Therapy interventions for improving joint range of motion: a systematic review
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CRD summary
This review assessed nonsurgical interventions to restore range of motion in patients with injuries to the upper extremity. The conclusion that splints, casts or passive exercise are effective after joint injury and immobilisation should be treated with some caution as it relies heavily on evidence from studies with designs open to bias. The recommendation for further research appears justified.

Authors’ objectives
To investigate the effectiveness of nonsurgical interventions to restore range of motion (ROM) in patients who had sustained fracture, fracture or dislocation, joint injury, or other soft tissues injuries to the upper extremity.

Searching
MEDLINE (from 1966 to June 2003), CINAHL (from 1982 to June 2003), the Cochrane Database of Systematic Reviews, PEDro, and ACP Journal Club and DARE (through EBM Reviews) were searched using the reported search terms. The reference lists of retrieved articles and abstract lists of relevant recent meetings were also checked for additional studies.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs), quasi-RCTs, cohort studies, case series and case reports were all eligible for inclusion.

Specific interventions included in the review
Nonsurgical interventions to restore ROM were eligible for inclusion. The included studies involved splinting, serial casting, joint mobilisation techniques, continuous passive motion, injection, an in-clinic programme and exercise interventions.

Participants included in the review
For inclusion in the review, the studies were required to focus on adult patients who had loss of motion after fracture and/or dislocation, other joint trauma, or crush injury to the upper extremity. Patients could also have had surgical intervention for fracture management or for release of joint contracture. Studies focusing on participants with no impairments, or those with congenital differences, tendon repair, systemic arthritis, disorders attributed to cumulative trauma, Dupuytren's contracture, systemic or metabolic disease such as diabetes, central and peripheral nervous system disorders, primary muscle diseases, and burns were not included.

Outcomes assessed in the review
Studies were required to report ROM as an outcome to be eligible for inclusion in the review. The secondary outcomes were pain, functional status, activities of daily living, length of treatment, return to activity and patient satisfaction.

How were decisions on the relevance of primary studies made?
Two reviewers searched the literature independently. All studies were judged by two reviewers independently. Any disagreements would have been referred to a third reviewer.

Assessment of study quality
The studies were scored using a system designed by MacDermid (see Other Publications of Related Interest), which had 24 items relating to background information, study design, participants, interventions, outcomes, data analysis and conclusions. Each item was given a score of 0 (lowest), 1 or 2 (highest), and the scores totalled to give a composite
score. Each study was also assigned a value (1 to 5) based on Sackett’s Levels of Evidence. Two reviewers were involved in scoring the studies. Any disagreements would have been referred to a third reviewer.

**Data extraction**
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

**Methods of synthesis**
How were the studies combined?
The studies were grouped according to the intervention in a narrative synthesis.

How were differences between studies investigated?
Differences in the participants, delivery of interventions and outcome measures were documented in the report.

**Results of the review**
The review included 26 studies (1,034 participants).

The quality of the included studies was moderate to low (scores ranged from 15 to 44).

**Splinting** (9 studies, 142 participants).

Two case series found turnbuckle splinting to be beneficial for elbow contractures. Dynamic splinting was found to improve ROM in three case series on different injuries. Two studies reported benefits of serial casting; a prospective crossover study found a wear time of 6 days to be more effective than 3 days. The results from another case series, however, suggested that a progressive static splint adjusted by the patient and used for 30-minute periods would be more effective than splints or casts worn for prolonged periods.

**Joint mobilisation** (6 studies, 106 participants).

The results of four cohort studies showed joint mobilisation techniques to be better than exercise alone for adhesive capsulitis and after metacarpal fracture, but of no additional benefit for primary impingement syndrome and after distal radius fractures. Two case series supported the use of joint mobilisation for adhesive capsulitis and after distal radius fracture.

**Continuous passive motion (CPM)** (2 studies, 64 participants).

One cohort study found CPM to be similar to ROM exercises at improving ROM and extension, but better at improving flexion, after surgery for elbow flexion contractures. Another cohort study found CPM to be no better than passive ROM exercises after rotator cuff repair.

**Exercise** (4 studies, 338 participants).

Four studies (one prospective, two case series, one case report) found that passive exercise improved ROM.

**In-clinic therapy** (3 studies, 249 participants).

The results of all three studies suggested that exercise at home was inferior to supervised in-clinic therapy only when the exercise was not established and instructed by a therapist.

**Steroids versus physical therapy** (2 studies, 135 participants).

Steroid injection was found to lead to faster gains in ROM than physical therapy alone in both studies (both prospective).
Authors' conclusions
The authors appear to have concluded the following. There was moderate evidence on the use of splints or casts to increase ROM after joint injury and immobilisation, and the use of passive exercise after injury, immobilisation and fracture. There was evidence that steroid injection with a supervised exercise programme could increase ROM, and that patients with adhesive capsulitis could be treated with a home exercise programme. There was insufficient evidence to support the use of CPM after surgery for rotator cuff repair or release of elbow joint contracture. The quality and quantity of evidence in this area were moderate to low. Further research is required.

CRD commentary
Although the review question addressed a broad range of interventions, the inclusion criteria were clearly defined. Several relevant sources were searched for primary studies. It was unclear whether any language restrictions were applied, thus the possibility of language bias could not be assessed. It appears that two reviewers worked independently to search for and assess the quality of the studies, which should have minimised the introduction of errors or bias during these processes. The assessment of study quality was given sufficiently high consideration considering the variety of study designs included in the review.

Detailed information about the primary studies was tabulated. The narrative synthesis of the studies, grouped according to intervention, was appropriate given the heterogeneity of the studies in terms of both intervention and design. The authors appeared to consider factors such as study design and study quality when drawing their conclusions, and the review was generally well conducted. The conclusions on intervention effectiveness should be treated with some caution as they rely heavily on evidence from studies with designs open to bias or without control groups. The call for further research appeared justified given the apparent lack of good-quality studies addressing the review question.

Implications of the review for practice and research
Practice: The authors did not explicitly state any implications for practice.

Research: The authors stated that further research is required to determine the effective dosage and most appropriate patient group for each technique.

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Other publications of related interest

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.