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Evaluate the effectiveness of lymphatic drainage massage on a secondary lymphedema multiple sclerosis patient: A case study

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Abstract

Purpose

This case study aims to evaluate the effectiveness of lymphatic drainage massage in decreasing bilateral secondary lymphedema in a patient with multiple sclerosis.

Background

Secondary lymphedema is common in multiple sclerosis patients¹; however, there is little scientific literature regarding the effectiveness of treating this edema using lymphatic drainage massage². Currently, the majority of research regarding the treatment of secondary lymphedema using manual therapies is specific to the treatment of edema following surgical intervention for breast cancer. Consequently, the field of research surrounding the treatment of lymphedema secondary to multiple sclerosis using manual therapies is open to advancement.

Methods

The patient in this case study presented with bilateral lymphedema in the lower extremities secondary to a multiple sclerosis diagnosis. The patient received lymphatic drainage massage of the lower extremities once per week for 45 minutes of a 60 minute treatment session for a period of ten weeks. Limb circumferences were recorded before and after each treatment at specific intervals along the patient's calf, ankle and foot.

Results

Measurements of both calf and foot circumference pre and post-treatment decreased bilaterally overall within each treatment, as well as over the course of the ten week session. However pre-treatment and post-treatment girth measurements of the patient's ankles increased overall within each treatment as well as over the course of the ten week treatment period.

Discussion and Conclusion

The results of this case study contradicted the projected treatment outcomes, necessitating the need for further research into this field prior to establishing definitive clinical guidelines for treating secondary lymphedema in multiple sclerosis patients.

Keywords: Lymphatic drainage massage; multiple sclerosis; lymphedema

Conflicts of Interest: None to declare.

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Introduction

Edema is the accumulation of fluid within the interstitial space between the tissues, which is the result of an altered physiological process in the body affecting lymphatic system function¹. It is not a disease but is rather an acquired condition which results from a disease or trauma. It may also occur secondary to a medical intervention that obstructs the lymphatic vessels such as surgery or radiation². In order to understand the presentation of edema in a clinical setting, it is first important to understand the anatomy and physiology of the lymphatic system.

The lymphatic system is comprised of lymphatic capillaries, vessels, nodes and organs³. The primary goal of the lymphatic system is to drain excess interstitial fluid and leaked plasma proteins from the capillary beds and return them to the circulatory system³. Blood within the circulatory capillaries is composed of various proteins suspended in plasma along with red and white blood cells³. As this blood passes through the capillary beds, exchange of substances such as oxygen and nutrients occurs³. However, slightly more fluid is pumped through the arteriole ends than is absorbed at the venous ends of the capillary beds¹. This excess interstitial fluid is collected by lymphatic capillaries and once in the lymphatic system, it is called lymph¹. This lymph is then filtered and pumped back toward the heart through lymphatic vessels, working against gravity with the aid of the skeletal muscle and respiratory pumps³. This system functions efficiently so long as the amount of fluid entering the interstitial tissues from the arteriole ends of the capillaries is equal to that taken up by the venules and lymphatic capillaries combined⁴. When this balance is upset, edema results¹.

This homeostatic equilibrium can be altered by numerous events. Edema can be caused by increased permeability of the capillaries as a result of inflammation or local trauma¹. It can also occur due to obstruction of lymphatic flow caused by infection, surgical removal of lymph nodes or scarring¹. This leads to the retention of plasma proteins within the interstitial fluid which in turn, attracts more fluid to the area causing further edema⁴. Increased capillary or venous pressure such as with heart failure or thrombophlebitis can also cause edema⁵. If the accumulation of interstitial fluid within the tissue persists into a chronic state, then the individual is said to have lymphedema¹. Lymphedema can be either primary or secondary in nature. Primary lymphedema is caused by a congenital decrease in the number, size or function of lymphatic capillaries¹. Secondary lymphedema can be caused by general systemic conditions and diseases, trauma resulting in local lymphatic obstruction, or surgical intervention².

Multiple sclerosis (MS) is a chronic, progressive neurodegenerative condition in which demyelination of the upper motor neurons within the central nervous system occurs¹. Myelin sheaths wrap around the axons of nerves, insulating the nerve and speeding the transmission of impulses¹. Demyelination of the nerves does not alone account for the persistent functional disturbances associated with MS⁶. A build up of scar tissue called a sclerotic plaque forms at the site of demyelination which can cause a slowing, alteration or blockage of local nerve impulses¹. However, the central nervous system (CNS) appears to have a different threshold for producing symptoms from one individual to another, which is reflected in the differing symptoms seen between Multiple Sclerosis patients⁶. Consequently the specific symptoms that each person experiences with MS will vary according to the location of the lesion within the central nervous system¹.

