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References and Abstracts.

Many of these articles are available online in full text, use Google Scholar or PubMed to search for full text version and related articles

Asplund, R. (2003). "Manual lymph drainage therapy using light massage for fibromyalgia sufferers: a pilot study." Journal of Orthopaedic Nursing **7**(4): 192-196.

> Fibromyalgia is a syndrome characterised by chronic wide-spread pain, stiffness, disturbed sleep and sleepiness. Medication with analgesics and antidepressants and also physiotherapy, are often prescribed and give some relief. Patients' experiences of symptom relief from manual lymph drainage therapy (MLDT) by the Vodder method were examined. Seventeen women aged 49.0 +/- 8.7 (mean +/- SD) years who had had fibromyalgia for 16.9 +/- 10.1 years were treated with light massage with the MLDT technique for 1 h on 12 occasions during a 4-week period. Symptoms were evaluated using visual analogue scales (VAS). Pain, stiffness, sleep, sleepiness and well-being all improved during the treatment period. Two months after treatment cessation, significant improvement remained in pain ($P<0.001$), stiffness ($P<0.01$), sleepiness ($P<0.01$) and well-being ($P<0.001$), but not in sleep, and after 5 months in pain ($P<0.05$) and sleepiness ($P<0.01$). Preliminary results indicate that MLDT can be a valuable alternative treatment for patients with fibromyalgia. Controlled studies are needed.

Bayrakci Tunay, V., et al. (2010). "Effects of mechanical massage, manual lymphatic drainage and connective tissue manipulation techniques on fat mass in women with cellulite." Journal of the European Academy of Dermatology and Venereology **24**(2): 138-142.

> Objective To evaluate and compare the effectiveness of three different noninvasive treatment techniques onfat mass and regional fat thickness of the patients with cellulites. Methods Sixty subjects were randomized into three groups. Group 1 (n= 20) treated with mechanical massage (MM), group 2 (n= 20) treated with manual lymphatic drainage (MLD) and group 3 (n= 20) treated with connective tissue manipulation (CTM) techniques. Subjects were evaluated by using standardized photographs, body composition analyzer (TBF 300) (body weight (BW), body mass index (BMI), fat %, fat mass (FM), fat free mass (FFM), total body water (TBW)), circumference measurement from thigh, waist-hip ratio (WHR), fat thickness measurements from abdomen, suprailium and thigh regions with skin fold caliper. Results All groups had an improvement in thinning of the subcutaneous fat after the treatment ($P < 0.05$). Thigh circumference decreased by an average of 0.5 cm in all groups and thigh fat thickness decreased 1.66 mm in Group 1, 2.21 mm in Group 2 and 3.03 mm in Group 3. Abdomen and suprailium fat thicknesses decreased 2.4 and 2.58 mm in Group 1, 1.78 and 2 mm in Group 2 and 1.23 and 0.64 mm in Group 3, respectively. The mean difference in waist-hip ratio was 0.1 cm in all groups. Conclusion All the treatment techniques are effective in decreasing the regional fat values of the patients with cellulites.

Bongi, S. M., et al. (2011). "Manual lymph drainage improving upper extremity edema and hand function in patients with systemic sclerosis in edematous phase." Arthritis care & research **63**(8): 1134-1141.

OBJECTIVE: In systemic sclerosis (SSc; scleroderma) patients in edematous phase, hand edema is often present. Manual lymph drainage (MLD) stimulates the lymphatic system and reduces edema. Our aim was to evaluate the efficacy of MLD in reducing edema and in improving functionality of the hands and perceived quality of life (QOL) in SSc patients in edematous phase.

METHODS: Of 35 SSc patients with edematous hands, 20 were treated with MLD according to the Vodder technique once a week for 5 weeks (intervention group), and 15 served as the observation group. Patients were evaluated at enrollment, at the end of treatment (T1), and after 9 weeks of followup (T2) by volumetric test (assessing hand volume), the Hand Mobility in Scleroderma (HAMIS) test, and 4 visual analog scales (VAS; scored 0-10) evaluating the perception of hand edema and pain and their interference on daily activities. QOL and disability were assessed by the physical synthetic index (PSI) and mental synthetic index (MSI) of the Short Form 36 (SF-36) and by the Health Assessment Questionnaire (HAQ).

RESULTS: In the intervention group, hand volume, the HAMIS test, and the 4 VAS were improved significantly at the end of treatment ($P < 0.001$). The results were maintained at T2 ($P < 0.001$). The HAQ and the PSI and MSI of the SF-36 also improved significantly at T1 ($P < 0.001$), but only PSI improvement was maintained at T2 ($P < 0.001$). In the observation group, no improvement at T1 and at T2 was observed.

CONCLUSION: In SSc, MLD significantly reduces hand edema and improves hand function and perceived QOL. Copyright 2011 by the American College of Rheumatology.

