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Scientific/Clinical Article

Effectiveness of edema management techniques for subacute hand edema: A systematic review

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ABSTRACT

Study Design: Systematic review.
Introduction: Prolonged hand edema can have detrimental effects on range of motion and function. There is no consensus on how best to manage traumatic subacute edema. This is the first systematic review which examines the clinical effectiveness of edema treatments on hand volume.
Purpose of the Study: The purpose of this systematic review was to examine the evidence of effectiveness of treatments for sub-acute hand edema.
Methods: A literature search of AMED, CINAHL, Embase, and OVID MEDLINE (from inception to August 2015) was undertaken. Studies were selected if they met the following inclusion criteria: randomized controlled or controlled trials in adults who have subacute swelling after a recent upper limb musculoskeletal trauma or cerebral vascular attack or after surgery. Two independent assessors rated study quality and risk of bias using the 24-point MacDermid Structured Effectiveness Quality Evaluation Scale (SEQES).
Results: Ten studies met the inclusion criteria. Study quality ranged from 23 to 41 out of 48 points on the SEQES. A total of 16 edema interventions were evaluated across the studies. Due to heterogeneity of the patient characteristics, interventions, and outcomes assessed, it was not possible to pool the results from all studies. Therefore, a narrative best evidence synthesis was undertaken. There is low to moderate quality evidence with limited confidence in the effect estimate to support the use of manual edema mobilization methods in conjunction with standard therapy to reduce problematic hand edema.
Conclusion: Manual edema mobilization techniques should be considered in conjunction with conventional therapies, in cases of excessive edema or when the edema has not responded to conventional treatment alone; however, manual edema mobilization is not advocated as a routine intervention.
Level of Evidence: 2b.

Introduction

The management of edema is a constant challenge for hand therapists where the objective is to reduce swelling as effectively and quickly as possible to focus therapy on more functionally related goals, such as return to usual activity. “Edema is glue”[1] highlights the challenges of balancing the physiological healing process after injury with the need to maintain and restore soft tissue length, function and joint motion.

Prolonged swelling has an impact on joint range of motion, soft tissue mobility, quality of scar tissue formation, function, strength, and esthetics of the hand. These factors may delay a patient’s recovery, return to work and resumption of activities of daily living and require frequent or increased outpatient appointments. Hunter and Mackin[2] advocate a comprehensive therapy program to manage edema tailored to the individual needs of the patient and comprising a combination of evidenced-based interventions. “The prevention and treatment of edema are of paramount importance during all phases of management of the injured hand.”[2]

Conflict of interest: All named authors hereby declare that they have no conflicts of interest to disclose.

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The most commonly used conventional treatment techniques in this phase include massage, elevation, exercise, and compression. Compression for hand edema is usually achieved through Lycra gloves which exert around 35 ± 5 mmHg pressure on the tissues of the hand.[3] The garment acts as an external counter pressure[4] which compensates for the inelasticity of edematous tissues, and, therefore improves circulatory efficiency by facilitating venous and lymphatic flow.[3]

Elevation permits gravity to assist with the drainage of edema from the distal limb.[5] Elevation alone[6] is not effective in reducing edema, but is recommended in combination with other modalities. Massage involves a "retrograde" action traditionally done in a distal to proximal direction. This technique uses a moderate force "milking" action but is considered too aggressive for the delicate lymphatic system to cope with and has recently been questioned.[5]

Recent evidence suggests that massage needs to be much lighter with only minimal pressure to traction the skin.[7] It should start and end proximally to clear lymph channels proximally and make way for fluid distributed distally. This technique referred to as manual edema mobilization (MEM)[7] is complimented with other methods aimed to assist with the facilitated direction of lymphatic flow which include low-stretch bandaging and a home exercise program. MEM massage does not involve pressure and in effect is more of a stroking action where the hand is brushed across the skin with only enough force to gently drag on the skin to the point at which it creases. Evidence suggests that a pressure of less than 30 mm Hg is sufficient, greater than 60 mmHg can cause damage to the lymphatics,[8,9] and at 75 mmHg, single cell lymphatic capillaries are completely collapsed.[9]

Active exercises which enable tendon gliding and muscular contractions can act as a pump which will assist with the flow of edema away from the periphery. Exercises can be completed in conjunction with other techniques to maximize the benefit; however, in certain circumstances, depending on the nature of the injury and/or surgery, the patients' hand movements are restricted based on healing timeframes and, if unable to use other techniques, this immobilization or restricted movement phase can have a detrimental effect of edema control.

