“Distal Radius Fractures – Blending Research into Practice”

WELCOME
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The Vision

• Saturday Meeting & Live Streaming
  – Improved availability
  – Increased access to our members statewide
  – Increased membership
  – Improved quality and diversification of meetings
This Meeting’s Vision

• Ann Lucado
• Sharon Hennigan
GHUESIG UPDATE
“PASS IT ON!”

EVELYN MACKIN, PT
Membership Update as of March 2011

- Membership averages ±50 members
- As of 3/1/11 we have **43 members**
- 14 (or 34%) of these members are NEW MEMBERS!!!!!!!!!!!!!!!!!!!! WOW!!!!!!!
- Our goal is **80 members**
- **We are half way there!!!**
- **Each of us should invite 1 person!**
- Can we get to 100 members? Why should we?
HOW MANY MEMBERS DO WE HAVE TODAY?
100 members!
Members Statewide

- metro Atlanta
- Douglas
- Macon
- Brunswick
- Uvalda
- Savannah

- Ellijay
- Calhoun
- Thomaston
- Columbus
- Athens
- Pooler
Outreach

• 2500 OTs statewide
• Mailed group announcements to 1000 OTs
• Goal
  – Invite others who are needing a vehicle into hand therapy
  – Mentoring
  – Networking
• If successful return, then we can repeat this for all OTs and PTs across the state
WEBSITE UPDATE
Website Highlights

• Advertising
  – Jobs
  – Volunteers
  – Meetings/Events
  – Products/Services
  – 30-day free postings

• Members Only
  – Live stream
  – Financials
  – Bylaws

• Donations
• Contact Us
• Our Blog
GHUESIG Volunteers

- Earn 25% discount to Educational Conferences
- Contact
  - **Research** – Sharon Hennigan
  - **Membership** – Merritt McKenzie
  - **Educational Conference Planning** – Lisa Smith & Missy Thurlow
  - **Fundraising** – Sharon Hennigan & Lisa Smith
  - **Newsletter** – Sheri Roberts
Summer 2011
Meetings / Speakers

• **June 7th, 2011, 7 pm – 9 pm**
  – “Distal Humerus Fractures & War-related Injuries”
  – Tedman Vance, MD
  – Piedmont Hospital, McRae Auditorium

• **July 2011** (No meeting scheduled)

• **August 4th, 2011, 7 pm – 9 pm**
  – “New Developments in Hand Transplantation”
  – Linda Cendales, MD
  – Piedmont Hospital, McRae Auditorium
2011 Educational Conference

- **August 26th & 27th**
- Ken Flowers, PT, CHT
- “The ESSENTIAL ELBOW & The SOLID SHOULDER: Two Very Different Joints”
- Piedmont Hospital
  - 1968 Peachtree Road Northwest, Atlanta, GA 30309, McRae Auditorium
- Course brochure coming soon!
QUESTIONS
Snehal Dalal, MD

- Southern Orthopedic Specialists
- OSU Medical School Graduate
- Medical College of Wisconsin Residency
- Milwaukee Hand & UE Fellowship

- Team Physician
  - Central Gwinnett HS
  - Atlanta Tennis Championship
  - Gwinnett Gladiators

- Expertise
  - Reverse total shoulder arthroplasty
  - Elbow hemiarthroplasty
  - Xiaflex collagenase injections for Dupuytren’s contractures
THANK YOU!
DISTAL RADIUS FRACTURES: ANATOMY, MECHANICS, AND MANAGEMENT

Snehal C. Dalal, MD
Shoulder, Elbow, and Hand Surgery
Board Certified in Orthopedic Surgery
May 18, 2011
ANATOMY
ANATOMY

- **Metaphysis**
  - Primarily cancellous bone with thin cortices, especially dorsal-radial

- **Articular Surface**
  - Biconcave: scaphoid and lunate fossae
FUNCTIONAL ANATOMY

- 80% axial load through distal radius
- 20% axial load through ulna and triangular fibrocartilage complex (TFCC)

Implication of reversal of normal palmar tilt (as in a dorsally angulated Colles’ fracture)
- Load transfer to ulna/TFCC
- Eccentric loading onto the dorsal aspect of scaphoid fossa
Ligamentous Anatomy

- Ligaments usually remain intact in fractures
  - This facilitates closed reduction through “ligamentotaxis”
- Volar ligaments are stronger and more essential than dorsal ligaments
**Radiographic Anatomy**

- **Radial inclination**
  - Average: 23 degrees (13-30)

- **Radial length**
  - Average 13 mm (8-18)

- **Volar tilt**
  - Average 11 degrees (1-21)

- **Ulnar variance**
Epidemiology

- Bimodal age distribution: childhood/adolescents and after the age of 60
- Childhood fractures: sports or fall from greater heights
- Elderly fractures: fall from standing height
  - 90% of elderly fractures are extraarticular and have satisfactory functional outcome
EPIDEMIOLOGY