Bringezu, G. (1994). "[Combatting fatigue in sports physical therapy with reference to manual lymph drainage]." Zeitschrift fur Lymphologie - Journal of Lymphology **18**(1): 12-15.

When continuous endurance is required in sports or work, the peripheral neuromuscular and the central nervous systems will end up in a state of tiredness. The sport physiotherapy enhances the peripheral regeneration and prevents the somatic sequelae of chronic physical stress. This review describes the procedures in thermo- and mechanotherapy also with respect to the manual lymphdrainage. In qualifying courses for sport physiotherapy, this technique is a valuable addition to the classical regenerative procedures being taught.

Duman, I., et al. (2009). "The efficacy of manual lymphatic drainage therapy in the management of limb edema secondary to reflex sympathetic dystrophy." Rheumatol Int **29**(7): 759-763.

The objective of this study is to investigate the efficacy of manual lymphatic drainage (MLD) therapy in edema secondary to the reflex sympathetic dystrophy (RSD). A total of 34 patients were allocated randomly into two groups. All of the patients undertook nonstreoidal anti-inflammatory drug, physical therapy and therapeutic exercise program for 3 weeks. Patients in study group undertook MLD therapy additionally. Then the patients continued 2-month maintenance period with recommended home programs. Volumetric measurements pain scores and functional measurements were assessed at baseline, after treatment and 2 months after the treatment. After treatment, improvement in edema was statistically significant in the study group but not in the control group. At follow-up, with respect to baseline, improvements were not significant in both of the groups. Between the

groups, difference of the percentage improvements in edema was statistically significant with superiority of MLD group after treatment, but not significant at follow-up. In this pilot study, MLD therapy was found to be beneficial in the management of edema resulted from RSD. Although the long-term results showed tendency towards improvement, the difference was not significant.

Ekici, G., et al. (2009). "Comparison of manual lymph drainage therapy and connective tissue massage in women with fibromyalgia: a randomized controlled trial." J Manipulative Physiol Ther **32**(2): 127-133.

OBJECTIVE: This study analyzed and compared the effects of manual lymph drainage therapy (MLDT) and connective tissue massage (CTM) in women with primary fibromyalgia (PFM). METHODS: The study design was a randomized controlled trial. Fifty women with PFM completed the study. The patients were divided randomly into 2 groups. Whereas 25 of them received MLDT, the other 25 underwent CTM. The treatment program was carried out 5 times a week for 3 weeks in each group. Pain was evaluated by a visual analogue scale and algometry. The Fibromyalgia Impact Questionnaire (FIQ) and Nottingham Health Profile were used to describe health status and health-related quality of life (HRQoL). Wilcoxon signed rank test and Mann-Whitney U test were used to analyze the data. RESULTS: In both groups, significant improvements were found regarding pain intensity, pain pressure threshold, and HRQoL ($P < .05$). However, the scores of FIQ-7 ($P = .006$), FIQ-9 ($P = .006$), and FIQ-total ($P = .010$) were significantly lower in the MLDT group than they were in the CTM group at the end of treatment. CONCLUSIONS: For this particular group of patients, both MLDT and CTM appear to yield improvements in terms of pain, health status, and HRQoL. The results indicate that these manual therapy techniques might be used in the treatment of PFM. However, MLDT was found to be more effective than CTM according to some subitems of FIQ (morning tiredness and anxiety) and FIQ total score. Manual lymph drainage therapy might be preferred; however, further long-term follow-up studies are needed.

Foldi, E., et al. (2000). "Effect of complex decongestive physiotherapy on gene expression for the inflammatory response in peripheral lymphedema." Lymphology **33**(1): 19-23.

Complex decongestive physiotherapy (CDP), consisting of manual lymph drainage, compression bandaging, remedial exercises and skin care, mobilizes accumulated edema fluid and increases lymph flow. On the other hand, it also has a beneficial therapeutic effect on fibrosclerosis. Because little is known of its possible mode of action on a molecular level, this preliminary study evaluated CDP in patients with peripheral leg lymphedema as to the potential role of gene expression in the inflammatory response. The quantitative expression of genes for CD14, interferon-gamma receptor (IFN gamma R), tumor necrosis factor-alpha (TNF alpha), integrin alpha 4 beta 1 (VLA-4), tumor necrosis factor receptor p55 (TNFR1) and CD44 (standard form) was examined in 9 patients with primary or secondary leg lymphedema before and after phase 1 of CDP. Overall, there was a decrease of expression of these pro-inflammatory genes after CDP, suggesting that biologic mechanisms implicated in the inflammatory cascades in other disorders are also involved in the fibrosclerotic reactivity in lymphedema. However, whereas each patient acted as his or her own control before and after CDP, gene expression in normal patients and normal limbs before and after CDP needs to be examined before the full meaning of these observations can be understood.

