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Karlie D. Kimball

Elizabethtown College, kimballk@etown.edu

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LymphaTouch® as a Tool for Manual Lymph Drainage: A Therapist's Perspective

Karlie D. Kimball

Elizabethtown College

Introduction

Lymphedema, swelling due to impaired flow of lymph fluid, is a result of interrupted lymph circulation of the lymphatic system (McLafferty, Hendry, & Farley, 2012). This project aims to review and synthesize literature regarding the physiology of the lymphatic system, treatment of lymphedema involving the use of manual lymph drainage (MLD), and technology advances in the use of negative pressure in treatment and intervention in lymph flow. In addition to the literature review and synthesis, one Certified Lymphedema Therapist and physical therapist will be interviewed and asked to provide commentary on her experience using an advanced technology, the LymphaTouch®.

Background

Lymphatic Physiology

The lymphatic system is part of the circulatory system that carries lymph to the heart; it also plays a major role in the immune system. It plays a key role in keeping your body healthy by filtering out and destroying microorganisms and other dangerous substances that may enter the body (McLafferty et al., 2012). A healthy lymphatic system fights illness and injury to keep the body healthy (*The Lymphatic System*, 2010). The lymphatic system is a part of the circulatory system that uses a one-way transport system to move lymph from body cavities and interstitial spaces to the heart (McLafferty et al., 2012). Lymph is a watery fluid that carries fluids throughout the lymphatic system and into the circulatory system (*The Lymphatic System*, 2010). This lymph is carried through lymphatic capillaries to lymphatic vessels, to the lymph nodes, tonsils, and spleen. (McLafferty et al., 2012). Lymphatic vessels and capillaries, similar to blood vessels and capillaries, act as one-way valve and that prevents the backflow of fluid. Within the lymphatic system, there are two major ducts. The right lymphatic duct drains lymph from the

right upper quadrant of the body and the thoracic duct drains lymph from the rest of the body (Ganong, 1993). Additionally, the system has open junctions between the endothelial cells, which allows the lymph to move freely (Ganong, 1993). Valves allow lymph to only move forward, not retroactively (Ganong, 1993). Lymph contains clotting factors, fats, and protein. While lymph generally has lower protein content than plasma, it is dependent on the source of the lymph. For example, the liver contains 6.2 g/dL of protein, whereas the skeletal muscle and skin only have 2 g/dL and the choroid plexus and ciliary body have 0 g/dL (Ganong, 1993).

Lymph nodes are found in clusters throughout the entire lymphatic system. They are small and are covered in connective tissue. Lymph passes through one or more node to scavenge for bacteria and other organisms, before entering the bloodstream (*The Lymphatic System*, 2010). Bacteria and other harmful substances are filtered out by macrophages and lymphocytes, but when it cannot be removed, it causes swelling of the tissues, called lymphedema (*The Lymphatic System*, 2010).

A healthy lymphatic system works to regulate homeostasis of tissue fluid, immune cell trafficking, removal of cellular debris, and lipid absorption/transport from the gastric system (Ridner, 2013). It also plays a large role in fluid exchange at the capillaries. It does this through four different forces interacting including capillary pressure, negative interstitial pressure, interstitial fluid colloid osmotic pressure, and plasma colloid osmotic pressure (Ridner, 2013). In a healthy system, the fluid is sent into interstitial spaces because of this pressure and most of the fluid is returned to the blood. The lymphatic system is responsible for removing any remaining fluid in the interstitial space. If any of these four pressures are varied, it can lead to lymphedema (Ridner, 2013).

Lymphedema

Lymphedema occurs when the lymph within the lymphatic vessels is not removed, causing swelling in a limb (McLafferty et al., 2012). Typically, this lymph is protein rich (Ganong, 1993). Lymphedema can either be primary or secondary. Primary lymphedema is caused by a genetic abnormality, whereas secondary is caused by a medical condition such as trauma of the surgery and radiotherapy of cancerous tumors (Buragadda, Alhusaini, Melam, & Arora, 2015). Symptoms of each of the different kinds of lymphedema blend together, so that even if they have primary lymphedema, it may look secondary. Lymphedema can develop shortly after cancer treatment or can present years afterward (Buragadda et al., 2015).

