The Effect of Manual Therapy on Dorsiflexion Range of Motion Following Lateral Ankle Sprains: A Systematic Review

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Introduction

• Manual therapy effects on the spine are well documented (Ernst & Canter, 2006)
• Limited research on manual therapy performed on the ankle
• Common physiotherapy intervention used in practice
Lateral Ankle Sprain

• One of the most common injuries in athletes (Garrick, 1977)

• Most commonly results from an inversion/plantarflexion force

• Re-occurrence rate 73-80% (Denegar et al., 2002)
Lateral Ankle Sprain Sequelae

- Loss of:
  - Ability to forcefully evert ankle
  - Proprioception/neuromuscular control
  - Ligament stability
  - Range of motion (ROM), especially dorsiflexion (DF)
  - Function (Denegar et al., 2002)
Hypotheses for limited DF ROM post lateral ankle sprain

• Tight ankle plantarflexors
• Capsular and soft tissue restriction
• Loss of normal posterior glide of the talus in the mortise
• Loss of other accessory motions at the tibiofibular, subtalar and midtarsal joints (Denegar et al., 2002)
Physiotherapy Treatment Options

• P.R.I.C.E.
• Electrotherapy
• **Manual therapy**
• Active exercises
• Bracing/taping
• Proprioceptive retraining
Manual Therapy

- Restoration of joint mobility and normal joint end feels (Canadian Orthopractic Manual Therapy Association, COMTA)
Types of Manual Therapy

1. Mobilization
2. Manipulation
3. Mulligan’s Mobilization with Movement (MWM)
Mobilization

• Gentle, rhythmic, repetitive passive movement of graded amplitude aimed at restoring mobility, function and reducing pain (COMTA)
Mobilization
Manipulation

- Skilled, passive, quick movement with goal of restoring mobility and function and reducing pain in a stiff joint and the associated tissues (COMTA)
Mulligan’s Mobilization with Movement

- Therapist applies a sustained accessory glide at right angles or parallel to the joint
- Limited painful physiologic movement is performed actively by the patient
- The aim is to reduce the restricted, painful movement and restore pain-free and full ROM (Mulligan, 1999)
Mulligans Mobilization with Movement
Recent Systematic Review

- Effectiveness of exercise therapy and manual mobilizations in acute ankle sprain (Van der Wees et al., 2006)
- Appears similar to ours BUT.......
<table>
<thead>
<tr>
<th>Study designs included</th>
<th>Van der Wees et al., 2006</th>
<th>Dean et al.</th>
</tr>
</thead>
<tbody>
<tr>
<td># of databases searched</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Languages searched</td>
<td>English, German, Dutch</td>
<td>English, French</td>
</tr>
<tr>
<td>Year of publication</td>
<td>Until 2005</td>
<td>Until 2006</td>
</tr>
<tr>
<td>Type of intervention</td>
<td>Manual mobilization/Exercise</td>
<td>Manual therapy</td>
</tr>
<tr>
<td>Intervention carried out by</td>
<td>Physiotherapist, Chiropractors</td>
<td>Physiotherapists only</td>
</tr>
<tr>
<td>Dependent Variable</td>
<td>Acute ankle sprain &amp;/or functional instability</td>
<td>Acute-chronic lateral ankle sprain</td>
</tr>
<tr>
<td>Outcome measure</td>
<td>Recurrent sprains, functional disability, gait, ankle ROM</td>
<td>Ankle ROM</td>
</tr>
</tbody>
</table>
Methods

Literature search

• Databases:
  – MEDLINE
  – EMBASE
  – CINAHL
  – PEDro
  – Pubmed
  – Cochrane Database of Systematic Reviews
  – Cochrane Central Register of Controlled Trials
  – Google Scholar
Search terms:

• ankle, ankle joint, talocrural joint AND
• manual therapy, mobilization, manipulation, glides, orthopaedic manipulation AND
• range of motion
Methods Con’t

• Hand searched 3 journals
• Reference lists reviewed
• Additional article identified while attending a course
Method Con’t

Types of studies:

• Randomized Controlled Trials (RCT)
• Case Studies
Methods Con’t

Outcome Measure:
- Range of Motion

Treatment included at least one of:
- Mobilization
- Manipulation
- Mulligan’s MWM
Methods Con’t

