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Lymphoscintigraphic evaluation of manual lymphatic therapy: the Godoy & Godoy technique

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Abstract

The objective of this study was to evaluate the transport of radiotracers in lymphatic collectors during manual lymphatic therapy. The legs of four male and two female patients with leg lymphedema were assessed using lymphoscintigraphy before, during and after manual lymphatic therapy. The ages of the patients, treated in Hospital de Base in Sao Jose do Rio Preto, ranged from 42 to 64 years with a mean age of 51.2 years. Consecutive patients with grade II leg lymphedema were enrolled in this study. Patients with lymphedema secondary to lymphadenectomy, active infections and weight greater than 130 kg were excluded. Patients were submitted to manual lymphatic therapy, which consists of the collapsing of capillaries using manual compression which is then slid along the skin in a stroking action in the direction of the lymph flow within lymphatic vessels towards the lymph nodes. Two dynamic studies were performed; the first was over 40 minutes (3 images every 10 minutes) which was immediately followed by an entire body scan. A second dynamic evaluation was performed taking images at 10-second intervals over 2 minutes during manual lymphatic therapy. To evaluate the displacement of radiotracers, the path of lymphatic collectors from the knee to a lymph node in the upper thigh was divided into five similarly sized regions of interest. The concentration of radiotracer was quantified in each of the regions of interest. The paired *t*-test was used for statistical analysis with an alpha error of 5% (p value < 0.05) being considered statistically relevant. The results show statistically significant differences in the number of particles in all the regions of interest comparing before and after treatment (two-tail paired *t*-test: p value < 0.0001). Manual lymphatic therapy improves the transport of radiotracers in lymphatic collectors.

Keywords

Manual lymphatic therapy, treatment, lymphedema, lymphoscintigraphy

Introduction

With the creation of manual lymph drainage by the Danish biologists Emil and Estrid Vodder in 1936, several supporters began to use and publicize the technique, making it one of the pillars of the treatment of lymphedema.[1–5]

Lymphedema is an accumulation of water, salts, electrolytes, high molecular weight proteins and other elements in the interstitial space resulting from mechanical or dynamic changes of the lymphatic system. This accumulation leads to a gradual and progressive increase of an extremity or body region with a reduction in functional and immunological capacity, weight gain and morphological changes.[6] The main therapeutic approaches to treating lymphedema are lymph drainage, compression mechanisms and myolymphokinetic activities and exercises.[7] Thus, lymph drainage is important in the treatment of lymphedema.

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Following Vodder and Vodder, Leduc developed his technique and more recently Godoy and Godoy developed a new technique to stimulate the lymphatic system which was recently named manual lymphatic therapy (MLT).[8–14]

MLT and lymphatic drainage (Vodder) are techniques that use physical stimulation which basically consists of manual compression to collapse the capillaries and a stroking movement to displace the lymph within. The difference between the techniques is in the type of movement used. In the case of Vodder the movements are circular or semicircular and in MLT (Godoy) the movements are linear which manually displace lymph along the anatomic path of the lymphatic vessels. In both techniques the pressure exerted for manual compression is similar, but subjective, at around 40 mmHg. The Godoy technique was developed based on the normal anatomy and on physiology and pathophysiological processes and adapted for each type of lymphedema.

MLT obeys the concepts of the hydrodynamic principles needed to drain collectors. Clinical studies have shown that it reduces edematous limb volume with improvements being apparent by lymphoscintigraphy.[11,12,15] The objective of the current study was to evaluate the transport of radiotracers in lymphatic collectors during MLT.

Method

The legs of six patients with leg lymphedema were assessed using lymphoscintigraphy before, during and after MLT. Consecutive patients with grade II leg lymphedema, treated in Hospital de Base in Sao Jose do Rio Preto in 2012, were enrolled. Patients with lymphedema secondary to lymphadenectomy, active infections and weight greater than 130 kg were excluded from the study. The ages of the four male and two female patients ranged from 42 to 64 years with a mean of 51.2 years.

Lymphoscintigraphy can be used to identify the path of the lymphatic vessels and to evaluate therapy. In this study, a quantity of 0.4 mL of dextran marked with technetium-99 (99Tc) was injected intradermally between the 2nd and 3rd toes. Two dynamic studies were performed. The first took 40 minutes with three images being taken every 10 minutes; this was immediately followed by an entire body scan. A second dynamic evaluation was performed with images taken at 10-second intervals during 2 minutes of MLT.

