A systematic review on mobilization splinting for the post-traumatic stiff hand

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Overview

- Background
- Objectives
- Method
- Results
- Summary
- Implications on practice & research
- Limitations
Background

Hand stiffness or contracture

- Persistent reduction in ROM of the fingers
- Common complication after a traumatic hand injury and/or surgery
- Due to structural changes in the connective tissues

(Michloviz, Harris & Watkins, 2004; Dudek & Trudel, 2008)
Background

- Hand stiffness or contracture
  - Restricts mobility of hand
  - Affects normal hand functions
  - Affects one’s ability to perform self-care and home-making tasks independently
  - May have a considerable financial impact

(Farmer & James, 2001; Wong 2002; Rosberg et al., 2003; Dias & Garcia-Elias, 2006)
Background

- Mobilization splints
  - Dynamic splint
  - Static progressive
  - Serial static / serial casting

(Flowers, 2002; Glasgow, Tooth & Fleming, 2010; Wilton 1997)
Background

- Mobilization splints
  - Few studies of high quality
  - Approach to splinting varied
  - Decision based on therapists’ subjective experiences

(Flowers, 2002; Wilton 1997)
Objectives

1. Assess the clinical effectiveness of mobilization splinting

*Key questions:*

- Does mobilization splinting increase the ROM for the post-traumatic stiff hand?
- Does mobilization splinting improve function for the post-traumatic stiff hand?
Objectives

2. Explore the types of mobilization splint believed to be the most effective

*Key question:*

- What type of mobilization splint is the most effective for improving ROM for the post-traumatic stiff hand?
Objectives

3. Identify factors that can influence splinting outcomes

*Key question:*

- What are the factors that can influence splinting outcomes?
Methodology

Step 1: Define the review question/objective
Step 2: Appoint a review team and advisory group
Step 3: Write a protocol and have it reviewed
Step 4: Literature search
Step 5: Screen the references
Step 6: Selection of studies
Step 7: Critical appraisal/Assessing study quality
Step 8: Data extraction
Step 9: Data synthesis
Step 10: Write up report

(Petticrew & Roberts, 2006)
Method—Literature search

- Electronic databases
  - AMED (1985 to May 2013)
  - MEDLINE (1950 TO May 2013)
  - Pubmed central (1948 to May 2013)
  - CINAHL (1981 to May 2013)
  - Scopus (1996 to May 2013)
Method—Literature search

- Hand searches
  - British Journal of Hand Therapy (1999-2008)
  - Hand Therapy (2009-2013)
  - Hand Clinic (2002-2013)

- Grey literature
Method—Literature Screening

1. **Electronic database search**
2. **Hand search**
3. **Grey literature search**

**First Screening**
Title and/or abstract were screened with inclusion/exclusion criteria checklist

**Second Screening**
Full-texts of the papers identified from first screening were screened with the Study Eligibility Form

- **Included studies**
- **Citation searching of included studies**

**Publications that passed both screening stages were included into the study**
## Method—Literature Screening

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Types of studies</strong></td>
<td><strong>Types of studies:</strong></td>
</tr>
<tr>
<td>Primary research with any study designs</td>
<td>Non-English articles</td>
</tr>
<tr>
<td></td>
<td>Literature reviews</td>
</tr>
<tr>
<td></td>
<td>Expert opinions</td>
</tr>
<tr>
<td><strong>Types of participants</strong></td>
<td><strong>Types of participants</strong></td>
</tr>
<tr>
<td>Participants aged 11 years and above</td>
<td>Participants under the age of 11</td>
</tr>
<tr>
<td>Participants with hand stiffness as a complication of hand injury and/or surgery</td>
<td>Participants with hand stiffness secondary to neurological conditions</td>
</tr>
<tr>
<td></td>
<td>Participants with stiffness due to non-traumatic hand conditions such as Dupuytren’s disease</td>
</tr>
<tr>
<td></td>
<td>Animal studies</td>
</tr>
<tr>
<td><strong>Types of intervention</strong></td>
<td><strong>Types of intervention</strong></td>
</tr>
<tr>
<td>Upper limb and hand rehabilitation/exercise programme that involved any type of mobilisation splints used for stiffness management</td>
<td>Stiffness treated with surgical interventions</td>
</tr>
<tr>
<td><strong>Types of outcome measures/assessment tools</strong></td>
<td><strong>Types of outcome measures/assessment tools</strong></td>
</tr>
<tr>
<td>ROM measurements</td>
<td>Nil</td>
</tr>
<tr>
<td>Total end range time</td>
<td></td>
</tr>
</tbody>
</table>
Method—Critical appraisal

- Assessing study quality
  - Structured Effectiveness Quality Evaluation Scale (SEQES) (MacDermid, 2004)
  - Centre for Evidence-Based Medicine (CEBM) Levels of evidence
Results