Manual therapy performed by a physiotherapist

Types of participants:
- Acute, sub-acute or chronic lateral ankle sprains
- Pain and/or swelling and/or limited ROM of the ankle and/or decreased function
Exclusion Criteria:

- Manual therapy performed by other health care professionals other than physiotherapists
- Asymptomatic subjects
- Fractures
- Degenerative joint disease
- Inflammatory arthritis
Methods Con’t

• Methodological Quality Assessment tool

• Level of Evidence
• A modified RCT quality assessment tool recommended by The Cochrane Back Review Group (Van Tulder et al., 2003)

• High methodological quality: score of ≥7
Table 1: RCT Methodological Quality Assessment Tool*

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Yes/No/Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Was the study’s purpose clearly stated?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>B</td>
<td>Was the method of randomization adequate?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>C</td>
<td>Was the treatment allocation concealed from the groups or individuals?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>D</td>
<td>Was the patient blinded to the intervention?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>E</td>
<td>Were the groups similar at baseline regarding the most important</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td></td>
<td>prognostic indicators?</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Was the therapist providing treatment blinded to the intervention?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>G</td>
<td>Was the outcome assessor blinded to the intervention?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>H</td>
<td>Were co-interventions avoided or similar?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>I</td>
<td>Was the compliance acceptable in all groups</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>J</td>
<td>Was the dropout rate described and acceptable?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>K</td>
<td>Was the timing of the outcome assessment in all groups similar?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>L</td>
<td>Did the analysis include an intention to treat analysis?</td>
<td>Yes/No/Not Sure</td>
</tr>
</tbody>
</table>

* Modified from Van Tulder et al., 2003
Quality Assessment

Case Studies:

• We developed a list of seven criteria to assess the quality of the case studies included in the review (Table 2)

• A minimum score of five was required to be considered for the review.
<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Yes/No/Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Was the purpose of the study clearly stated?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>B</td>
<td>Was the hypothesis clearly stated?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>C</td>
<td>Were the patients described in detail so that you could decide whether they are comparable to those seen in practice?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>D</td>
<td>Were the interventions and treatment setting described well enough so that they could be replicated?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>E</td>
<td>Were the measures used clearly described, valid and reliable for measuring the outcome of interest?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>F</td>
<td>Was the size of the effect clinically important?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td>G</td>
<td>Were the limitations of the study identified &amp; discussed?</td>
<td>Yes/No/Not Sure</td>
</tr>
<tr>
<td></td>
<td>TOTAL /7</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>Therapy/Prevention, Etiology/Harm</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>---------------------------------</td>
<td></td>
</tr>
<tr>
<td>1a</td>
<td>Systematic review (SR) (with homogeneity) of RCTs</td>
<td></td>
</tr>
<tr>
<td>1b</td>
<td>Individual cohort study, including low quality RCTs (e.g., &lt;80% follow-up)</td>
<td></td>
</tr>
<tr>
<td>1c</td>
<td>All or none</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>Systematic review (with homogeneity) of cohort studies</td>
<td></td>
</tr>
<tr>
<td>2b</td>
<td>Individual cohort study, including low quality RCTs (e.g., &lt;80% follow-up)</td>
<td></td>
</tr>
<tr>
<td>2c</td>
<td>&quot;Outcomes&quot; Research; Ecological studies</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>SR of case-control studies</td>
<td></td>
</tr>
<tr>
<td>3b</td>
<td>Individual Case-Control Study</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Case-series (and poor quality cohort and case-control studies)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Expert opinion without explicit critical appraisal, or based on physiology, bench research or &quot;first principles&quot;</td>
<td></td>
</tr>
</tbody>
</table>
Figure. Streaming of study selection

Initial search of databases:
Medline = 196, Google Scholar = 2, Cochrane
Database of Systematic Reviews = 0,
Embase = 37, CINAHL = 58, PEDro = 33, PubMed = 67
Total = 391

Studies excluded after title and abstract screening:
N = 40

Articles found after hand searching, grey literature, and screening reference lists:
N = 6

