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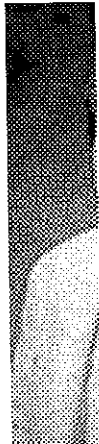
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Can Practitioners Be Trained to Manually Identify Lymphatic Flow? Evidence From a Case Control Study Assessing Skills in Manual Lymphatic Mapping (MLM) B. Chikly, M.D.

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Introduction

Manual Lymphatic Mapping (MLM) of the lymphatic circulation is a gentle, noninvasive method by which trained practitioners - using only their hands - can identify the specific direction of the lymphatic circulation on an affected or unaffected area of the body [1-15].

A recent advancement in manual palpation techniques, Manual Lymphatic Mapping is a component of Lymph Drainage Therapy (LDT) [1-2] - a hands-on modality based on the traditional work of osteopath F.P. Millard (1922) [3] and Emil Vodder (1936) [4].

Manual assessment of the lymphatic rhythm and direction requires time and dedicated effort. Without previous specific training it may seem totally impossible to assess this component of the lymphatic circulation. Once learned, however, Manual Lymphatic Mapping offers refinements to the therapeutic process that are an important tool in the management and pre- and postoperative functional assessment of lymphedema.

Research continues on the method as we seek to demonstrate the scientific validity and reliability of Manual Lymphatic Mapping in providing greater benefits to the lymphedema patient.

MLM Reliability Study: Comparison to a Control Group

Objective: To compare the reliability of MLM between an experimental population and a control group. Each examiner maps subjects, addressing an identical nonaffected part of the body (that has not been previously studied).

Background: Complex Decongestive Physiotherapy (CDP) is the noninvasive treatment of choice for lymphedema patients in the USA. It is recognized and reimbursed by a growing number of national insurance companies. The emphasis of the manual component of CDP is to create alternative pathways through which lymph and interstitial fluid can flow. Manual techniques to accomplish this are used daily in lymphedema clinics.

Manual Lymphatic Mapping (MLM) is a safe and noninvasive manual technique that may more accurately identify alternate pathways in lymphedema patients. This can reduce treatment time and invasiveness of lymphedema treatment. More than 1,500 therapists have been trained in MLM in North America. Many of those who have treated lymphedema using CDP and MLM at the same time report faster volume reduction for extremity lymphedema and the need for fewer visits during the course of the treatment.

Population: This study compares the results of manual lymphatic mapping performed by:

1. **Control Group:** first-day Lymph Drainage Therapy (LDT) students, without any previous training in MLM.

2. **Experimental (Trained) Group:** students from Lymph Drainage Therapy, level-2 seminar, after 4 days of training in MLM. No previous training in MLM. This trained group received only an initial training in MLM. It is not a group of LDT-certified therapists. They will get experience with their patients and further training in LDT level 3 and Advanced level.

Approximately 5,200 students have received training to palpate the superficial lymphatic flow through LDT. More than 1,500 practitioners, including physicians, PTs, OTs, lymphedema therapists, and massage therapists, have been trained in North America in MLM.

Method:

The area of the body they are asked to map is in physiological condition (nonaffected area). Before beginning, each population is asked to complete and sign a questionnaire that includes two exclusionary questions:

1. "I have/have not been trained to assess the lymph flow by palpation."

If this question is answered positively by a student of the control group, he/she will be excluded from the study.

2. "I have/have not seen a complete lymph chart of [body area] (with watersheds)."*

If this question is answered positively in any group, the student will be excluded from the study.

*(Complete lymphatic maps of this specific area are difficult to find in the United States.)

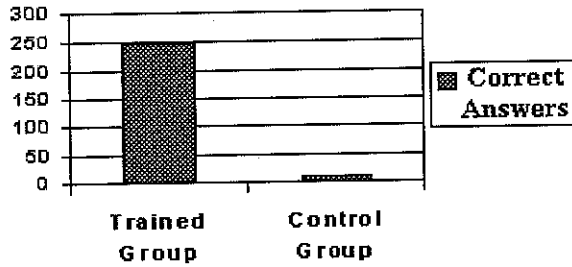
Results:

Descriptive Statistics

The numbers of completed and signed forms we have at this time relating to the mapping of a same nonpathological physical area are:

Experimental Group 393	Correct Answers 245
Control Group 411	Correct Answers 11

Response by Treatment Group



Analytical Statistics

The Chi-square analysis found the results to be highly significant:

$$\chi^2 = 329.54, p < 0.0000001$$

The difference in the experimental group and the control group correct response proportion was highly statistically significant. It is extremely unlikely that the difference was due to chance variation.

The odds-ratio (OR) analysis also found the results to be highly significant:

	Experimental Group	Control Group	Total
Correct Answers	245	11	256
Incorrect Answers	148	400	548
	393	411	804

$$OR = 60.20, p < 0.0000001 \text{ (CI: } 31.02 < OR < 119.87)$$

Essentially the subjects in the experimental group were 60 times more likely to provide a correct response than those in the control group.

The experimental group (LDT level-2 students, day 4) has just learned the MLM technique. Some of these students will require some time to integrate and practice MLM before they can master the technique. We could expect a higher number of correct answers later in their career.

What is Lymphatic Rhythm?

To understand what causes the lymphatic rhythm, we must look at the anatomy and physiology of the lymphatic system. Elements of this system include lymph capillaries (or initial lymphatics), which carry fluid from interstitial spaces to pre-collectors; these pre-collectors then convey the fluid to larger vessels called lymph collectors. Collectors are approximately 100 to 600 microns in diameter and consist primarily of chains of muscular units called lymphangions, which possess two-leaflet bicuspid valves. Described as little "lymphatic hearts" (Mislin, 1961), lymphangions work much like the body's heart pacemakers, contracting regularly throughout the lymphatic system (lymphangiomotoricity) and moving lymph in peristaltic waves. From the tunica media to the tunica externa, these muscular units have extensive sympathetic and parasympathetic innervation, somewhat similar to the alpha and beta receptors found in blood vessels.