- Most common fracture in adults
  - 1/6th of fractures treated in emergency room
- Women affected 6-7 times more than men, increasing with advancing age
- 16% of white women and 3% of white men will fracture their distal radius after 50 years
RISK FACTORS

- Highest in aging women
  - Development of postmenopausal osteoporosis
  - Postural instability, more likely to fall than men
- Falls while out walking in women over 50
  - Active women had DR fx
  - Inactive had proximal humerus fx
- Low bone density
- History of recurrent falls
- History of previous fracture
FRACATURE MECHANICS
**Injury Patterns**

- **Bending**
  - Metaphysis fails in tension
    - Colles’, Smith’s

- **Compression**
  - Articular fracture with impaction of subchondral and metaphyseal bone
    - Die Punch fracture

- **Shearing**
  - Intraarticular/lip fracture
    - Barton’s, Volar Barton’s

- **Combination**
  - High energy injuries (MVA, fall from height, etc.)
Colles’ Fracture

- Originally, extraarticular fractures
- Presently, extra- and intraarticular fractures:
  - DORSAL angulation
  - DORSAL displacement
  - RADIAL shift
  - RADIAL shortening
COLLES’ FRACTURE

- Mechanism: fall on hyperextended, radially deviated wrist with forearm pronated
- >90% of DR fractures are of this pattern
- Intraarticular fx usually in young due to higher energy forces
SMITH’S FRACTURE

- Fractures that collapse in palmar flexion
- Mechanism: fall on a flexed wrist with forearm in supination
- Notoriously unstable fracture pattern
  - Usually requires ORIF
BARTON’S FRACTURE

- Fracture subluxation of wrist
- Intraarticular dorsal or volar (Volar Barton’s) rim fracture
Barton’s Fracture

- Mechanism: fall on dorsiflexed wrist with forearm fixed in pronation
- Volar Barton’s is more common
- Most are unstable and require ORIF
Radial Styloid Fracture

- Aka “Chaffeur’s Fracture”
- Avulsion fracture with extrinsic ligaments remaining attached to styloid fragment
- Mechanism: compression of scaphoid against styloid with wrist in dorsiflexion and ulnar deviation
- May involve entire, dorsal, or volar portion of styloid
- Often associated with intercarpal ligament injury (scapholunate dissociation or perilunate dislocation)
- ORIF may be necessary, closed treatment is possible
MANAGEMENT
FACTORS IN TREATMENT

- Fracture Pattern
- Local Factors
  - Bone Quality, Soft tissue injury, comminution, displacement/energy of injury
- Patient Factors
  - Physiologic age
  - Lifestyle/Occupation
  - Hand dominance
  - Medical conditions
  - Associated injuries
  - Compliance
FACTORS IN TREATMENT

- Current literature focuses on operative fixation devices
- Art of reduction and casting is a viable option for majority of fractures
**STABLE FRACTURES**

- Closed reduction, casting
- Treatment of choice for majority of fractures
- Wrist in volar flexion and ulnar deviation
- Cast for 6 wks, long arm/Muenster cast initially
- Avoid extreme flexion of wrist as this can increase carpal canal pressure and increases digital stiffness

**DORSAL COMMINUTION**
- Most important indicator of maintained reduction in a cast
**Hematoma Block**

- Very useful in the first 48 hours
- Insert 20 gauge needle, aspirate hematoma and inject 4-5 cc on lidocaine/marcaine
REDUCTION TECHNIQUES: DISTAL RADIUS
REDUCTION TECHNIQUES: DISTAL RADIUS

- Successful hematoma block
- Finger traps to Thumb and IF
- Countertraction
- Traction exploits the biomechanics of LIGAMENTOTAXIS
- May spontaneously reduce!
- May splint while in traps
Reduction Techniques: Distal Radius

- With fingertrap/manual traction
- Gentle, firm, even pressure
- “Placing hat on top of the head”
UNSTABLE FRACTURES

- Percutaneous pinning
  - Extraarticular or two part articular fractures
  - Good bone quality
  - Extrafocal
  - Intrafocal/Kapandji pinning for extraarticular fractures
UNSTABLE FRACTURES

- External fixation
  - Bridging ex fix: distracting forces across carpus
  - Ligamentotaxis can restore radial length and inclination, but not palmar tilt
Unstable Fractures

- **External fixation**
  - Complications: CRPS, stiffness, fracture through pin sites, radial sensory neuritis, pin tract infection
  - Dynamic ex fix has failed to be effective in restoring normal kinematics
Unstable Fractures

- Limited open reduction
  - Fractures with persistent articular displacement despite traction (ex-fix)
  - Limited open reduction, bone graft and Kirschner wires
  - Ex fix alone inadequate to treat intraarticular fxs
  - Ex fix with supplemental K wire fixation significantly improved outcomes
UNSTABLE FRACTURES

- Open reduction and internal fixation
  - Unstable Smith’s, Barton’s, and comminuted fractures
  - Ulnar styloid may need ORIF if DRUJ is unstable
Unstable Fractures