Common clinical presentations for patients with MS include chronic fatigue, tingling and numbness, spasticity, altered biomechanics and inefficient body temperature regulation¹. Reduction of mobility and muscle strength is typical in MS patients due to the presence of sclerotic plaques within the CNS and in some, this can result in partial or complete limb immobilization¹. This immobility can lead to secondary lymphedema of the affected limbs. In MS patients with muscle spasticity, involuntary spasms not only occur in the affected muscle but also occur in the capillaries serving that muscle. These vascular spasms, known as lymphangiospasm modify the uptake of interstitial fluid from the capillary beds, also resulting in secondary lymphedema⁵.

The relationship between multiple sclerosis and secondary lymphedema is well documented. In a 2006 study by Solaro et al., of 205 patients with a confirmed MS diagnosis, 93 patients (45% of the sample) presented with significant lymphedema of the lower extremities when assessed using lymphoscintigraphy (lymph node mapping)⁵. There is less research however, investigating the treatment of MS-related lymphedema using manual therapies. A systematic review was conducted at McMaster University in 2012 that compared the effectiveness of several conservative manual therapy treatments for secondary lymphedema. This review compared 30 randomized control trials and 6 cohort studies in which patients received manual therapy as treatment for lymphedema secondary to any condition except a parasitic filariasis infection. Three of the randomized control trials (RCTs) failed to show superiority of intermittent pneumatic compression (inflatable garments for the limbs which are intermittently inflated and deflated to mimic the skeletal muscle pump) over lymphatic drainage massage².

However an additional two RCTs reported significantly greater reductions in arm circumference with intermittent pneumatic compression than with manual lymphatic drainage². One of the observational studies found that patients receiving manual lymphatic drainage in addition to compression stockings experienced less pain than those receiving bandaging alone, although there were no statistically significant reductions in limb volumes between the two groups². As is evident from these conflicting results, further research is necessary prior to establishing definitive clinical guidelines for treating secondary lymphedema in multiple sclerosis patients.

As an initial step in establishing a body of research on which to base these guidelines, this case study aims to evaluate the effectiveness of lymphatic drainage massage in decreasing secondary lymphedema in a patient with multiple sclerosis.

Case History

The patient in this case report is a 55 year-old female diagnosed with multiple sclerosis fourteen years prior to initiation of the study. In 2001 the patient woke up with facial paralysis through the right side of her face, which spread inferiorly through the right side of her body over the course of the week. A diagnosis of multiple sclerosis was confirmed shortly after via magnetic resonance imaging (MRI) which was consistent with a family history of MS. Through the aid of traditional medical and pharmacological care in combination with continual manual therapies, the client has since regained both motor and sensory innervation through her entire right side.

The patient's primary complaint at the start of the ten week treatment course was that her legs felt extremely heavy and the pressure through her lower limbs felt tight and restrictive.

The patient was concerned that should the edema in her lower limbs continue to increase, it might limit her ability to comfortably put her feet into her shoes and limit her ankle mobility as she walked.

At the time of intake, the patient presented with bilateral secondary lymphedema of the lower extremities distal to the tibiofemoral joint which had been present for many years. This lymphedema was accompanied by bilateral varicosity through the posterior compartment of the leg, as well as bilateral venous stasis dermatitis (discoloration due to vascular insufficiency⁶) around the medial and lateral malleoli. The patient underwent a bilateral percutaneous transluminal angioplasty in 2011 to address chronic venous insufficiency, however she had not received follow up treatment since. The patient also presented with paresthesia bilaterally through the plantar aspect of her feet which she described as a “tingling sensation”. Her symptoms were aggravated with prolonged sitting or standing, as well as with heat and became progressively worse over the course of the day. Throughout the study, the patient was taking Baclofen twice per day to decrease MS-induced muscle spasms, Pregabalin once per day to decrease pain in her feet due to edema and Zopiclone as required to aid with her sleep⁷. The patient was not receiving any additional manual therapies during the course of the ten week treatment period.

Assessment

Upon initial intake, a thorough health history was recorded and a treatment plan centred around lymphatic drainage was established to meet the patient’s goal of decreasing her lymphedema.

