
		∅H	∅H		
		∅G/∅K	∅G/∅K	(for panty hose crotch measurements)	
		∅F	∅F		
		∅E	∅E		
		∅D	∅D		
∅C	∅C				
∅B'	∅B'				
∅B	∅B				
∅A Foot length (Back of heel to cA)	∅A Foot length (Back of heel to cA)				
∅Z Total foot length (indication only if desired with closed toe)					

Figure 1. Lower-extremity lymphoedema measurement sheet.

required. However, after the first session, this patient announced that he had to urgently go abroad for a month and that he had only 4 days to complete the treatment. This necessitated a change to the treatment plan. As such, double sessions were considered, by combining the CDT with an IPC device on the same day.

Measurements

The measurement of the foot was performed with a tape measure at the reference points and filling in the appropriate sheet (Figure 1). A total of two measurements were performed. One at the beginning, before the start of the first treatment (baseline measurement) and one on the fourth day after the completion of the treatment. The measurement of the fourth day, in addition to evaluating the result of the treatment, was carried out to take measurements for a special custom-made stocking. However, due to the fact that receiving the custom stocking would take a few days, on the last

day before he went away on business, the patient was supplied with a standard (non-customised) stocking from the author's centre. This was done so that there would be no recurrence of the lymphoedema until he received his custom stocking.

Daily therapy protocol

The patient came to the physiotherapy studio in the morning where the CDT was performed. This lasted 1 hour and included massage, skin care, bandaging and the performing of gentle exercises.

MLD and skin care

The MLD was performed using the manipulations from Vodder's massage, (International Lymphoedema Framework, 2006), while the sequence of manipulations was done according to the instructions of Pritschow and Schuchhardt (2010). The following massage manipulations were applied: stationary circles in the area around the inguinal lymph nodes, pump



Figure 2. Bandaging of lymphoedema.



Figure 2. Left lower-extremity lymphoedema at base line measurement.



Figure 2. Left lower-extremity lymphoedema at the end of the fourth day.

strokes and stationary circles in the thigh area on the anterior inner and outer surface, stationary circles in the area of the outer lateral ligament of the knee, scoop strokes in the gastrocnemius muscle, stationary circles around the lateral and medial malleolus, pump strokes in the area of the Achilles tendon, stationary circles and pump strokes on the dorsal surface of the sole. Upon completion of the massage, a moisturiser (moisturising body lotion for dry skin) was applied to the area of the foot to prevent dehydration of the skin.

Compression therapy

The lower limb was bandaged with short-stretch elastic compression bandages. The following were used to bandage the lower limb: one box of lower-limb jersey (Tricofix), one box of 4 cm elastic bandages for toes (Elastomul), 10 cm Artiflex substrate, one 6 cm Comprilan bandage, two 8 cm Comprilan bandages, one 10 cm Comprilan bandage and one 12 cm. Due to the fact that the swelling was located from the middle of the gastrocnemius muscle and below, the bandage was applied a little below the knee joint. The bandaging was applied based on the instructions of Pritschow and Schuchhardt (Pritschow and Schuchhardt, 2010).

However, owing to the fact that the patient had great difficulty wearing his shoes with the bandage, he requested that the bandage on his toes be removed (Figure 2). The bandage was removed experimentally and after finding there was no swelling in the toes, it was decided that the toes remain free of bandaging for 4 days.

Exercises

Upon completion of the bandage, the patient performed some very gentle exercises for the lower limb, such as lifting the toes and heels of the feet, toe pump exercises. The exercises that were performed lasted 10–15 minutes and are recommended by the international consensus guidelines (Executive Committee, 2016).

During afternoon therapy, the patient returned to the centre in the afternoon, when the bandage was removed and he entered the IPC device (Xiamen Lymphedema Pneumatic Compression Device, China) for 40 minutes. Immediately after the application of IPC, a procedure of shorter duration (about 10 minutes) MLD was followed than the one performed in the

Table 1. Pre- and post-treatment measurement values and percentage of circumference reduction.

Location	Baseline measurement	Fourth day	Circumference reduction %
Circumference of the tibia below the knee	56 cm	47 cm	16%
Tibia circumference in the ankle area	58 cm	28 cm	51.7%
Circumference of the foot in the malleoli area	56 cm	41 cm	26.7%
Circumference of the sole in the metatarsal area	30.5 cm	27 cm	9.9%

morning, re-bandaging and the patient then left for his home until the next morning.

The above schedule was followed for 4 days, as this was the time frame that we had at our disposal to complete the treatment.

Results

After the 4th day of treatment, the results were very positive as there was a noticeable decrease in all the reference points of measurement of the lower limb. In fact, this reduction was so great and abrupt that the skin in the ankle area could not be adapted to this reduction and folds were created (Figures 3&4). More specifically, the circumference of the tibia below the knee was reduced from 56cm to 47 cm (reduction corresponding to 16%), the tibia circumference in the ankle area was reduced from 58 cm to 28 cm (reduction corresponding to 51.7%), the circumference of the foot in the malleoli area was reduced from 56 cm to 41 cm (reduction corresponding to 26.7%) and the circumference of the sole in the metatarsal area was reduced from 30.5 cm to 27 cm (reduction corresponding to 9.9%) (Figures 3 & 4; Table 1).

Discussion

According to current literature, physiotherapy treatment of primary lymphoedemas does not differ from the management of secondary ones (International Lymphoedema Framework, 2006; Pritschow and Schuchhardt, 2010) The CDT is an effective treatment for lower-limb lymphoedema, able to reduce the volume of lymphoedema and restore function (Rockson, 2000). However,

treatment often proves to be tedious for the patient. Keeping the bandage on for 24 hours for a period of 10 to 15 days and daily treatments can act as a deterrent to the patient following this treatment (Pritschow and Schuchhardt, 2010).

The IPC is a method of treating lymphoedema that shows very good results (Feldman et al, 2012). In fact, its use is more indicative of primary lymphoedema than secondary in which lymph nodes have not been removed (International Lymphoedema Framework, 2006; Pritschow and Schuchhardt, 2010). However, although the decongestive ability of these devices is high, it is necessary to bandage the limb after treatment, in order to maintain volume reduction. In addition, we have seen in clinical practice that performing MLD on the lymph after using an IPC device aids in the improved adaptation of the skin and the smoother absorption of the lymphoedema. Therefore, based on the author and his colleagues' clinical experience the application of the IPC should always be combined with the CDT, in order to achieve better results.

The results of this treatment regimen were made evident faster, comparative to other cases. This may be due to the combined application of the CDT and IPC and the double treatments in the same day. It is possible that this combination may yield faster results in patients with primary lower-limb lymphoedema. Further investigation of this combination is recommended, in order to determine whether our findings can be applied through new research as a guideline in the treatment of patients with primary lymphoedema.

Implications for practice

Due to the fact that lymphoedema is a chronic condition, its proper treatment presupposes the long-term compliance of patients with it. A person with lymphoedema, whether primary or secondary, should follow lifelong management treatments for their lymphoedema (Pritschow and Schuchhardt, 2010), so it is important to look for ways and methods through which this treatment time can be reduced.

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