- Dorsal Plate Fixation
  - Introduced in 1980s
  - Dorsal approach allows direct visualization of intraarticular fragments
  - Rigid fixation allowed earlier motion
  - Improved results, with increase in complications
    - Tenosynovitis
    - Tendon ruptures, especially EPL
    - Wrist stiffness
UNSTABLE FRACTURES

• Volar Plate Fixation
  • First described for osteotomies
  • Butress plating for volar lip fractures
  • Revolutionary fixed angle plating introduced in 2000
    • Obviated problems encountered with dorsal plating
  • Treatment of choice for simple and complicated fracture patterns
UNSTABLE FRACTURES

- Implant Choice
  - Intramedullary, minimally invasive implant
UNSTABLE FRACTURES

- Implant Choice
  - Distal volar radius (DVR) plate, fixed screws
UNSTABLE FRACTURES

- Implant Choice
  - Distal volar radius (DVR) plate, variable angle screws
REHABILITATION
OBJECTIVES

- Restore digital and wrist motion
- Followed by strengthening
- Edema control
  - Increased dorsal skin stretching leads to extensor tightness
  - Compression, elevation, massage, A/PROM of digits
- Focus on tendon gliding
  - Caution that exercises loads do not exceed fixation strength
OUTCOMES

- Rigid fixation allows early, more aggressive mobilization and strengthening
- Starting therapy earlier vs later are inconclusive
  - Similar end ROM and grip strength
- Clear benefit lies in patient satisfaction
  - Less immobilization time
  - Earlier return to daily activities
CASES
CASE #1: DISTAL BOTH BONE FRACTURE
Case #1: Distal Both Bone Fracture
CASE #2: COMBINATION WITH DIE PUNCH
Case #2: Combination with Die Punch
CASE #3: DR WITH STYLOID FRACTURE
CASE #3: DR WITH STYLOID FRACTURE
Case #4: Highly comminuted BBFFX
CASE #4: HIGHLY COMMINUTED BBFFX
CASE #5: DORSAL COMMINUTION
CASE #5: DORSAL COMMINUTION
COMPLICATIONS

- Up to 30%, varying from reported series
- Median nerve dysfunction
  - Lesion despite adequate reduction: nerve exploration
  - Lesion after reduction: loosen splint and place in neutral position. Exploration and release if no improvement
  - Incomplete lesions requiring ORIF: recommend concomitant CTR
COMPLICATIONS

- Malunion
  - Corrective osteotomy +/- bone grafting
- Posttraumatic arthrosis
- Complex regional pain syndrome (CRPS)
- Digital, wrist, forearm stiffness
- Tendon Rupture (esp. EPL in NON DISPLACED fractures)
- Midcarpal instability (DISI pattern)
- Infection
THANK YOU

For any questions/referrals, please contact:
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If you sign up for online access through the ASHT link, you do not have to sign in again at the JHT site. If you are not a member of the ASHT, you can go directly to the Journal of Hand Therapy website http://www.jhandtherapy.org/ and have free access to all of the abstracts or can subscribe to the journal.

A Retrospective Pilot Study Comparing the Number of Therapy Visits Required to Regain Functional Wrist and Forearm Range of Motion following Volar Plating of a Distal Radius Fracture by Kristin Valdes. To be presented by Tina Jaya.

ABSTRACT Purpose: The purpose of this retrospective study was to compare the number of therapy visits and amount of time required to achieve functional motion in patients who underwent open reduction and internal fixation of the distal radius.

Methods: Fourteen patients started early range of motion (ROM) and nine patients started ROM exercises after six weeks. Group comparisons were performed regarding age, Upper Limb Functional Index scores across time points, forearm and wrist ROM measurements across time points, grip strength, days until goal attainment, and number of visits attended.

Results: A statistically significant difference (F 1/4 6.48, p , 0.005) (95% confidence interval [CI] 14.52 to 6.34) was present between groups when comparing the number of therapy visits. A statistically significant difference (F 1/4 2.35, p , 0.005) (95% CI 49.72 to 24.49) was present between groups when comparing the number of days each group took to attain functional ROM of the wrist and forearm.

A Comparison of the Ability of Two Upper Extremity Assessments to Measure Change in Function by Leigh Lehman, et al. To be presented by Marge Krengel.

ABSTRACT: Study Design Retrospective Measurement Comparison. Introduction: Upper extremity musculoskeletal disorders affect millions, thus, discerning optimal assessments for measuring change in upper extremity function is critical.

Purpose of the Study: To compare responsiveness (ability to measure change) of the Disabilities of Arm, Shoulder, and Hand (DASH) and Upper Extremity Functional Index (UEFI).

Methods: Statistical analyses included Rasch analysis to place the instruments on the same scale, analysis of variance to compare change scores, correlations to compare change scores with global ratings, and the use of receiver operating characteristic (ROC) curves to determine meaningful change scores and overall error.

Results: Change scores on the DASH and UEFI and correlations between change scores and global ratings were similar. Areas under the ROC curves for the DASH and UEFI were 67% and 65%, respectively.