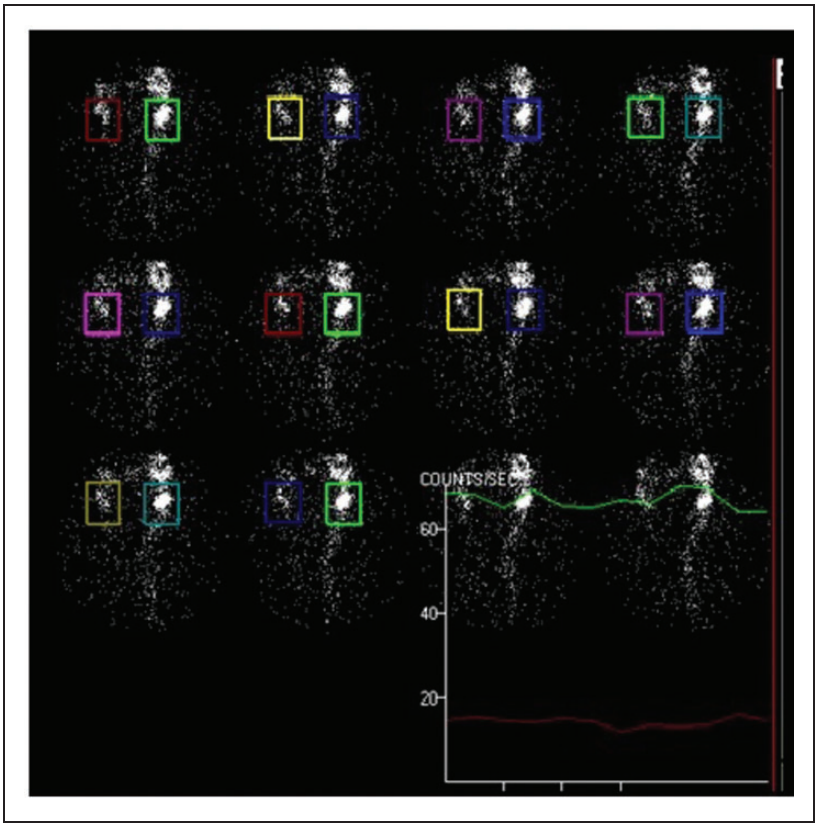

Figure 1. Points at which the radiotracer was evaluated – immediately before manual lymphatic therapy.

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To evaluate the pattern of the displacement of radiotracers, the path of lymphatic collectors from the knee to a lymph node in the upper thigh was equally divided into five regions of interest. The number of particles in each of the five regions of interest was quantified.

The paired *t*-test was used for statistical analysis with an alpha error of 5% (p value < 0.05) being

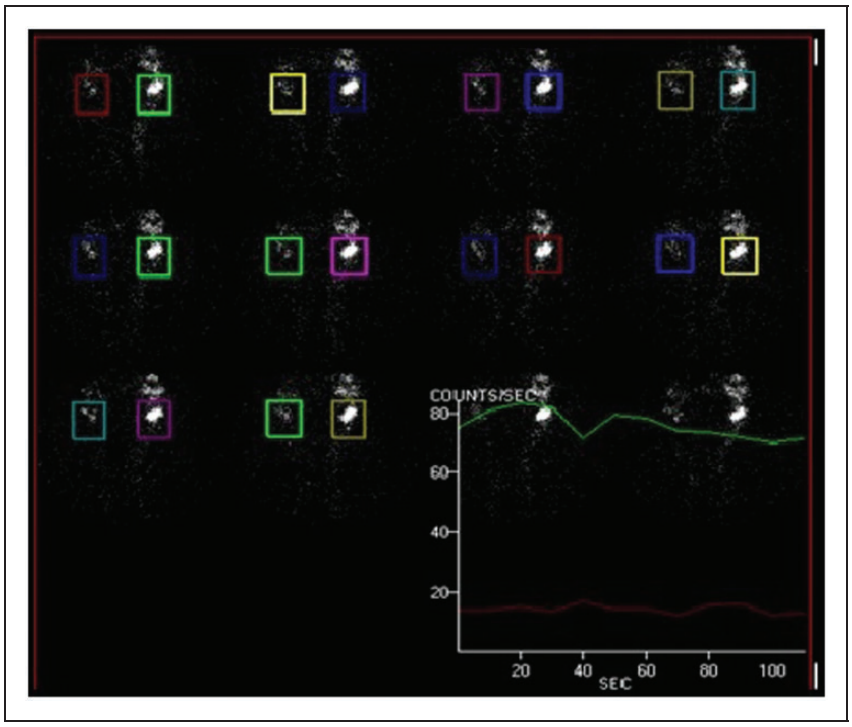

Figure 2. Points at which the radiotracer was evaluated – immediately after manual lymphatic therapy.