Franzeck, U. K., et al. (1997). "Combined Physical Therapy for Lymphedema Evaluated by Fluorescence Microlymphography and Lymph Capillary Pressure Measurements." Journal of Vascular Research **34**(4): 306-311.

> The treatment of patients with lymphedema is still controversial. Combined physical therapy with manual lymph drainage and compression therapy is most frequently used to reduce lymphatic leg swelling. However, objective evidence is rare that this empirical form of treatment has a scientific basis. In a prospective study fluorescence microlymphography and pressure measurements in cutaneous lymph capillaries were used to assess objectively the effect of combined decongestive physical therapy on abnormal microlymphatic dynamics in lymphedema. 12 patients with primary and secondary lymphedema were studied before treatment, after 2 weeks of intensive physical therapy and 3 months of continuing compression and ergotherapy. After 2 weeks of intensive manual lymph drainage and compression bandaging (phase 1) microlymphatic hypertension (12.8 ± 5.7 mm Hg) was significantly (p = 0.01) reduced to a mean lymph capillary pressure of 5.9 ± 4.5 mm Hg. More than 3 months later after continuing compression lymph capillary pressure (3.2 ± 5.2 mm Hg) was still significantly (p = 0.03) reduced. Simultaneously the maximum spread of the fluorescent contrast medium in the superficial lymph capillary network decreased significantly (p = 0.01) from 21.3 ± 14.3 to 11.3 ± 4.8 mm. Accordingly the clinical condition improved, and the mean circumferences of the forefoot and ankle were significantly (p& < 0.05) reduced. Combined decongestive physical therapy is an effective treatment for lymphedema which results in a normalization of microlymphatic hypertension and an improvement of the clinical appearance.

Haren, K., et al. (2000). "Effect of manual lymph drainage as described by Vodder on oedema of the hand after fracture of the distal radius: a prospective clinical study." Scandinavian Journal of Plastic & Reconstructive Surgery & Hand Surgery **34**(4): 367-372.

> The aim of this study was to evaluate the efficacy of manual lymph drainage, as described by Vodder, in reducing oedema in the hand after a traumatic injury. During a period of 10 months in 1996-7, a total of 26 consecutive patients with a fracture of the distal radius that was treated by external fixation were included in the study. Patients were randomised into an experimental (n = 12) and a control group (n = 14). Treatment started 11 days after application of the external fixator. All patients had the same conventional treatment with exercises, movement, oedema control, and education. The experimental group was given 10 treatments of manual lymph drainage in addition. Oedema was measured four times with the volumeter, and the injured hand was always compared with the uninjured one. The first measurement was made three days after removal of the external fixation. The difference in hand volume showed that the experimental group had significantly less oedema in the injured hand. This result indicates that manual lymph drainage is a useful method for reducing post-traumatic oedema in the hand.

Harris, R. and N. Piller (2002). "Evaluation of treatment efficacy - Objective measurement of the treatment impact of manual lymphdrainage." Evaluierung der behandlungs-effektivität - Objektive messungen zur wirkung der manuellen lymphdrainage **6**(2): 93-96.

> Aim: To demonstrate the value of objective measurement in providing an indication of treatment impact on chronic lymphedema using Manual Lymph Drainage (MLD). Study Sample: One patient is a 46 year old woman who had a total groin clearance with chronic lymph nodectomy secondary lymphedema of three years duration. The second patient is a 75 year old male with a primary unilateral lymphedema of 35 years duration. Method:

Patients were measured prior to treatment and then immediately following. Tonometry was used to assess the extent of fibrotic induration of the major lymphatic territories of the legs, bio-impedance to assess the extent of extracellular and total fluid accumulation and perometry to assess total volume and circumference changes. Patients were given a, 45-minutes, standardized treatment using the Dr. Vodder method of Manual Lymph Drainage (MLD). Results: Secondary Lymphedema Patient: Tonometry showed MLD softened the affected limb significantly in all positions and had a smaller effect on the normal limb. Bio-impedance showed a 170 ml fluid reduction in the affected limb and also a surprising 150 ml reduction in the contralateral normal one. The removed fluid appeared in the truncal area, as it had not yet naturally cleared. Perometry showed similar reductions in limb volumes and circumferences. Primary Lymphedema Patient: Tonometry showed significant softening in all lymph territories of the massaged limb but little change in the contralateral normal one. Bio-impedance again showed significant reductions of 120 ml in the affected limb and 150 mi in the normal one. These changes were confirmed by perometry. Conclusion: The effect of the treatment can be demonstrated by the objective measurement of changes in a limb after a single MLD treatment. This not only allows the therapist to see how well their treatment is working but it could be used to modify the treatment plan and achieve ever better outcomes for the patient. These case studies have shown a good reduction can be achieved and objectively demonstrated even after previous, normally very effective forms of treatment.

Harris, R. and N. Piller (2003). "Three case studies indicating the effectiveness of manual lymph drainage on patients with primary and secondary lymphedema using objective measuring tools." Journal of Bodywork & Movement Therapies **7**(4): 213-221.