Conclusions: Neither assessment has a clear advantage over the other when measuring clinical change.


A Randomized Clinical Controlled Study Comparing the Effect of Modified Manual Edema Mobilization Treatment with Traditional Edema Technique in Patients with a Fracture of the Distal Radius by Karin Knygsand---Roehoej and et al. To be presented by Amy Todd, OTR/L.

ABSTRACT: Study Design: Randomized controlled clinical trial. Introduction: Manual edema mobilization (MEM) is a method of edema reduction based on the lymphatic system’s ability to drain and resolve subacute edema.

Purpose of the Study: To investigate the effect of a modified MEM approach and compare it with a traditional edema technique in patients with subacute hand/arm edema after a distal radius fracture.

Method: The patients were randomized into one of two treatment groups: a group that received traditional edema treatment and a group that received a modified MEM treatment. All patients were examined for edema, active range of motion (AROM), pain, and activities of daily living (ADL). The number of edema sessions and the number of all sessions were counted.

Results: No statistically significant changes were observed in edema reduction, AROM, pain, and ADL at six and nine weeks between the treatment groups. A statistically significant improvement was observed in ADL after three weeks after inclusion (p 1/4 0.03) in the modified MEM group compared with the control group. Furthermore, fewer edema treatment sessions were needed (p 1/4 0.03) in the modified MEM group. At six weeks, we observed a difference between the two groups’ needs for further edema treatment (p 1/4 0.04).
Conclusion: Neither the traditional nor the modified MEM treatment program was superior in terms of edema reduction, although the modified MEM resulted in fewer sessions to decrease subacute hand/arm edema compared with using traditional edema reduction techniques in patients after distal radius fracture.


Proprioception of the Wrist Joint: A Review of Current Concepts and Possible Implications on the Rehabilitation of the Wrist by Elisabet Hagert. To be presented by Zita Gonzalez---King

ABSTRACT: Study Design: Narrative review. Recent years have brought new research findings on the subject of wrist joint proprioception, which entails an understanding of the wrist as part of a sensori-motor system where afferent information from nerve endings in the wrist joint affects the neuromuscular control of the joint. An understanding of proprioception is also essential to adequately rehabilitate patients after wrist injuries. The aim of this narrative review was to give the reader a background of proprioception as it relates to neuromuscular control and joint stability, what is presently known in relation to the wrist joint and how these findings may be applied to the field of wrist rehabilitation.


Static Progressive Splinting for Restoration of Rotational Motion of the Forearm by Michael McGrath, et al. To be presented by Cathie Taylor.

ABSTRACT: This study examined the use of a bidirectional, patient-directed orthosis that used the principles of static progressive stress to improve forearm rotation. Thirty-eight patients who had limited pronation and supination motions after injuries and who failed other physical therapy techniques underwent a 30- to 60-minute stretching protocol with the orthosis one to three times per day. The mean arc of rotation increased by 42 degrees (range, 0°122) after a mean treatment duration of 12 weeks (range, 3°57). The mean patient satisfaction score was 8.1 points on a scale of 0°10 points. All of the patients completed the treatment and no short-term complications were reported. The gains in motion were comparable to the published results of other orthoses as well as surgical procedures such as external fixators and closed manipulation, but fewer complications occurred with the static progressive stress technique. This orthosis is a useful treatment for patients who have limitations of forearm rotation.

**Mobilizing the Stiff Hand: Combining Theory and Evidence to Improve Clinical Outcomes** by Celeste Glasgow and et al. To be presented by Vanessa Cavalheiro.

ABSTRACT: The purpose of this narrative review is to provide a clinically reasonable guide to intervention choices, by combining a sound understanding of theory with available research evidence. The pathology of contracture formation is presented within the context of tissue repair. The soft tissue response to stress is explained and the optimal “dose” of treatment is discussed. The evidence behind the use of exercise, joint mobilization, continuous passive motion, casting motion to mobilize stiffness, and mobilizing splinting is examined. Recommendations regarding treatment implementation and future research needs are highlighted. The importance of mobilizing splinting and exercise as treatment modalities in the management of joint contracture is demonstrated.

A Retrospective Pilot Study Comparing the Number of Therapy Visits Required to Regain Functional Wrist and Forearm Range of Motion following Volar Plating of a Distal Radius Fracture

by Kristin Valdes

presented by Tina Jaya, OTR/L, CHT
Purpose of the study

- Compare the number of therapy visits taken to achieve functional range of motion of wrist and forearm of two groups one group started motion 1 week post op the other group started motion 6 weeks post op.
- Compare the length of time post op to achieve functional range of motion between the fore mentioned groups.
Hypothesis of Study

- There is a difference in
  - the number of therapy visits it takes to achieve functional range of motion
  - The length of time post op to achieve functional range of motion between a group of people who underwent ORIF of the distal radius and moved 1 week post op versus those who had the same procedure and moved 6 weeks post op.
Review of Literature

31 patients who had volar plate fixation for dorsally displaced fractures achieved excellent functional results.