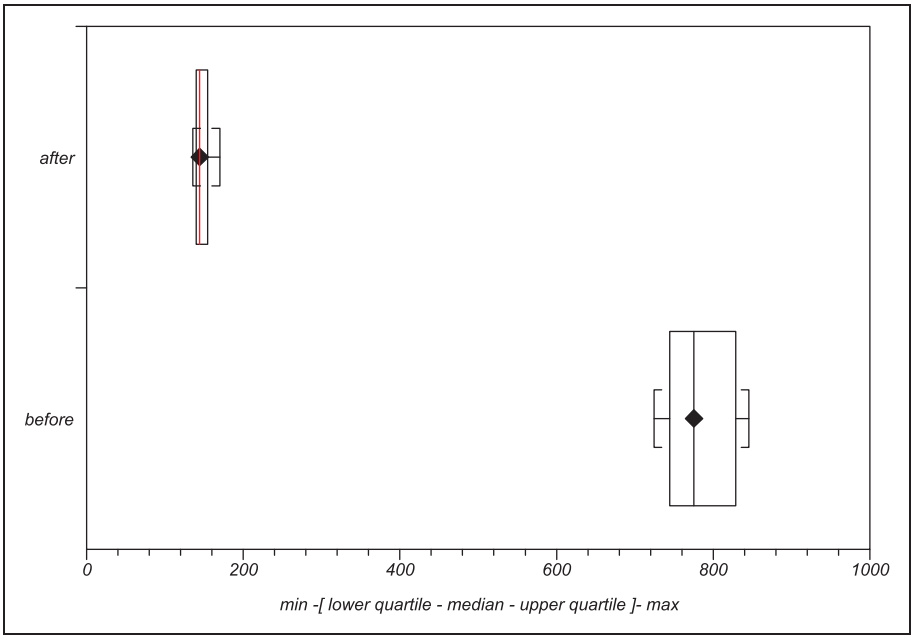

Figure 3. Box & whisker plot showing the number of particles in the thigh region before and after manual lymphatic therapy.

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Table 1. Number of particles in region of interest before and after manual lymphatic therapy.

Patient	Region of interest	Before drainage	After drainage
1	1	747	140
	2	829	140
	3	845	150
	4	846	136
	5	725	170
2	1	797	145
	2	798	145
	3	753	136
	4	745	154
	5	737	163
3	1	685	144
	2	702	159
	3	648	146
	4	699	152
	5	646	146
4	1	644	144
	2	680	131
	3	700	140
	4	699	142
	5	734	132
5	1	741	143
	2	789	140
	3	756	138
	4	752	152
	5	690	147
6	1	670	140
	2	660	135
	3	702	145
	4	712	135
	5	764	142

considered statistically relevant. This study was approved by the Research Ethics Committee of FAMERP.

Results

The results of the first dynamic study show a statistically significant difference in the deposition of particles in the thigh before and after treatment (two-tail paired t-test: p value < 0.0001). Before MLT (Figure 1), the radiotracer (white spots) is spread throughout both legs even though there is a concentration in the lymph node (large region of white). In Figure 2 after MLT, the white is concentrated in the lymph node with fewer white spots spread around the legs. Figure 3 shows a Box whisker plot before and after MLT. Table 1 shows number of particles in region of interest before and after MLT.

Figure 4 shows the dynamics of lymph drainage over 2 minutes of MLT with images taken at 10-second intervals. In the first images it is possible to clearly identify the path of the lymphatic collectors by a trail of white spots leading down from the lymph node (bright white region). By 80 seconds, this trail has been reduced, there is little radiotracer along the path of the lymphatic collectors because it has been drained as far as the lymph node. However, by 100 seconds it is possible to see that the radiotracer is refilling the vessels as the lymphatic collectors are becoming more apparent again.

Discussion

The current study shows MLT using manual compression which is slid along the path of the lymphatic vessels assisting in the transport of radiotracers as evidenced by lymphoscintigraphy. This form of evaluation allows a qualitative and quantitative analysis of the potential of the lymphatic system. Additionally, a real-time assessment of lymph drainage techniques is possible even though few studies have used this form of evaluation to compare the effectiveness of different techniques.[16]

MLT was developed after identifying the physiological mechanisms involved in the displacement of fluids within the lymphatic system. Its objective was to find ways to increase both the formation of lymph and drainage.

Lymph is continuously formed and drained with the absorption of interstitial fluid into lymph capillaries and its transport within the lymphatics. It is important to remember that the lymph flows along the capillaries to corresponding lymph nodes.