The diagnosis of lymphedema is key in determining how it is treated. Lymphedema is commonly diagnosed through medical history and physical exam; however co-morbid conditions like obesity, endocrine dysfunction, and infection may make diagnosis more difficult (International Society of Lymphology, 2017). When patients have these co-morbid conditions, physicians use imaging techniques like ultrasound or lymphangioscintigraphy to rule out venous diseases, genetic testing to screen hereditary syndromes caused by gene mutations and chromosomal abnormalities, biopsy may be necessary to examine the lymph nodes (International Society of Lymphology, 2017).

There are different stages to differentiate between severities of lymphedema. Stage 0 occurs when there is a latent condition, but swelling is not visible (International Society of Lymphology, 2017). In Stage 1, there is a small amount of fluid with high amounts of protein which may cause pitting, a slight indentation in the swelling (International Society of Lymphology, 2017). Stage 2 is characterized by pitting and elevation does not help in the reduction of the edema (International Society of Lymphology, 2017). Finally, Stage 3 occurs

when there is lymphostatic elephantiasis where there is no pitting, but skin is changed as a result of the edema (International Society of Lymphology, 2017).

Treatment of Lymphedema

Treatment of lymphedema is necessary to ensure that the client is able to live a full and meaningful life despite this condition. It is well recognized that lymphedema can be treated best using Complete Decongestive Therapy (CDT). It aims to reduce the swelling in the limbs either to a “normal” state or to a state where the size of the limb has stabilized (Quirion, 2009). There are four steps within CDT- Manual Lymph Drainage (MLD), compression bandaging, meticulous skin care, and remedial exercises/ patient education (Quirion, 2009).

MLD uses light touch to move the lymph through altering the lymph flow through normal, healthy lymphatics and lymph node basins (Oremus, Daves, Walker, & Raina, 2012). Bandaging and compression therapy serves a variety of different purposes. It works to open up new lymphatic tracts and keep them stimulated, prevents the accumulation of lymph into a recently drained lymphatic tract, and breaks up connective and scar tissue deposits (Mahran & Moshref, 2011). After limb volume reduction, individual compression sleeves are ordered for daily wear (Quirion, 2010).

Because the lymphatic system is so sensitive to change, careful attention to skin care is essential for success in lymphedema management. Because the system is not working correctly in clients with lymphedema, the body cannot easily handle infections and foreign substances, which can cause skin breakdown (Quirion, 2010). By keeping skin clean and clear of infection, skin damage can be avoided. The last part of CDT is remedial exercises and deep breathing to help with venous and lymphatic flow as well as flexibility (Mahran & Moshref, 2011).

LymphaTouch®

LymphaTouch®, a device created in 2009 by developers in Finland, was designed to use negative pressure and high-frequency vibrations to mimic the effects of MLD (Healthy Life Devices, 2017). LymphaTouch® can be beneficial to people with lymphedema as well as athletes and other sport injuries (Healthy Life Devices, 2017).

LymphaTouch® operates on the principle of negative pressure (Vuorinen, Ivarinen, Jurvelin, & Airaksinen, 2013). Negative pressure is used to stimulate fluid flow and heal fibrotic tissues (Iivarinen, Korhonen, & Jurvelin, 2016). The operating principle behind LymphaTouch® is that negative pressure pulls the tissue to increase lymph movement. When used, LymphaTouch® moves the tissue vertically and horizontally in order to move the anchoring filaments that cause the lymph to stay where it is (Healthy Life Devices, 2017). When these filaments are moved, the endothelial cells open, causing lymph to be able to move into the interstitial space (Healthy Life Devices, 2017). From this, the mechanism that causes lymph to move is now activated, allowing for the lymph to be moved to another space (Healthy Life Devices, 2017). The high frequency vibrations work to stimulate the superficial layer of the lymphatic system, while the lower frequency vibrations work to stimulate the deep layer of the lymphatic system (Healthy Life Devices, 2017).