The superficial lymphatic system is divided into areas called lymphatic territories which are separated by watersheds. When the lymphatic system fails to remove its load either due to surgery, radiotherapy or some congenital malformation of it then the fluid (and the proteins and wastes contained within it) accumulates in that territory. Anastomotic connections exist across the watersheds and while they can work unaided, manual lymph drainage (MLD) can significantly help drainage across them into unaffected lymphatic territories. MLD also can help the movement of extracellular fluids into the lymph vessels and then along them. The purpose of the study is to examine the effectiveness of a manual technique in moving fluids and softening hardened tissues using three non-invasive examination tools. We examined the movement of fluids from the affected limbs of three lymphedema patients who underwent a standardized 45-min treatment using the Dr Vodder method of M L D. We chose a typical cross section of patients with either a primary leg, secondary leg or secondary arm lymphedema. The arm lymphedema patient was also measured for return of edema over a 30-min period after the conclusion of treatment and underwent a follow-up control measurement, 2 months later without treatment. The tools used were tonometry, multi-frequency bioelectrical impedance and perometry. All three evaluation tools indicated a movement of fluid to different and unblocked lymphatic territories as well as a softening of tissues in some of the affected limbs. Fluid movements were also detected in the contralateral, apparently normal limbs, even though they were not treated. MLD thus is an effective means of fluid clearance when it has accumulated as a consequence of a failure of the lymphatic system. It seems likely that MLD has a systemic effect on the lymphatic system and that it can improve flow from otherwise normal tissues. It is hypothesized that a series of treatments (as is the norm) would result in even more significant improvements.

Hutzschenreuter, P. and H. Brümmer (2005). "The influence of manual lymph drainage (Dr. Vodder method) on the lymphatic control system in patients and lymph therapists." Die regelkreise der lymphsysteme bei patient und therapeut unter manueller lymphdrainage nach Dr. Vodder **9**(1): 21-27.

The lymphatic control system works by a feedforward control and negative feedback in its central regulator (hypothalamus). Mechanoreceptors translate information (compression force) of manual lymph drainage techniques into biological signals. Out of them, its regulator calculates sympathetic and parasympathetic ranks which changes during manual lymph drainage treatment parameters of RLS in patients and in lymph therapists.

Hutzschenreuter, P., et al. (2003). "The vagatonic effects of Dr. Vodder's manual lymphdrainage." Die vagotone wirkung der manuellen lymphdrainage nach Dr. Vodder **7**(1): 7-14.

Vodder's working hypothesis of vagotonic effects was confirmed by motility analysis of the small intestine of 17 patients with secondary post-operative arm lymphedema. These results during the first treatment were called the primary effect of manual lymph drainage (MLV). The vagotonic effect remained unchanged between the end of the first treatment and the beginning of the second treatment on the same day. This is called the secondary effect (carry over effect) of MLV. Combined, the carry over effect of the first treatment and the primary effect of the second treatment make up the tertiary effect (cumulative effect) of MLV during the same day.

Hutzschenreuter, P. and R. Ehlers (1986). "[Effect of manual lymph drainage on the autonomic nervous system]." Zeitschrift fur Lymphologie - Journal of Lymphology **10**(2): 58-60.

Biotonometry according to Rilling enables determination of HR and HC in healthy subjects. These two parameters hardly change during the day (diurnal profiles). In healthy 18 to 21 year old women and men, HR is 7 to 8 kOhm and HC 0.15 to 0.25 microfarad. In healthy subjects, HR increases and HC decreases during ML according to Dr. Vodder. In patients with phlebedema, local ML carried out several times brought about an increase in the level of the HR curve. Similarly to Kracmar, Hauswirth and Rilling, we conclude that there is a transition from a sympathotonic or normotonic reaction situation into a parasympathotonic reaction situation after carrying out ML. These results of experimental investigations thus confirm the clinical observations according to which a vagotonic reaction situation arises during ML (Wittlinger and Wittlinger).

Kessler, T., et al. (2003). "Effect of manual lymph drainage after hindfoot operations." Physiotherapy Research International **8**(2): 101-110.

Background and Purpose Manual lymph drainage therapy is often prescribed following hindfoot operations. However, the relative efficacy of this treatment component has not yet been determined. Method A two-group pre-test–post-test study design was used in this preliminary randomized clinical trial of 23 subjects who underwent hindfoot surgery. Patients were randomly assigned into two groups: an intervention group of 11 patients who received standard physiotherapy plus manual lymph drainage; and a control group of 12 patients who received standard physiotherapy but no lymph drainage. The main outcome measure was the percentage reduction in excess limb volume, measured by the water displacement method at the second post-operative day (t1) and at the day of discharge (t2). Results Compared to the control group, a significant reduction in post-operative swelling

was measured in the intervention group only (p = 0.011). Conclusions Application of lymph drainage techniques after hindfoot operations, in combination with standard physiotherapy exercises, achieves greater limb volume reduction than exercise alone. The present study offers an insight into a treatment that may shorten rehabilitation and thereby control the cost of caring for post-operative treatment complicated by post-operative swelling. Copyright © 2003 Whurr Publishers Ltd.