The accumulation of macromolecules in the interstitial space is the result of a failure in the formation or drainage of lymph. The edema in lymphedema is the accumulation of these macromolecules which leads to retention of fluid, thus it differs from other types of edema. Treatment involves the mobilization of these macromolecules into the bloodstream. Hence, specific techniques are necessary with MLT being suggested as the most effective technique. A pressure gradient between the lymphatic vessels and interstitial space due to physiological or pathophysiological processes stimulates the formation of lymph. Manual lymphatic drainage techniques use increased pressure inside the interstitial space (by manual compression) to form lymph inside the lymphatic vessels; drainage, that is displacement of this lymph, is achieved by applying pressure to collapse the vessel at one point and then sliding this pressure along the vessel as far as the corresponding lymph nodes.

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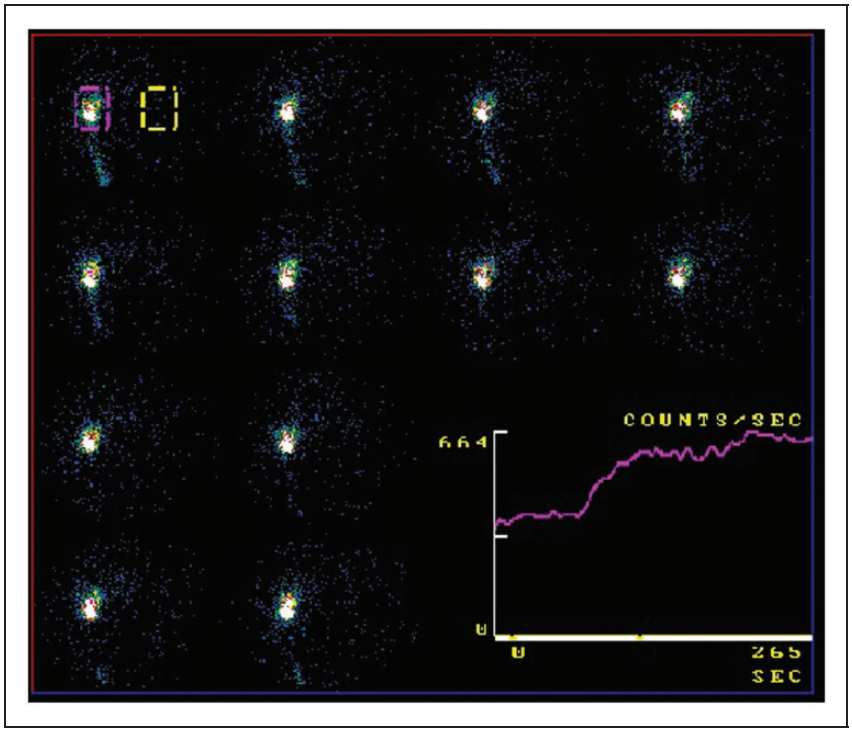

Figure 4. Drainage dynamics of radiotracers with images taken at 10-second intervals over two minutes of manual lymphatic therapy.

A clinical evaluation of this simple linear movement and its effectiveness can be seen by draining a visible vein, for example in the back of the hand, by compressing its distal portion and sliding the pressure along the vessel.

A pilot study has clearly shown that there is difference in the displacement of lymph, that is, drainage of the lymphatic collectors comparing linear movements with circular or semicircular movements. Lymphoscintigraphy can be used to assess whether the movements are effective or not. Semicircular or circular movements are different to linear movements as the lymph is not only "forced" along the vessels but also in the opposite direction against the valves. Employing lymphoscintigraphy, the lymphatic collectors are marked and the result of lymph displacement can be observed in real time, that is, immediately on the computer screen. The pressure exerted can also be evaluated instantly. Hence, a new line of research using this technique may teach us more about lymphatic drainage techniques in clinical studies.

In physics, hydrodynamics (or fluid dynamics) is a subdiscipline of fluid mechanics that deals with the science of fluid flow. Therefore, the use of these concepts in the development of a lymphatic drainage technique is critical and similar to their use in the development of extracorporeal circulation systems. In addition to the immediate clinical evaluation before and after MLT using lymphoscintigraphy, the volume of the limb can be evaluated in the short (1 month) and long terms (30 months).[11,12]

Only transport of the radiotracer in the superficial system was assessed in this study of MLT. Drainage of the deep lymphatic system uses successive stretching and contraction of muscles. Breathing movements are used to increase the formation and drainage of lymph in the ribcage and manual compression is used to increase drainage of the abdominal cavity. However, drainage of the abdominal and thoracic walls follows the same principles as of the extremities.

MLT is adapted according to the physiopathology of lymphedema. In general, this approach can be performed in most primary and secondary cases of lymphedema with the exception being lymphedema secondary to lymphadenectomy, for example, after lymph node resection.

Conclusion

MLT consists of manual compression which is then slid along the skin in the same direction as the lymphatic vessels; this technique improves the transport of radiotracers in lymphatic collectors.

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Conflict of Interest

None declared.

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