One study done by Vuorinen, Ivarinen, Jurvelin, and Airaksinen (2013) looked at different diagnostic measurements in 13 women who had upper extremity lymphedema as a result of a mastectomy. Researchers looked at range of motion, volumetric limb measurement, quality of life, limb volume, as well as many other measurements to determine outcomes. Participants were split into either a LymphaTouch® group or a MLD group. Each participant had ten treatments in their respective groups, which lasted for 90 minutes each. This study found

significant changes in tissue stiffness and degree of disability in the LymphaTouch® group relative to the MLD group (Vuorinen et al., 2013). Additionally, the MRI measurements of limb volume show that muscle tissue edema decreased by 7% following LymphaTouch® treatment. It also found that the two groups had similar results in mobility, grip strength, circumferences, or body fluid changes (Vuorinen et al., 2013). These results suggest that LymphaTouch® may be a positive and safe treatment that does not have any adverse effects.

Another study also suggests that LymphaTouch® has an effect on soft tissue. Researchers tested a forearm while resting and while experiencing venous occlusion. It was found that when the tissue swells, the skin and adipose tissue stiffen at around the same time. It also found that skin stretch is more sensitive than adipose tissue (Iivarinen, Korhonen, Julkunen, & Jurvelin, 2013). This study suggests that there may be a benefit in LymphaTouch® and its role in diagnosis and screening for changes in soft tissue in addition to lymphedema and other swelling conditions (Iivarinen et al., 2013).

In a study by Airaksinen, Vuorinen, and Raittila (2011), 18 patients were treated with LymphaTouch® and their edema and perceived pain was measured before and after treatments. This study used the LymphaTouch® protocol for a 20 minute treatment session. Patients with shoulder, neck, and knee edema showed a significant decrease in pain after 6 weeks of sessions (Airaksinen, 2011). Patients with elbow edema showed a moderate pain decrease. Additionally, edema was decreased with each session (Airaksinen, 2011). All of the patients felt that LymphaTouch® was helpful and that they never felt discomfort from it (Airaksinen, 2011). Although this study did not specifically look at limb volume, but rather pain, the authors still suggest that LymphaTouch® may be a safe form of pain reduction (Airaksinen, 2011).

Iivarinen, Korhonen, & Jurvelin (2016) looked how two different LymphaTouch® negative pressure protocols affected tissue swelling. Eleven participants were placed into either cyclic or continuous protocols. Cyclic pressure occurs when the pressure is varied to allow the skin to move, stop, then return back to normal. Continuous pressure occurs when the pressure stays the same throughout the entire treatment session. The continuous protocol showed higher fluid pressure and more effective fluid movement than the cyclic protocol (Iivarinen et al., 2016). This study suggests that negative pressure models may be beneficial in increasing free movement of fluid (Iivarinen et al., 2016).

Osborne & Newell (2015) looked at how effective LymphaTouch® is in increasing function of lymphatics. They used two different phases- subfascial and superficial intervention, in order to reach both the deep and superficial lymphatic systems (Osborne & Newell, 2015). In the subfascial intervention, lymph was drained from deep structures like joint synovia nerves and muscles (Osborne & Newell, 2015). The purpose of this was to move the lymph from the deep system to the superficial system (Osborne & Newell, 2015). Then, the superficial intervention strengthens the gaps and filaments to allow the lymph to move smoother (Osborne & Newell, 2015). This treatment, using LymphaTouch®, reduced inflammation, reduced proteolytic activity, and reduced adipose tissue and fibrosis (Osborne & Newell, 2015).

Therapist's Perspective

To gain a stronger understanding of LymphaTouch®, Maureen McBeth, MPT, CLT-LANA, a physical therapist and Certified Lymphedema Therapist at Mercy Medical Center, was interviewed. McBeth has been working with patients with lymphedema for 14 years and using LymphaTouch® for 5. Convenience sampling was used to find this participant, as she was a colleague of the faculty advisor. With IRB approval from Elizabethtown College and receiving

consent to use her name, a semi-structured interview was conducted to gain clinical commentary about the device. The interview took place over the phone and the questions were open ended, to allow the participant the option to add her own stories. The interview questions were designed to connect results from research studies to McBeth's experiences in the clinic.