Kim, S. J., et al. (2009). "Effects of manual lymph drainage on cardiac autonomic tone in healthy subjects." International Journal of Neuroscience **119**(8): 1105-1117.

This study was designed to investigate the effects of manual lymph drainage on the cardiac autonomic tone. Thirty-two healthy male subjects were randomly assigned to manual lymph drainage (MLD) (experimental) and rest (control) groups. Electrocardiogram (ECG) parameters were recorded with bipolar electrocardiography using standard limb lead positions. The pressure-pain threshold (PPT) was quantitatively measured using an algometer. Heart rate variability differed significantly between the experimental and control groups ($p < 0.05$), but the PPT in the upper trapezius muscle did not ($p > 0.05$). These findings indicate that the application of MLD was effective in reducing the activity of the sympathetic nervous system.

Kurz, W., et al. (1981). "Effect of Manual Lymphdrainage Massage on Blood Components and Urinary Neurogormones in Chronic Lymphedema." Angiology **32**(2): 119-127.

In an earlier paper we have shown that manual lymph drainage massage of edematous limbs can result in the excretion of up to 1 liter urine derived from reabsorption and transport from the interstitial fluid, simultaneously with significant changes in the excretion of urinary neurohormones.1 These findings indicated that histamine and serotonin were released from the edematous tissue and that circulation improved through increased output of adrenaline and noradrenaline. The results achieved led us to assume that similar changes may have occurred in the blood during treatment, and induced us to study the effect of manual lymphdrainage on various blood constituents and urinary neurohormones.

Mayrovitz, H. N., et al. (2009). "Lymphedema: Role of Truncal Clearance as a Therapy Component." Home Health Care Management & Practice **21**(5): 325-337.

Lymphedema is increasingly being seen in patients receiving home health care and throughout the general population. Substantial risks of complications are associated with failure to recognize its presence, worsening of the condition and the use of inadequate or incomplete therapy. Therapeutic truncal clearance as a component of therapy is universally accepted by professional therapists as being essential, but often rejected by third-party payers. This therapeutic component is based on sound physiological principles, but there has not been, nor will there likely be, peer-reviewed testing because it is deemed unethical to subject patients to therapy without its use. We believe that if the physiological basis for this therapy were more widely understood, its absolute need would be better recognized. Thus, our goal is to describe those lymphatic system features that directly impact lymphedema development and complications emphasizing the role of and scientific basis for truncal clearance as an essential treatment component.

Mayrovitz, H. N., et al. (2008). "Localized tissue water changes accompanying one manual lymphatic drainage (MLD) therapy session assessed by changes in tissue dielectric constant inpatients with lower extremity lymphedema." Lymphology **41**(2): 87-92.

> Previous reports described the utility of assessing local tissue water via tissue dielectric constant (TDC) measurements. Our goal was to determine the suitability of this method to evaluate lymphedema changes. For this purpose, we measured changes in TDC produced by one MLD treatment in 27 legs of 18 patients with lower extremity lymphedema. TDC values were measured to a depth of 2.5 mm at the greatest leg swelling site before and after one MLD treatment. Girth at the target site was measured with a calibrated tape measure. TDC values, which range from 1 for zero water to 78.5 for all water within the sampled volume, were measured four times and the average used to estimate local changes. Results showed that in every case the posttreatment TDC was reduced from its pretreatment value with percentage reductions (mean SD) of -9.8 +/- 5.64% ($p < 0.0001$). Girth changes were smaller being -1.5 +/- 1.93% ($p < 0.01$). We conclude that since TDC measurements reflect changes to a depth of about 2.5 mm whereas girth measurements reflect conditions of the entire cross-section, TDC assessment may be more sensitive to localized lymphedema changes. This finding suggests that TDC measurements are useful as complementary and perhaps as independent assessment methods of edema/lymphedema and treatment-related changes.

Mottura, A. A. (2002). "Face lift postoperative recovery." Aesthetic Plastic Surgery **26**(3): 172-180.