Electronic database: 1065

Other sources: 28

986 records

First Screening: Inclusion/exclusion criteria

948 excluded

Second Screening: Study Eligibility form

32 excluded: Population=3, Intervention=4, Study design=25

6 articles included
### Results

<table>
<thead>
<tr>
<th>No.</th>
<th>Study</th>
<th>Study Objective</th>
<th>Design</th>
<th>n</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flowers &amp; LaStayo (1994)</td>
<td>Test if improvement in PROM is directly proportional to total end range time</td>
<td>Prospective cohort study</td>
<td>15 (20 digits)</td>
<td>Mean age: 38 (18-84)</td>
</tr>
<tr>
<td>2</td>
<td>Prosser (1996)</td>
<td>Investigate treatment outcome after a dynamic splinting programme</td>
<td>Prospective case series</td>
<td>20 (22 digits)</td>
<td>Mean age: 35</td>
</tr>
</tbody>
</table>
| 3   | Benaglia, Sartorio & Franchignoni (1999) | 1. Describe fabrication of a new static progressive splint  
2. Report efficacy of splint | Prospective case series | 4               | Mean age: 20.5 (18-24) |
| 5   | Glasgow et al. (2011)          | Identify predictors of outcome with dynamic splinting                          | Prospective cohort study | 46 (56 joints) | Mean age: 44.2 (15-76) |
| 6   | Glasgow et al. (2012)          | Compare effect of daily TERT                                                   | RCT           | 18              | Mean age: 41 (group 1) vs 35.3 (group 2) |
## Results

<table>
<thead>
<tr>
<th>No.</th>
<th>Study</th>
<th>Intervention</th>
<th>Outcome</th>
<th>SEQES score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flowers &amp; LaStayo (1994)</td>
<td>Group A: serial cast 6 days then 3 days</td>
<td>Group A: total gain 106°</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group B: serial cast 3 days then 6 days</td>
<td>Group B: total gain 60°</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Prosser (1996)</td>
<td>Dynamic splint for 8 weeks; 8-12 hours/day</td>
<td>All participants improved: Average gain 18°</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>Benaglia, Sartorio &amp; Franchignoni (1999)</td>
<td>Static progressive PIPJ extension splint 1-hr wear, 1-hr rest, 6x/day</td>
<td>1 gain full extension after 1/52; 3 gain full extension after 2/52</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>Glasgow, Wilton &amp; Tooth (2003)</td>
<td>Intermittent or continuous use of mobilization splints for 4 weeks (static progressive or dynamic splints)</td>
<td>Group A: &lt;6 hrs per day; Group B: 6-12 hrs per day</td>
<td>28</td>
</tr>
<tr>
<td>5</td>
<td>Glasgow et al. (2011)</td>
<td>Dynamic splint for 8 weeks; 6-12 hrs/day</td>
<td>Significant predictors: Pre-treatment stiffness &amp; type of deficits</td>
<td>27</td>
</tr>
<tr>
<td>6</td>
<td>Glasgow et al. (2012)</td>
<td>Capener splint for 8 weeks</td>
<td>Group 1: mean daily TERT-9.5 hrs</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 1: daily TERT 6-12 hrs</td>
<td>Group 2: mean daily TERT-11.5hrs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 2: daily TERT 12-16 hrs</td>
<td>No significant difference in improvement</td>
<td></td>
</tr>
</tbody>
</table>
Objective 1: Assess the clinical effectiveness of mobilization splinting

Key question:

- Does mobilization splinting increase the ROM for the post-traumatic stiff hand?
  - All studies reported an increase in ROM post-mobilization splinting
  - NO control group

- Low to moderate evidence
Summary

Objective 1: Assess the clinical effectiveness of mobilization splinting

Key question:

- Does mobilization splinting improve function for the post-traumatic stiff hand?
  - No study uses function as an outcome measure
  - No answer to this question
Objective 2: Explore the types of mobilization splint believed to be the most effective

Key question:

What type of mobilization splint is the most effective for improving ROM?

- Each study utilized 1 type of splint
- Only 1 study examined results for dynamic & static progressive, however the splints worked on different type of deficits
- Difficult to pool & compare results due to variability among studies

➢ Little to no evidence
Objective 3: Identify factors that can influence splinting outcomes

Key question:

What are the factors that can influence splinting outcomes?

- Possible factors:
  - Total end range time
  - Pre-treatment stiffness
  - Time since injury

- Methodological flaws and biases noted
  - Limited inconclusive evidence
Implications for practice

- Low to moderate evidence to suggest mobilization splinting as an effective approach
  - Supported current practice
  - However, ↑ ROM ≠ ↑ functional ability
  - Therapists to translate ROM gains into functions
Implications for practice

- Insufficient & inconclusive evidence to suggest the most effective splint type & factors affecting outcome
  - Review of splinting protocol
    - Provides treatment consistency
    - Provides guidance to less experienced therapists
Implications for research

- Well-designed RCTs comparing various types of mobilization splints against a control group
- Well-designed RCTs that compare different lengths of TERT
- Trials to include functional assessments as outcome measures
- Exploratory trials that use mobilization splints during different stages of tissue healing
Limitations

- Different approach from conventional Cochrane systematic reviews
  - Studies of lower quality

- Single reviewer under supervision
  - In part fulfilment for an MSc dissertation

- Excluded non-English articles
References

References

References