Concluded that fixation allowed early wrist motion that resulted in good functional outcomes.
Studied 60 patients one group started wrist range of motion at 2 weeks post op and the other group moved at 6 weeks post op. Early or late mobilization does not have long term impact on wrist range of motion.
Focus’s on the patient’s perspective. Concludes that early return to function results in high patient satisfaction.
Methodology

- Retrospective study that was conducted by reviewing database at a private practice outpatient therapy facility.
- The subjects were treated by the same certified hand therapist and there were patients from 2 physicians.
- Post op protocol was designed for the 2 different groups and each specific protocol was used for each group. Therapist designed protocol based on review of literature. (see table 3 p 315).
- Selected all cases between June 2006 and September 2008 who had diagnosis code of 813.41 closed colles fracture.
- 76 charts were selected, next step was to select the charts of subjects who had ORIF.
- 23 charts were selected, next step was to contact the potential candidates and provide information and receive consent for the subjects to participate in the study.
Inclusion criteria: primary diagnosis of distal radius fracture and primary surgical diagnosis of ORIF distal radius.

2 candidates that had additional procedures were included.

Exclusion criteria: infection and non-union but from the results the 2 candidates that met this criteria were still included.
The following data was collected from the 23 charts:
- Upper Limb Functional Index
- Wrist Range of Motion
- Forearm Range of Motion
- Grip
- Number of therapy visits to achieve ROM
- Length of time post of to achieve ROM
- Demographics
Results

- Did she answer her question?
- Based on her results, she did.
- There was a statistically significant difference between the number of therapy visits to achieve range of motion in the early group (6.57 visits) vs late group (17.0 visits).
- There was also statistically significant difference between the number of days post op to attain functional range of motion between the early group (34.79 days) and late group (71.89).
She used the analysis of variance to compare the other variables and concluded that from the demographics and the other dependent variables there was no statistically significant difference and so early and delayed mobilization were the only variable with any impact on the time to achieve functional motion.
Study Weaknesses

- Small sample size
- Uneven number of participants in the 2 groups
- 1 therapist, 1 protocol
- ULFI vs PRWE

The author concludes that because of the above there is higher potential of type II error and no broad assumptions can be made from this study.

Literature reviewed for this study was limited. Post op therapy protocol is rigorous and unique, ROM at each visit, I am not sure how easily that will translate to most clinical settings.
Study Strengths

- She answered her question.
- She was able to go to her records and have 32 charts that she had 100% data to collect.
- She conducted a pilot study she certainly can move forward from here. I am not sure if her study is ready for multicenter would need more detail about the treatment protocols.
- It is a good foundation for prospective study.
Table 3 good example of how to design a therapy protocol based on evidence.

This article can be used to introduce the idea of early mobilization following distal radius ORIF to those referring physicians who immobilize for more than 1 week.

You can cite the article when educating patient about the benefits of early motion.

It is important to remember because this is a pilot study it would be good to ensure
A Comparison of the Ability of Two Upper Extremity Assessments to Measure Change in Function
Authors

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<table>
<thead>
<tr>
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<tbody>
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Compare the responsiveness of the DASH (Disabilities of Arm, Shoulder and Hand) and UEFI (Upper Extremity Functional Index)

Specific aims:
1. Ability to measure change in upper extremity function (admission to discharge)
2. Determine association between the change in function ratings for each patient on the DASH and UEFI and a global patient-reported measure of functional change then, to compare the degree of association found for the two assessments.
3. Identify total score change on each assessment that best indicates a change in functional ability. Identify the optimal cutoff value. (change score with sensitivity and specificity)

4. Compare overall error in predicting clinically important change between DASH and UEFI (comparing area under ROC curve)
Upper extremity musculoskeletal disorders affect millions, thus, discerning optimal assessments for measuring change in upper extremity function is critical.
The comparison of responsiveness between DASH and UEFI.

The Upper Extremity Functional Index (UEFI) has been shown to have a high test–retest reliability ($r=0.95$)

Stratford PW, Binkley JM, Stratford D. Development and initial validation of the upper extremity functional index. Physiother Can. 2001; Fall Volume 53, pages 259–67
Methodology

- Retrospective study design.
- Data previously collected from various outpatient clinics throughout United States by Focus on Therapeutic Outcomes (FOTO)

- Specific Aim 1 Measure change in UE function from admission to discharge. Patients included who completed both the DASH and UEFI at two time points, admission and discharge.
Specific Aim 2–4: Determine association between change in function ratings for each individual on the DASH and UEFI and a global patient-reported measure of functional change and then, compare the degree of association found for the two assessments.

Due to missing global rating data, patients were reduced to 178.