> The purpose of this paper is to describe what I have studied and experienced, mainly regarding the control and prediction of the postoperative edema; how to achieve an agreeable recovery and give positive support to the patient, who in turn will receive pleasant sensations that neutralize the negative consequences of the surgery.After the skin is lifted, the drainage flow to the flaps is reversed abruptly toward the medial part of the face, where the flap bases are located. The thickness and extension of the flap determines the magnitude of the post-op edema, which is also augmented by medial surgeries (blepharo, rhino) whose trauma obstruct their natural drainage, increasing the congestion and edema. To study the lymphatic drainage, the day before an extended face lift (FL) a woman was infiltrated in the cheek skin with lynfofast (solution of tecmesio) and the absorption was observed by gamma camera. Seven days after the FL she underwent the same study; we observed no absorption by the lymphatic, concluding that a week after surgery, the lymphatic network was still damaged. To study the venous return during surgery, a fine catheter was introduced into the external jugular vein up to the mandibular border to measure the peripheral pressure. Following platysma plication the pressure rose, and again after a simple bandage, but with an elastic bandage it increased even further, diminishing considerably when it was released. Hence, platysma plication and the elastic bandage on the neck augment the venous congestion of the face. There are diseases that produce and can prolong the surgical edema: cardiac, hepatic, and renal insufficiencies, hypothyroidism, malnutrition, etc. According to these factors, the post-op edema can be predicted, the surgeon can choose between a wide dissection or a medial surgery, depending on the social or employment compromises the patient has, or the patient must accept a prolonged recovery if a complex surgery is necessary. Operative measures which prevent extensive edemas are: avoiding transection of the temporal pedicle, or to realizing platysma plication too tight by using strong aspirative drainage instead of elastic bandages. In the post-op, the manual lymphatic drainage is initiated on the third or fifth day, but must be done by a trained professional, in a method contrary to that specified in the books for non-operated individuals. An aesthetician washes the hair and applies decongestive cold tea on the face the second day, and on the fifth, moisturizes the skin and cosmetically conceals any signs of

bruising. The psychological support provided by the staff keeps the patient calm and relaxed. Five years experience with this protocol has enabled us to minimize post-op pain. The edema can be predicted with certain consistency (in which surgery there will be more or less edema) and the proper technique can be selected, permitting the patient to choose the best moment for a FL while the surgeon can avoid intra and postoperative measures that increase the edema. After surgery, the patient receives the daily assistance of the staff, which rapidly and efficiently improves this condition. We can predict and control the post-op recovery and the patient feels fine, unlike the past when recovery was abandoned to its natural evolution. If the patient perceived an intensive, positive support on behalf of the entire staff that kept him or her content, then we have succeeded in doing an excellent marketing. This may encourage others to undergo aesthetic surgery, especially those who are convinced that after surgery they might have to endure considerable suffering.

Palazzin, E. P., et al. (2012). "Effect of lymphatic drainage on blood and urinary glucose in patients with type 1 diabetes mellitus: Preliminary study." Efeito da drenagem linfática manual sobre a glicemia e a glicose urinária em pacientes com diabetes mellitus do tipo 1: Estudo preliminar **22**(2): 97-101.

AIMS: To assess the immediate influence of manual lymphatic drainage in the lower limbs on capillary glycemia and urinary glucose in patients with type 1 diabetes mellitus. Methods: Seven subjects with type 1 diabetes mellitus underwent nine interventions using the Vodder method of manual lymphatic drainage. We analyzed the blood glucose and glycosuria pre- and post-manual lymph drainage. The results were analyzed using the paired t test, considering $p<0.05$ significant. Results: The averages pre-manual lymph drainage for blood glucose were 215.9±129.7 mg/dL and for urinary glucose were 1288.2±2221.1 mg/dL, and for the the post-manual lymph drainage were 187.1±109.2 mg/dL for blood glucose and 1049.6±1866.0 mg/dL for urinary glucose. Both variables showed a significant difference: for capillary blood glucose, $p<0.00001$; and for urinary glucose, $p=0.0321$. Conclusions: Manual lymphatic drainage showed an acute effect on the blood and urinary glucose of type 1 diabetic patients.

Schillinger, A., et al. (2006). "Effect of Manual Lymph Drainage on the Course of Serum Levels of Muscle Enzymes After Treadmill Exercise." American Journal of Physical Medicine & Rehabilitation **85**(6): 516-520 510.1097/1001.phm.0000219245.0000219538.ed.

Schillinger A, Koenig D, Haefele C, Vogt S, Heinrich L, Aust A, Birnesser H, Schmid A: Effect of manual lymph drainage on the course of serum levels of muscle enzymes after treadmill exercise. Am J Phys Med Rehabil 2006;85:516-520. Objective: Improving muscular recovery after exercise is an important topic in sports medicine. The aim of the present study was to evaluate the effect of manual lymph drainage on the course of serum levels of muscle enzymes after an extended treadmill exercise. Design: Fourteen recreational athletes (seven women, seven men) were included in the study. The participants underwent a graded exercise test on a treadmill ergometer to determine the individual anaerobic threshold (IAT). Seven days after the graded exercise test, all subjects performed 30 mins of treadmill exercise at an intensity equivalent to IAT. The subjects were randomized into two groups of seven persons. One group was treated with manual lymph drainage (ML), whereas the control group (CG) received no treatment after the endurance exercise at IAT level. Results: After an increase immediately after exercise, a fast decrease in lactate dehydrogenase (LDH) and in aspartate aminotransferase (AST) concentration was observed, with significantly lower values for LDH after 48 hrs in the subjects having received lymph drainage treatment.