Treatment outcomes included pre-treatment and post-treatment limb circumference measurements, which are indicative of overall changes in limb volume⁴.

The limb measurements used herein were based on previous work done by Brodovicz et al. in 2009. In a cross-sectional observational study comparing eight methods to quantitatively measure peripheral edema, circumference measurements performed at specific anatomical locations showed the highest inter-examiner reliability of the eight methods tested⁸. This finding is further supported by Karges et al. as well as Sander et al., both of whom determined that calculating lymphedematous arm volumes via circumferential measurements correlated highly with volumes determined through water displacement methods^{9,10}. In establishing a protocol on which to base segment lengths (distance between consecutive circumference measurements) Mayrovitz et al. suggest that 4-cm, 8-cm and 12-cm increments are primarily used in the literature to track limb volume changes¹¹. However, using larger segment lengths meant fewer required circumference measurements before and after each treatment. As time restraints were present in this series of treatments, larger variable segment lengths were used as opposed to circumference measurements at fixed intervals along the lower limbs.

Bilateral girth measurements of the patient's calves, ankles and feet were taken using a standardized flexible tape measure. The calf girth measurements were taken 16cm inferior to the patient's tibial tuberosity, wrapping the tape measure around her posterior calf. Girth measurements of the ankle were then taken by wrapping the tape measure inferior to the patient's medial and lateral malleoli. Lastly, girth measurements of the patient's feet were taken by wrapping the tape measure proximal to the tuberosity of the fifth metatarsal laterally and just

distal to the navicular tuberosity medially. Each circumference measurement was done once and the patient was treated and measured by the same therapist throughout the course of treatment.

Treatment Plan

The primary objective throughout this ten week treatment course was to decrease secondary lymphedema of the lower extremities bilaterally. Treatments were performed once per week, at a consistent time of day, for 60 minutes following a 15 minute assessment in a clinic-based setting. Of this 60 minute treatment time, 45 minutes were devoted to performing lymphatic drainage of the lower extremities and the additional 15 minutes were used to treat any concerns that the client presented with that day superior to the level of T12.

Lymphatic drainage techniques were performed following the principles of manual lymph drainage, however it should be noted that the practitioner providing the treatments was not certified in manual lymphatic drainage. The treatments began with thoracic pumping bilaterally while the patient was supine to exaggerate the action of the respiratory pump¹. The therapist placed both hands on the anterior the therapist passively followed the movement of the thorax and upon inhalation, the therapist resisted the upward motion of the thorax with counter-pressure for several seconds before releasing⁴. This was repeated five times at the beginning of each treatment. Next the thoracic and right lymphatic ducts were treated, collectively called “terminus”, as this is where the lymphatic vessels terminate (Figure 1), and expel the remaining filtered lymph back into the right and left subclavian veins³. This enhances drainage for the rest of the body, and is a necessary first step regardless of the body part that is being addressed with lymphatic drainage massage⁴. The therapist positioned two fingers bilaterally over these ducts,

which are located approximately where the sternocleidomastoid muscle originates on the superior aspect of the clavicle. The therapist then performed 5-7 repetitions of nodal pumping. Following this, the therapist pretreated the inguinal lymph nodes using the palm of her hand positioned inferomedially while pumping approximately 5-7 times bilaterally. The anterior legs were then treated using small stationary circles which provided an oval-shaped stretching of the skin with the palmar surface of the hand in the direction of the inguinal nodes (Figure 2). This motion was repeated moving proximal to distal and medial to lateral, at a rate of approximately two strokes per second.

Local scoop techniques in which the therapist's palmar surface was contoured around the anterior aspect of the leg were then used distal to the tibiofemoral joints moving inferiorly to the dorsal aspect of the foot. The patient was then turned into prone at which point a flat, pumping technique was used at the gluteal fold 5-7 times bilaterally to prime the nodes. The medial posterior thighs were treated using small stationary circles toward the inguinal nodes (Figure 2) while the lateral posterior thighs were treated using small stationary circles in a lateral direction. Local scoop techniques were then used from the popliteal fossa inferiorly toward the calcareous. This was followed by small thumb circles distally down the plantar aspect of the feet bilaterally⁴, and thus concluding the lymphatic drainage portion of the treatment.

The remaining 15 minutes of treatment time were used to address the patient's specific goals or requests for that session, provided the work was proximal to the level of T12 and would not interfere with the lymphatic drainage massage performed on the lower extremities. The only modification made to these treatments occurred in the ninth week of treatment, when the patient

asked to be positioned in side lying for her massage due to unilateral muscle spasm pain through her T9-T10 intercostal region.