She states that it is difficult to compare MLD from LymphaTouch® because they are so different (M. McBeth, personal communication, April 9, 2018). McBeth also says that MLD calms down the whole nervous system through constant contact. LymphaTouch® activates the lymphatic system, but affects the local tissues of the area as well. McBeth also found that when the device does not move, it can help identify areas that need to be addressed (personal communication, April 9, 2018). This is consistent with the Iivarinen et al. (2013) study that suggests that LymphaTouch® is effective in diagnosis and detecting changes in soft tissue. Additionally, McBeth states that she finds that patients respond best to treatment when the device is used with cyclic pressure (personal communication, April 9, 2018). Iivarinen et al. (2016) suggested that continuous pressure was better because it allowed for more fluid movement, so more research should be conducted on this with more participants.

Additionally, in McBeth's opinion, LymphaTouch® works best when used along with MLD. By controlling pressure, static/dynamic properties, vibration, and physical effects, it can treat many different side effects of cancer treatment (M. McBeth, personal communication, April 9, 2018). She suggests that LymphaTouch® can help patients with lymphedema, cording, peripheral neuropathy, and other sensory deficiencies. While studies regarding LymphaTouch® and these side effects have not yet been done, McBeth says that "LymphaTouch® can help you adapt to all of those problems." Even though there are not settings to differentiate treating each different side effect, it simultaneously treats all of them at the same time.

When asked what challenges she has faced while using this technology, McBeth stated that the mechanical design could use work. After 5 years of usage, the plastic handle is cracked, but all challenges are related to the durability of the product, not the outcomes of it. She also stated that she has been working with the creators of LymphaTouch® to improve the overall design of the machine. Although she does not know the exact number of patients she has treated with LymphaTouch®, McBeth stated that she has never had a patient who had a negative response to the treatment. She added that patients with sensitive skin or is taking blood thinners may be more likely to have a “cupping” effect on their skin that causes discomfort, not pain (M. McBeth, personal communication, April 9, 2018). In the Vuorinen et al. (2013) research, they also found their participants did not have any adverse side effects or pain from the treatment.

Because LymphaTouch® acts as an “extra set of hands”, many patients have bought one for their home. This would make treatment possible at home, with the proper training. Additionally, McBeth adds that surgeons have used it prior to trauma surgeries to help decrease edema before going into surgery. McBeth also mentions that LymphaTouch® can be used in early intervention to see if the patient is having any subtle changes and helps to treat them early (personal communication, April 9, 2018). In the Iivarinen et al. (2013) research, it was found that LymphaTouch® can be used to help diagnose and treat early, similar to what McBeth mentioned.

Overall, McBeth spoke highly of LymphaTouch®, stating that it had many benefits to both therapists and patients. When used in conjunction with Kinesio Tape, bandaging, compression therapy, and other modalities, LymphaTouch® shows promise in decreasing lymphedema symptoms (M. McBeth, personal communication, April 9, 2018).

Conclusion

The literature and the clinical commentary from Maureen McBeth suggest that LymphaTouch® might have benefits for patients who are undergoing Complete Decongestive Therapy to treat tissue stiffness, pain, and improve lymph flow. The clinical commentary gained from McBeth suggested that the device may have other benefits, however more research needs to be conducted. While this study showed that LymphaTouch® may be beneficial for clients; however, there are limitations. Only one therapist was interviewed to gain clinical commentary. Because only one therapist was interviewed, her commentary cannot be generalized to all therapists that use LymphaTouch®. To gain more evidence on LymphaTouch® research should be conducted to determine its effectiveness in decreasing cording, neuropathy, as well as other sensory deficiencies. Additionally, research should be conducted to determine the patients' perspectives on LymphaTouch®. Overall, the literature and clinical commentary suggest that LymphaTouch® could be a beneficial device to use for CDT, but more research should be conducted to find its effectiveness for other conditions.

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