Average age 48.8/14.0
Female: 92 (51.7%) Male: 89 (48.3%)
Statistical Analysis

- Rasch analysis to place the instruments on the same scale.
- Analysis of variance to compare change scores.
- Correlations to compare change scores with global ratings.
- Receiver operation characteristic (ROC) curves to determine meaningful change scores and overall error.
<table>
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<th>Activity</th>
<th>Difficulty</th>
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<tbody>
<tr>
<td>1</td>
<td>Open a tight or new jar.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Write.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Turn a key.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Prepare a meal.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Push open a heavy door.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Place an object on a shelf above your head.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Do heavy household chores (e.g., wash walls, wash floors).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Garden or do yard work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Make a bed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>Carry a shopping bag or briefcase.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>Carry a heavy object (over 10 lbs).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12</td>
<td>Change a light bulb overhead.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>Wash or blow dry your hair.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td>Wash your back.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>Put on a pullover sweater.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>Use a knife to cut food.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17</td>
<td>Recreational activities which require little effort</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>(e.g., card playing, knitting, etc.).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Recreational activities in which you take some force or impact</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Recreational activities in which you move your arm freely</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>(e.g., playing frisbee, badminton, etc.).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Manage transportation needs (getting from one place to another).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21</td>
<td>Sexual activities.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
## Disabilities of the Arm, Shoulder and Hand

### Questionnaire

#### Question 22
During the past week, to what extent has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups? *(Circle number)*

<table>
<thead>
<tr>
<th>NOT AT ALL</th>
<th>SLIGHTLY</th>
<th>MODERATELY</th>
<th>QUITE A BIT</th>
<th>EXTREMELY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Question 23
During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem? *(Circle number)*

<table>
<thead>
<tr>
<th>NOT LIMITED AT ALL</th>
<th>SLIGHTLY LIMITED</th>
<th>MODERATELY LIMITED</th>
<th>VERY LIMITED</th>
<th>UNABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Please rate the severity of the following symptoms in the last week. *(Circle number)*

<table>
<thead>
<tr>
<th>NONE</th>
<th>MILD</th>
<th>MODERATE</th>
<th>SEVERE</th>
<th>EXTREME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

24. Arm, shoulder or hand pain.

25. Arm, shoulder or hand pain when you performed any specific activity.

26. Tingling (pins and needles) in your arm, shoulder or hand.

27. Weakness in your arm, shoulder or hand.

28. Stiffness in your arm, shoulder or hand.

<table>
<thead>
<tr>
<th>NO DIFFICULTY</th>
<th>MILD DIFFICULTY</th>
<th>MODERATE DIFFICULTY</th>
<th>SEVERE DIFFICULTY</th>
<th>SO MUCH DIFFICULTY THAT I CAN'T SLEEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

29. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand? *(Circle number)*

<table>
<thead>
<tr>
<th>STRONGLY DISAGREE</th>
<th>DISAGREE</th>
<th>NEITHER AGREE NOR DISAGREE</th>
<th>AGREE</th>
<th>STRONGLY AGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

30. I feel less capable, less confident or less useful because of my arm, shoulder or hand problem. *(Circle number)*

<table>
<thead>
<tr>
<th>DASH DISABILITY/SYMPTOM SCORE = [(sum of n responses) - 1] x 25, where n is equal to the number of completed responses.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A DASH score may not be calculated if there are greater than 3 missing items.</td>
</tr>
</tbody>
</table>
Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.

<table>
<thead>
<tr>
<th>Activity</th>
<th>No Difficulty</th>
<th>Mild Difficulty</th>
<th>Moderate Difficulty</th>
<th>Severe Difficulty</th>
<th>Unable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open a tight or new jar.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Do heavy household chores (e.g., wash walls, floors)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Carry a shopping bag or briefcase.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Wash your back.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Use a knife to cut food.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Please rate the severity of the following symptoms in the last week. (circle number)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Arm, shoulder or hand pain.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. Tingling (pins and needles) in your arm, shoulder or hand.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Please rate the extent to what extent has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?

<table>
<thead>
<tr>
<th>Extent</th>
<th>Not at All</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Quite a Bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. During the past week, to what extent has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Please rate the extent you were limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?

<table>
<thead>
<tr>
<th>Extent</th>
<th>Not Limited at All</th>
<th>Slightly Limited</th>
<th>Moderately Limited</th>
<th>Very Limited</th>
<th>Unable</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Severity</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please rate the severity of the following symptoms in the last week. (circle number)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. Arm, shoulder or hand pain.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. Tingling (pins and needles) in your arm, shoulder or hand.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

11. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand? (circle number)

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>No Difficulty</th>
<th>Mild Difficulty</th>
<th>Moderate Difficulty</th>
<th>Severe Difficulty</th>
<th>So Much Difficulty that I Can’t Sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand? (circle number)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

QuickDASH Disability/Symptom Score = \([(\text{sum of } n \text{ responses}) - 1] / n \times 25\), where n is equal to the number of completed responses.

A QuickDASH score may not be calculated if there is greater than 1 missing item.
Upper Extremity Functional Scale

We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your upper limb problem for which you are currently seeking attention. Please check (✓) an answer for each activity.