One of the patient's primary concerns upon entering this case study was that her lymphedema might eventually inhibit her ankle mobility to a degree that could affect her ability to walk. Consequently, appropriate homecare was given to aid the patient in maintaining her ankle range of motion despite her lymphedema. Throughout the ten week study period, the patient was instructed to perform pain-free Active Range of Motion (AROM) of the talocrural and subtalar joints in all ranges three times per day. In addition, the client was instructed to elevate her lower limbs bilaterally whenever possible to aid in both venous and lymphatic return.

Results

Specific pretreatment and post-treatment calf, ankle and foot girth measurements are presented as absolute values in Appendix A-Tables 1 and 2. Overall pre and post-treatment changes in girth measurements for each subsequent treatment were compared bilaterally for calf, foot and ankle circumferences as demonstrated in Figures 3, 4 and 5 respectively.

As the trends in Figures 3 and 4 demonstrate, bilateral decreases in both foot and calf girth measurements were observed. The mean change in bilateral pre and post-treatment girth measurements were -0.31cm for calf circumference and -0.03cm for foot circumference. This overall decrease in girth measurement of the patient's calves and feet bilaterally is consistent with the overall treatment goal to decrease secondary lymphedema.

In contrast, change in ankle circumference between pre and post-treatment measurements increased bilaterally over the course of the ten week treatment period as demonstrated in Figure 5.

Discussion and Conclusions

The purpose of this case study was to provide preliminary evidence as to whether lymphatic drainage massage could be a useful tool in decreasing secondary lymphedema in a patient with multiple sclerosis. The current study identified an overall decrease in circumference of the patient's calves and feet between pre and post-treatment measurements. Additionally, there was an overall decrease in girth measurement of these two segments over the course of a ten week treatment period. However, this study also concluded that there was a simultaneous increase between pre and post-treatment girth measurements of the patient's ankles, as well as an overall

increase in the circumference of the patient's ankles bilaterally over the course of the study period. These conflicting results could be due to a number of internal and external confounding factors, not limited to, but including the instrumentation chosen to perform the girth measurements, the number of measurements, and segment lengths chosen and the frequency of treatments.

Currently, the majority of research regarding the treatment of secondary lymphedema using manual therapies is specific to the treatment of lymphedema following surgical intervention in response to breast cancer². In a systematic review comparing the effectiveness of several conservative manual therapy treatments for secondary lymphedema, 32 of the 36 studies extracted involved participants with lymphedema secondary to breast cancer². Oremus et al. found that most active manual therapy treatments, including lymphatic drainage massage, reduced the size of lymphatic limbs². However due to the fact that there was very little homogeneity in areas such as length of follow up, treatment protocols and outcome measures, the researchers were unable to determine whether any one type of manual therapy treatment was superior². Additionally, the majority of the extracted studies in this review were conducted post-surgically on those with a history of breast cancer and therefore these results cannot be generalized to those with other conditions causing secondary lymphedema.

Consequently, the field of research into treating lymphedema secondary to multiple sclerosis using manual therapies is open to advancement. This is a particularly relevant field for massage therapists working with MS patients as approximately 45% of multiple sclerosis patients present with secondary lymphedema⁵.

With this in mind, future studies in this field should consider using fixed segment lengths as opposed to variable segment lengths at fixed anatomical positions. It has been suggested that segment lengths of 4-cm, 8-cm and 12-cm could all be used with comparable results so long as the same segment lengths are used consistently throughout the evaluation^{4,12}. By performing the pre and post-treatment circumference measurements at fixed intervals, segmental volumes can be more readily determined which would allow the researchers to determine the volume of the limb of interest by the sum of the segment volumes¹¹. Efficacy of the lymphatic drainage treatments could therefore be assessed by comparing volume reductions for each limb separately. In addition, future therapists should consider using a tension controlled measuring tape as opposed to a standard measuring tape to minimize measurement error due to differences in the amount of tension applied to the tape⁸. Regarding treatment frequency, there is little data to support the benefits using lymphatic drainage massage more frequently than was performed in this study. However future therapists looking to replicate this work may choose to alter treatment frequency.

This case study was intended to provide a foundation regarding the effectiveness of treating lymphedema secondary to multiple sclerosis with lymphatic drainage massage. In order to establish clinical guidelines for treating these patients, further research will be required.

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