The course of creatine kinase (CK) levels was comparable, but did not reach significance. Conclusion: Manual lymph drainage after treadmill exercise was associated with a faster decrease in serum levels of muscle enzymes. This may indicate improved regenerative processes related to structural damage of muscle cell integrity. (C) 2006 Lippincott Williams & Wilkins, Inc.

Selosse, E. (1981). "Vodder's manual lymph drainage in posttraumatic edema." LE DRAINAGE LYMPHATIQUE MANUEL SELON VODDER DANS LES CAS D'OEDEME POST-TRAUMATIQUE **No. 90**: 97-102.

Sitzia, J., et al. (2002). "Manual Lymphatic Drainage Compared with Simple Lymphatic Drainage in the Treatment of Post-mastectomy Lymphoedema: A pilot randomised trial." Physiotherapy **88**(2): 99-107.

SummaryPurpose To determine whether manual lymphatic drainage (MLD) is significantly more effective than simple lymphatic drainage (SLD) in reducing oedematous limb volume in women with breast cancer related arm oedema. Design Randomised trial. Methods The study measured change in affected limb volume over a two-week intensive treatment period. One group of patients (N = 13) was treated with SLD, the other group (N = 15) with MLD. All patients were treated daily by the same lymphoedema specialist nurse and wore multi-layered bandaging between treatments. The sole outcome measure was percentage change in excess limb volume (PCEV) following treatment. Results The mean percentage reduction in PCEV was 33.8% in the MLD group and 22.0% in the SLD group (mean difference 11.8%, 95%CI = –3.8% to +27.4%). Conclusions These data suggest that MLD is more effective than SLD in reducing limb swelling. However, the data are not statistically conclusive. These results firmly support the need for this study to be replicated with a larger, statistically viable sample.

Szolnoky, G., et al. (2008). "Complex decongestive physiotherapy decreases capillary fragility in lipedema." Lymphology **41**(4): 161-166.

Lipedema is a disproportional obesity featuring frequent hematoma formation due to even minor traumatic injuries. On the basis of clinical observations, complete decongestive physiotherapy diminishes the incidence of hematomas due to minor injuries beyond leg volume reduction. Hematoma development may be caused by altered capillary resistance (CR) or altered capillary fragility (CF). We measured capillary fragility (CF) before and after complex decongestive physiotherapy (CDP) to examine, whether CDP could reduce CF. 38 women with lipedema were included in the study. Twenty-one (21) patients were treated with CDP and 17 using exclusively moisturizers as the control group. CDP comprised once daily manual lymph drainage, intermittent pneumatic compression and multilayered short-stretch bandaging performed throughout a 5-day-course. CF was evaluated with the vacuum suction method (VSM) using Parrot's angiosterrometer in both groups. Decongestive therapy resulted in a significant reduction of the number of petechiae while no change was detected within the control group. Complete decongestive physiotherapy significantly reduced CF in patients with lipedema and this reduction may lead to reduced hematoma formation.

Szolnoky, G., et al. (2007). "Manual lymph drainage efficiently reduces postoperative facial swelling and discomfort after removal of impacted third molars." Lymphology **40**(3): 138-142.

The removal of wisdom teeth is often associated with severe postoperative edema and pain, and operation on the third molar can cause local inflammation that impairs lymph transport. The objective of the study was to assess the efficacy of manual lymph drainage (MLD) in reducing swelling following bilateral wisdom tooth removal. Ten consecutive patients with bilateral impacted wisdom teeth that required surgical removal were enrolled in the study. Each patient was postoperatively treated with MLD (after Vodder's method) on one side of the neck region with the untreated contralateral side as a control. Swelling was evaluated using a tape-measure placed in contact with the skin. The six landmarks of measurement included tragus-lip junction, tragus-pogonion, mandibular angle-external corner of eye, mandibular angle-ala nasi, mandibular angle-lip junction, and mandibular angle-median point of chin. Subjective assessment of MLD was conducted with self-evaluation using a visual analogue bar scale (VAS, range 0-100 mm). Of the 6 linear measurements, 4 lines (2, 4, 5, 6) showed a significant reduction of swelling on the side of MLD compared to the untreated side. Mean score of VAS of pretreatment condition was 35.5 ± 20.60 mm that decreased to 22 ± 19.32 mm measured after MLD (p=0.0295). This initial study demonstrates that MLD may promote an improvement of lymph circulation and work in an adjunctive role for reduction of postoperative swelling and pain following removal of impacted third molars.

Tan, I. C., et al. (2011). "Assessment of Lymphatic Contractile Function After Manual Lymphatic Drainage Using Near-Infrared Fluorescence Imaging." Archives of Physical Medicine and Rehabilitation **92**(5): 756-764.e751.