Today, do you or would you have any difficulty at all with:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Extreme Difficulty Or Unable to Perform Activity</th>
<th>Quite a Bit of Difficulty</th>
<th>Moderate Difficulty</th>
<th>A Little Bit of Difficulty</th>
<th>No Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any of your usual work, household, or school activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your usual hobbies, recreational or sporting activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifting a bag of groceries to waist level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifting a bag of groceries above your head</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grooming your hair</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pushing up on your hands (e.g., from bathtub or chair)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparing food (e.g., peeling, cutting)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuuming, sweeping, or raking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dressing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing up buttons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using tools or appliances</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening doors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tying or lacing shoes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleeping</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laundering clothes (e.g., washing, ironing, folding)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening a jar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throwing a ball</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrying a small suitcase with your affected limb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Stratford P, Blimley JM, Stratford POW. Development and initial validation of the upper extremity functional index. Physiotherapy Canada Fall 2001;259-266, 281.

Patient name: __________________________ Signature: __________________________ Date: __________________________

Score __________________________/80 MDC (minimum detectable change) = 9 pts Error +/- 5 scale points
How DASH and UEFI are scored

- DASH 30 questions
  - Score 1–5
  - 1 no difficulty
  - 5 unable
  - Add raw score
  - Divide by number answered
  - Subtract one
  - Multiply by 25
  - Lowest possible score 0

- UEFI 20 questions
  - Score 0–4
  - O is extreme difficulty
  - 5 is no difficulty
  - Add raw score.
  - Highest possible score is 80/80

DASH has more research

UEFI very little research
Change scores on the DASH and UEFI and correlations between change scores and global ratings were similar. DASH 20 UEFI 15

Both test assess person measure change from admission to discharge in a similar way.

Reason for similarity in measuring is due to similarity in questions on each test.

Larger change score in either test yields a smaller sensitivity and greater specificity.
It is unclear what treatments used contributed to change.

Neither DASH or UEFI has clear advantage over other when measuring clinical change.

Authors suggest use of UEFI over DASH due to time required.

DASH is more widely used and better for communications of outcomes for other therapist or insurance companies.
Conclusion

- A better “Gold Standard” is needed for assessing change in upper extremity function.
- Divide the DASH into fine motor items, gross motor items/complex task, and symptom items.
- More research on responsive assessments is needed to set guidelines for future assessment developments.
What do you think?

- Use DASH of UEFI as a guide for setting functional goals.
- Does using outcomes of DASH or UEFI support what we do in the clinic?
- How can we as clinicians use the results of this research to better communicate with the insurance companies, our patients and our referring physicians.
Thank you,
Marge Krengel OT, CHT
East Cobb Shoulder, Elbow and Hand Therapy
Title: A Randomized Clinical Controlled Study Comparing the Effect of Modified Manual Edema Mobilization Treatment with Traditional Edema Technique in Patients with a Fracture of the Distal Radius

By: Karin Knygsand-Roenhoej, OT, CLT and Thomas Maribo, MHS, PT

Published: December 2010

Purpose:

The purpose of this study is to investigate the effect of modified MEM approach and based on MEM pump points (MPP) stimulation technique and compare it with the traditional edema technique in terms of edema reduction, reduction in pain, AROM, and ADL in patients with a sub acute hand/arm edema.

Traditional edema technique=elevation, compression and functional training such as Coban, activity over shoulder height for at least 10 min, Flowtron intermittent compression system for 20 min,

MEM=New to the scene in 1995 for sub acute and acute edema. Based in European Manual Lymphatic Drainage used with patients who have post cancer lymphedema.

MPP= MEM Pump Points involve simultaneous, synchronized movement of hands in a U shape over areas of lymphatic bundles /”watersheds”/lymph nodes

MEM/MLD differences: 1) MLD used for permanent edema; MEM for subacute edema. 2) MEM uses MEM pump points, MLD does not.

Theory of MPP- by massaging the MPP you change the pressure gradient in the lymphatic system creating a vacuum effect and allowing for greater lymphatic drainage. Between pump points MEM flow massage is performed.

- Massage in U shape with light skin traction with U arms facing proximally in UE and toward uninvolved side in trunk. Series performed from proximal to distal then distal to proximal to clear the system then push edema through.
Hypothesis:

Outcomes with a modified MEM treatment program will be better than outcomes of the traditional edema technique in terms of speed of edema reduction, rate of pain reduction, increase in mobility, and resumption of ADL in patients with sub acute hand/arm edema.

Lit Review:

- No studies on effect of the MPP stimulation technique, but three studies on lymphatic drainage for hand patients exist (Haren et al 2000, Haren et al 2006, Rodrick et al 2004) all showing better results with MLD than conservative treatment
- No other studies comparing modMEM treatment with conservative treatment
- Modified MEM v. MEM incorporating pump points has not been fully evaluated.