Many of the advances in the management of edema after trauma are based on the research completed on lymphedema. Manual edema mobilization (MEM), which was introduced in 1995 as a method to reduce subacute and chronic hand and arm edema, has been adapted from the principles of manual lymph drainage (MLD) which is used to treat postcancer lymphedema.[10,11]

MEM, according to Artzberger,[10] consists of massage in a proximal to distal then distal to proximal direction, exercises, pump point stimulation, a home exercise program, and low-stretch bandaging. Kinesiology tape and myofascial release can also be used where necessary as a tissue softening method. In current practice, potential issues arise with interchanging terminology and a lack of awareness of the differences between the components of each technique.

Kinesiology tape, which can be used as part of the MEM program but also as an adjunct to the more traditional techniques, is designed to mimic the elastic properties of the skin by lifting the skin to allow greater interstitial space and encourage lymphatic drainage. In contrast to the traditional compression method which, using a glove and/or retrograde massage, is designed to push the fluid proximally into the venous and lymphatic system.[12] The tape is said to be unique in that it mimics the elastic properties of the skin and its wave-like grain provides a pulling force to the skin creating more space by lifting the fascia and soft tissues under the areas where it is applied.[13]

The benefit of using it in the hand, unlike an edema glove, is that it leaves most of the skin surface free for sensory feedback which is essential for functional use. It can also be worn in water. As the tape is elastic and stretches up to 55%-60% of its length it also allows for unrestricted movement.[13,14] Kinesiology tape is becoming more popular for hand edema management and is already widely used in National Health Service clinical practice; however, there is no research evidence to suggest that it is effective in treating edema[14-16] in the hand and there is limited understanding of its mechanism of action.[17] As with some of the previous techniques mentioned, most of the research on kinesiology tape is also focused on its use in lymphedema[18] where it has been shown to be effective. Given that lymphedema is a permanent and irreversible overloading of the lymphatic system, it is plausible that its mechanism of action may be similar to subacute edema where there is only a temporary overloading of the lymphatic system.

Purpose of the study

The purpose of this systematic review was to examine the evidence of effectiveness of a range of hand edema treatments on hand volume.

Methods

We conducted a systematic review using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analysis) recommendations (http://www.prisma-statement.org/index.htm).[19] The review protocol was registered prospectively on PROSPERO (CRD42015026836) http://www.crd.york.ac.uk/PROSPERO.

The following electronic databases were searched: the Cochrane Library (Wiley InterScience), MEDLINE (via Ovid), Embase (via Ovid), AMED (via Ovid), CINAHL (via EBSCO), SPORTDiscus (via EBSCO), PEDro (Physiotherapy Evidence Database), Allied Health Evidence, trial registers: Cochrane (Central Register of Controlled Trials) [CENTRAL] and the WHO (International Clinical Trials Registry Platform) from inception to August 2015. Search terms included: *EDEMA THERAPY/, exp EDEMA/TH [TH=Therapy], (hand ADJ edema).ti,ab, (edematous ADJ hand).ti,ab, *CRYOTHERAPY/, *RADIUS FRACTURES/, *FINGERS/, *HAND/, *WRIST/ OR *WRIST JOINT/, [Limit to: (Language English) and (Age group Adult) and Humans].

Additional references were searched for by examining the reference list of retrieved studies.

Eligibility criteria

Criteria for inclusion were English language, randomized controlled trails (RCTs) or controlled trials of adult participants with subacute swelling, after a recent upper limb musculoskeletal, hemiplegic stroke, or after surgery (ie, orthopedic and plastic). Active treatment must have occurred during the subacute phase. Subacute refers to swelling which is present after the initial acute inflammatory phase of ~3-5 days and which persists into the fibroblastic phase between 2 and 6 weeks after trauma. Outcomes had to be assessed using a clinician derived measure of volume.

Studies were excluded if they used animals or humans where edema was investigated at an organ or cellular level. Studies using participants where edema was due exclusively to pregnancy or which only measure acute edema (day 0-14 after surgery or trauma) or chronic edema (around 3 months after surgery or trauma) were also excluded. Studies which only used a medicinal product or invasive methods to treat the edema (such as cortisone injection and anti-inflammatory drugs) were also excluded.