Clinical Applications of Manual Lymphatic Mapping to Lymphedema

In lymphedema, Manual Lymphatic Mapping (MLM) can be used during a session to assess the patient's lymph pathways and help define a specific treatment protocol.

The whole treatment plan must be consistent with the lymph pathways found with the MLM. This technique can be used to check the proper use of the compression bandage or garment, i.e., to confirm that the identified alternative pathways are still working and have not been misdirected by the compression. Finally, the pathways identified can suggest effective protocols for bandaging, Tribute© or JoVi Pak© sleeves, Kinesio Taping©, exercise under compression and self-drainage.

It has been noted, for example, that in cases of postmastectomy upper-extremity lymphedema, lymph flow has some 20 alternate pathways to choose between for rerouting to an unaffected lymph territory (lymphotome). These can include anterior and posterior pathways to the unaffected axilla, inguinals, clavicles, intercostals, Mascagni's pathway, vasa vasorum and other special reroutes. It may be difficult for a manual practitioner to "guess" or assume which pathway will be taken by the lymph flow. Wrong assumptions can sometimes cause a significant loss of time and resources. Working on each and every possible lymph reroute is very time-consuming and may not be the most efficient way to help the functional lymph pathways.

Information about the direction and contractility of superficial and deep lymphatic circulation has definite clinical implications:

1. Identification of the specific directions of the lymphatic circulation and areas of fluid restriction and fibrosis.

- Before the session, mapping is used to make an initial assessment of the areas of fluid restriction, stagnation and fibrotic tissue.
- During the session, the therapist can determine whether the most appropriate work area has been selected and how efficiently the lymph flow has been stimulated or rerouted.
- After the session, mapping is used to verify the results of the technique, to check the areas of initial restriction, and to fine-tune sites that require further attention.

An advanced therapist does not need to perform MLM on bare skin, but can actually map through bandaging and other types of medical compressions to help determine whether the reroute of fluid under the compression is consistent with the pathway determined and encouraged by the therapist. If not, the compression can be reapplied. A proper compression is essential for optimal effectiveness, comfort and patient compliance.

2. Description of the new "pathological watershed."

3. Identification of the various alternative pathways used by the lymphatic/interstitial fluid circulation and the most efficient alternate pathway(s) leading to a healthy lymphotome(s).

4. Selection of a physical treatment protocol for self-drainage, bandages and garments, etc.

5. Preventive application (subclinical lymphedema): Evaluation of functional alternate pathways or areas of stagnation in latent phases of lymphedema.

6. Preventive Lymph Drainage Therapy with evacuation toward most efficient alternate lymphatic/interstitial fluid pathway(s) before a clinical lymphedema takes place.

Can We Use MLM in Prevention of Lymphedema?

It is important to note that being able to assess patients in the postsurgical phase, before lymphedema takes place (lymphedema stage 0 or subclinical lymphedema), may help save significant time, effort and money for patients, therapists and insurance companies, as well.

Stage-0 lymphedema could also be defined as a patient with abnormal/nonefficient lymph reroutes but no clinical edema. For example, in the case of upper-extremity lymphedema, this would be a nonpathological pathway that avoids the axilla but cannot efficiently connect all the way to another group of nodes (inguinals, contralateral axilla, etc.). Assessing these patients and creating alternate pathways in a nonlymphedematous, non-fibrotic, extremity may be done in one or two sessions.

MLM (a component of CDP) may help create efficient reroutes before the lymphedema takes place. These reroutes are equivalent to the reroutes created at the end of a phase of CDP for clinical lymphedema patients. Bandaging is not necessary in subclinical lymphedema. In a certain number of cases, "shunting" of the lymph circulation before any pathology occurs may be enough to prevent lymphedema from ever occurring. All the other precautions for lymphedema (good hygiene and skin care, avoidance of increased weight and temperature, etc.) may still be applied.

Other Scientific Studies With Manual Lymphatic Mapping

1. Long-term evolution of patients with stage-0 (subclinical) lymphedema that has been "rerouted" efficiently. Assessment of the extremity volume (development of lymphedema) and complications over time.
2. Compare the results of MLM and lymphangioscintigraphy (LAS). This study continues an investigation that began at the Nuclear Medicine Center Rene Huguenin in Paris (Dr. Alain Pecking). Due to unfortunate technical problems and the fact that the study has to be done in France, we agreed to publish only the feasibility of the study and delayed the study for a later date.
3. Long-term study in lymphedema centers comparing limb-volume decrease in lymphedema patients treated by therapists using MLM and therapists not using this technique.

Conclusion

The probability that the trained group can palpate the MLM not due to random chance in comparison to the control group is > 99.9999999%.

If more studies confirm the efficiency of Manual Lymphatic Mapping, this technique may offer lymphedema therapists an important tool for CDP management of stage-0 (subclinical) to stage-3 (spontaneously irreversible) lymphedema.

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Bruno Chikly, M.D.

Laureat of the Medical Faculty of Paris
Member of the International Society of Lymphology (I.S.L.)
Associate Member of the American Academy of Osteopathy and the Cranial Academy
Director of Lymph Drainage Therapy seminars

28607 N. 152nd Street
Scottsdale, AZ 85262-6939 USA

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Main: 561-622-4334 · UI HealthPlex: 561-622-4706
Fax: 561-622-4771 · Registration: 1-800-233-5880, ext. 90012
11211 Prosperity Farms Road, Suite D-325 · Palm Beach Gardens, FL 33410