After extraction of duplicate studies:
N = 30

Full text of studies retrieved after using abstract screening tool
N = 11

Studies excluded after evaluation of full text:
N = 5
Results

• 5 studies retrieved:
  – Green et al., 2001
  – O’Brien and Vicenzino, 1998
  – Whitman et al., 2004
  – Collins et al., 2004
  – Reid et al., in press
Table 6: Methodological Quality of RCT studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality Score (/12)</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green et al., 2001</td>
<td>9</td>
<td>1B</td>
</tr>
<tr>
<td>Collins et al., 2003</td>
<td>11</td>
<td>1B</td>
</tr>
<tr>
<td>Reid et al., 2006</td>
<td>11</td>
<td>1B</td>
</tr>
</tbody>
</table>
Table 7: Methodological Quality of Case Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality Score (/7)</th>
<th>Level of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whitman et al., 2001</td>
<td>6</td>
<td>3B</td>
</tr>
<tr>
<td>O'Brien and Vincenzino, 1998</td>
<td>6</td>
<td>3B</td>
</tr>
</tbody>
</table>
Discussion

DF ROM:

• Manual Therapy was found to be beneficial in all stages of healing

• DF is essential for many activities and its restoration an integral part of the rehabilitation process (Willems et al., 2005)
Discussion

• Potential culprits for decreased DF ROM:
  – anterior subluxation of the talus
  – reduced posterior glide of the talus
  – or both

(Green et al., 2001, Denegar et al., 2002, Collins et al., 2004)
Discussion

Functional mobility:
• Subjects: acute and sub-acute lateral ankle sprains
• MWM treatment technique
• Significantly greater immediate improvements in functional mobility
• Improvements were maintained at the short term and long term follow up

(O’Brien and Vicenzino 1998, Whitman et al., 2005)
Discussion

Pain:

• Both found a decrease in pain immediately and at 6 months post mobilization
• Collins et al. (2004) found no significant effect on thermal threshold or pain threshold
• Suggests that pain decrease is mechanical and not neurally mediated

(Collins et al., 2004, O’Brien and Vicenzino 1998, Whitman et al., 2005)
**Discussion**

**Grades of Recommendation (Phillips et al., 2001)**

<table>
<thead>
<tr>
<th>A</th>
<th>consistent level 1 studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>consistent level 2 or 3 studies or extrapolations from level 1 studies</td>
</tr>
<tr>
<td>C</td>
<td>level 4 studies or extrapolations from level 2 or 3 studies</td>
</tr>
<tr>
<td>D</td>
<td>level 5 evidence or troublingly inconsistent or inconclusive studies of any level</td>
</tr>
</tbody>
</table>
Discussion

Grades of Recommendations:

• **Grade A**
  – To increase ROM
  – To improve gait characteristics

• **Grade B**
  – To decrease pain
Methodological Limitations

- None of the RCTs scored a point for therapist blinding, item “F”
- Neither case study clearly stated their hypotheses, item “B”
Methodological Limitations

• Tools were modified by the reviewers
  - Reputable quality assessment tool selected as template (Van Tulder et al., 2003)
  - Tools were tested on studies not included in this review in order to ensure inter-rater reliability
Methodological Limitations

• Lower quality study designs were included
  – To avoid overlooking potential contributions to the research
  – Enhanced clinical representation
Methodological Limitations

- Limited to studies in which manual therapy treatment was performed by a physiotherapist.

- Large amount of heterogeneity:
  - stage of soft tissue healing
  - characteristics of the participants
  - treatments given
Future Research

• Compare effects of manual therapy on DF ROM through the stages of healing

• Long term follow-up

• Comparison of manual therapy techniques
Implications for Physiotherapy

• Manual therapy found to increase ankle DF ROM

• Must understand indications and contraindications for manual therapy
Conclusion

• Preliminary evidence to support manual therapy to improve dorsiflexion ROM following lateral ankle sprains
• Caution in generalization of outcomes
• Review offers important information for practitioners
Thank you!!!

• Elizabeth Dean
• Susan Harris
• Andrea Reid
• May Nolan
References

References con’t

• Reid A, Alcock G, Birmingham T. Effect of mobilization with movement as a method of increasing dorsiflexion following lateral ankle sprain, 2006 submitted for publication.