Methodology:

- Single-blinded, randomized, controlled clinical trial, Level of evidence 1
- Danish study cleared by Danish Data Protection Agency / Central Denmark Region Committees on Biomedical Research Ethics. Informed consent received.
- Group A-control, traditional edema treatment; Group B- experimental , modMEM treatment
- 15 patients per group, two therapists for evaluation, two therapists for measurements (blinded to treatment groups)
- Collected between Oct 2004 and July 2008
• Inclusion: 18+ yrs, unilateral postdistal radius fracture treated with cast/internal/external fixation, 60mL+ difference in volume between UEs
• Exclusion: mental impairment, infection, disease of internal organs, presence of lymphedema

Intervention:
• Both groups edema treatment 3x week for four weeks then 2x week for two weeks
• After initial 6 weeks treatment continued until function reached level that reflected the patients needs and therapists assessment of functional requirements
• Parallel to edema tx, patients underwent regular therapy for ROM and strength
• All patients received same HEP for ROM exercise and one edema exercise, and slept in Isotoner glove (25-35 mmHG compression)
• Traditional edema tx consisted of elevation, compression and functional training such as Coban, activity over shoulder height for at least 10 min, Flowtron intermittent compression system for 20 min,
• ModMEM group started with deep diaphragmatic breathing, exercise starting proximally and ending distally, terminus (supraclavicular) stimulation, axillary stimulation starting in uninvolved side, MEM to trunk, MPP to involved UE. Low stretch bandage if needed and one handed MEM home program. Series took 30 min to perform. Wear glove at all times unless receiving treatment.

Outcome Measures:
• Two therapists performed measurements, met to calibrate tools initially and every 6 months
• AROM, edema, pain and ADL measured at inclusion, weeks 1, 3, 9 and 26 weeks.
• Perceived performance and satisfaction with ADL assessed at 1 and 9 weeks after inclusion
• Edema: volumeter protocol by ASHT, water temp between 23-24°C, patients standing
• AROM: Pulpa Vola distance (Danish translation Pulp to palm) from nail tip to proximal palmar crease (reported as average of four ulnar finger values); thumb opposition from nail of thumb to base of 5th finger,
• Pain: visual analog scale with patients marking average pain over past three days for both activity and resting.
• ADL: Investigators designed questionnaire for bilateral activities (QBA). Four activities rated 0/unable to 3/PLOF and 4/irrelevant. Activities: tying shoelaces, eating with knife and fork, peeling potatoes, cutting slice of bread. Scoring: 0/unable; 1/with help; 2/independent but compensates; 3/PLOF; 4/irrelevant. Perceived performance and satisfaction by Canadian Occupational Performance Measure COPM. Change in performance and satisfaction of 2 or more considered to be clinically important.

Statistical Analysis:
• Multivariate repeated measurement model used
• Continuous data presented as mean, SD and range; Dichotomous data reported as proportions.
• P-value below .05 considered statistically significant
• Used STATA version10.0 for all analysis

Results:
• 30 patients included, 29 finished (dropout in ModMEM group)
• Edema: decreased equally in both groups. No statistical difference at inclusion, after 6, 9 weeks. Tendency for ModMEM group to receive 20% fewer OT sessions than control, but not significant (p=.13). 9 control and 3ModMEM received edema tx for more than six weeks with statistically significant p=.04
• Pain: at rest and with activity changed equally in both groups with no significant difference between groups.
• AROM: no sig differences between groups at inclusion and after 6, 9 weeks for both PV and Thumb measures.
• ADL: with QBA no sig difference noted between groups at inclusion, 6, 9 weeks. Sig change noted at 3 weeks. With COPM no statistical difference but control group 13 of 15 experienced clinically important improvement with performance while the entire modMEM group did.

Discussion:
• Hypothesis partially supported by findings
• Patients in ModMEM group managed bilateral ADLs more quickly than control, but only at week three then balanced out
• No stat difference between groups in terms of reduction of edema, but tendency toward greater reduction at 9 weeks noted in modMEM group. Possible need for full MEM technique?
• No stat difference in pain between groups, one pt in modMEM group developed CRPS and another developed periarthrosis humeroscapularis (frozen shoulder) which influenced outcomes due to increased pain and stiffness and increased treatment time. Pain may have been influenced by pain medication use, difficulty in reporting pain average over three days.
• Fewer edema treatments needed for modMEM v. control which is clinically relevant in the time of insurance and reimbursement limitations. ModMEM seems to counteract return of edema to the edematous area.
• No difference in amount of total OT sessions needed overall. Other symptoms such as reduced sensation, ROM and strength were not looked at for effect on this.
• AROM may have been influenced because control group received functional treatment as early as possible, but initiated four weeks into tx modMEM group
• Could have benefitted from having a no intervention control group to determine if traditional or modMEM effects edema reduction; this study cannot say if modMEM is better than no treatment

Questions for Discussion:
• Impact of using own questionnaire on study v. one that is readily available and validity is established.
• Anyone else use MEM based v. retro based.
• Other treatments used? Elevation? Wrap? What were the outcomes?

Further Studies:

• Compare modMEM with full MEM for subacute edema
• Effect of low stretch bandaging on edema and pain
• Comparing MEM with retromassage