Tan I-C, Maus EA, Rasmussen LC, Marshall MV, Adams KE, Fife CE, Smith LA, Chan W, Sevick-Muraca EM. Assessment of lymphatic contractile function after manual lymphatic drainage using near-infrared fluorescence imaging. Objective To investigate the feasibility of assessing the efficacy of manual lymphatic drainage (MLD), a method for lymphedema (LE) management, by using near-infrared (NIR) fluorescence imaging. Design Exploratory pilot study. Setting Primary care unit. Participants Subjects (N=10; age, 18–68y) with a diagnosis of grade I or II LE and 12 healthy control subjects (age, 22–59y). Intervention Indocyanine green (25 μg in 0.1 mL each) was injected intradermally in bilateral arms or legs of subjects. Diffused excitation light illuminated the limbs, and NIR fluorescence images were collected by using custom-built imaging systems. Subjects received MLD therapy, and imaging was performed pre- and posttherapy. Main Outcome Measures Apparent lymph velocities and periods between lymphatic propulsion events were computed from fluorescence images. Data collected pre- and post-MLD were compared and evaluated for differences. Results By comparing pre-MLD lymphatic contractile function against post-MLD lymphatic function, results showed that average apparent lymph velocity increased in both the symptomatic (+23%) and asymptomatic (+25%) limbs of subjects with LE and control limbs (+28%) of healthy subjects. The average lymphatic propulsion period decreased in symptomatic (−9%) and asymptomatic (−20%) limbs of subjects with LE, as well as in control limbs (−23%). Conclusions We showed that NIR fluorescence imaging could be used to quantify immediate improvement of lymphatic contractile function after MLD.

Vairo, G. L., et al. (2009). "Systematic review of efficacy for manual lymphatic drainage techniques in sports medicine and rehabilitation: an evidence-based practice approach." The Journal of manual & manipulative therapy **17**(3): e80-89.

Manual therapists question integrating manual lymphatic drainage techniques (MLDTs) into conventional treatments for athletic injuries due to the scarcity of literature concerning musculoskeletal applications and established orthopaedic clinical practice guidelines. The

purpose of this systematic review is to provide manual therapy clinicians with pertinent information regarding progression of MLDTs as well as to critique the evidence for efficacy of this method in sports medicine. We surveyed English-language publications from 1998 to 2008 by searching PubMed, PEDro, CINAHL, the Cochrane Library, and SPORTDiscus databases using the terms lymphatic system, lymph drainage, lymphatic therapy, manual lymph drainage, and lymphatic pump techniques. We selected articles investigating the effects of MLDTs on orthopaedic and athletic injury outcomes. Nine articles met inclusion criteria, of which 3 were randomized controlled trials (RCTs). We evaluated the 3 RCTs using a validity score (PEDro scale). Due to differences in experimental design, data could not be collapsed for meta-analysis. Animal model experiments reinforce theoretical principles for application of MLDTs. When combined with concomitant musculoskeletal therapy, pilot and case studies demonstrate MLDT effectiveness. The best evidence suggests that efficacy of MLDT in sports medicine and rehabilitation is specific to resolution of enzyme serum levels associated with acute skeletal muscle cell damage as well as reduction of edema following acute ankle joint sprain and radial wrist fracture. Currently, there is limited high-ranking evidence available. Well-designed RCTs assessing outcome variables following implementation of MLDTs in treating athletic injuries may provide conclusive evidence for establishing applicable clinical practice guidelines in sports medicine and rehabilitation.

Williams, A. F., et al. (2002). "A randomized controlled crossover study of manual lymphatic drainage therapy in women with breast cancer-related lymphoedema." European Journal of Cancer Care **11**(4): 254-261.

This paper describes a randomized controlled crossover study examining the effects of manual lymphatic drainage (MLD) in 31 women with breast cancer-related lymphoedema. MLD is a type of massage used in combination with skin care, support/compression therapy and exercise in the management of lymphoedema. A modified version of MLD, referred to as simple lymphatic drainage (SLD), is commonly taught as a self-help measure. There has been limited research into the efficacy of MLD and SLD. The study reported here explores the effects of MLD and SLD on a range of outcome measures. The findings demonstrate that MLD significantly reduces excess limb volume (difference, d=71, 95% CI=16–126, P=0.013) and reduced dermal thickness in the upper arm (d=0.15, 95% CI=0.12–0.29, P =0.03). Quality of life, in terms of emotional function (d=7.2, 95% CI=2.3–12.1, P=0.006), dyspnoea (d=−4.6, 95% CI=−9.1 to −0.15, P=0.04) and sleep disturbance (d =−9.2, 95% CI=−17.4 to −1.0, P=0.03), and a number of altered sensations, such as pain and heaviness, were also significantly improved by MLD. The study provides evidence to support the use of MLD in women with breast cancer-related lymphoedema. The limitations of the study are outlined and future areas for study are highlighted.