

Resting injured limbs delays recovery: A systematic review

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Practice recommendations

- Injured limbs are traditionally rested by splint or cast. This is undertaken both for palliation and also in the belief that resting improves recovery time, and reduces complications such as deformity, functional problems and long-term pain.
- Early mobilization decreases pain, swelling and stiffness, particularly in the short term, without longer-term cosmetic or radiologic deformity. (SOR: **A**)
- Patients usually (but not always) prefer early mobilization, and return to work earlier. (SOR: **C**)
- Rest may be overused for limbs injury, although the extent to which early mobilization should be adopted needs more research. (SOR: **C**)
- The scope of limb injuries explored with trials of mobilization also needs further research.

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Abstract

Objectives Rest is commonly used as primary treatment, rather than just palliation, for injured limbs. We searched the literature for evidence of benefit or harm from immobilization or mobilization of acute limb injury in adults.

Data Sources We systematically searched for and retrieved randomized controlled trials (RCTs) of mobilization or rest for treatment of acute limb injuries, in Medline (1966–2002), EMBASE, Web of Science, and the Cochrane library, in all languages.

Review Methods We examined patient-centered outcomes (pain, swelling, and cost), functional outcomes (range of motion, days lost from work) and complications of treatment.

Results Forty-nine trials of immobilization for soft tissue injuries and fractures of both upper and lower limbs were identified (3366 patients). All studies reported either no difference between rest and early mobilization protocols, or found in favor of early mobilization. Reported benefits of mobilization included earlier return to work; decreased pain, swelling, and stiffness; and a greater preserved range of joint motion. Early mobilization caused no increased complications, deformity or residual symptoms.

Conclusions We should not assume any benefit for immobilization after acute upper or lower limb injuries in adults. Rest appears to be overused as a treatment. More trials are needed to identify optimal programs for early mobilization.

We know that bed rest generally is overprescribed.¹ But what about resting or immobilizing acutely injured limbs—from simple sprains to gunshot wounds? This specific application of rest is controversial.²⁻⁶

Theoretically, rest should reduce further tissue damage by limiting movement, decreasing pain and swelling, and lessening loss of fracture reduction.⁷⁻¹⁵ However, mobilization increases blood flow and so reduces muscle atrophy, disuse osteoporosis, adhesions, and joint stiffness.⁷⁻¹⁵

The first empirical trials to determine whether rest or mobilization would offer greater benefit were undertaken in the 1980s, using both human and animal models. Systematic reviews have looked at specific injuries: acute ankle sprains¹⁶; ankle ligament rupture¹⁷; isolated ulnar fracture¹⁸; metacarpal fractures¹⁹; collateral ankle ligament sprains²⁰; and soft-tissue ankle injury.²¹ Each review independently suggests benefits for early mobilization.

However, most clinicians employ some period of enforced rest of injured limbs. For example, a survey of orthopedic surgeons in Denmark found early mobilization for ankle fractures is prescribed for only 6% of patients.²²

We systematically reviewed the literature to find trials that compared rest with early mobilization in acute limb injuries.

■ METHODS

Protocol and search strategy

We searched the literature to identify prospective randomized controlled trials (RCTs) comparing rest with mobilization for acute limb injuries, searching the Cochrane Controlled Trials Register and Systematic Reviews, Medline (1966–2002), EMBASE (Rehabilitation and Physical Therapy), and Web of Science, combined with the following terms:

immobilis*, immobiliz*, mobilis*, mobiliz*, injur*, fracture*, limb*, cast*, brace*, splint*, leg*, arm*, wrist*, elbow*, joint*, *carpal*, *tarsal*, knee*, ankle*, femur*, tibia*, fibula*, colles*, ulna*, radi*, humer*, sprain*, soft tissue, plaster slab, dislocat*

We accepted all publication languages and

translated several papers. We found 445 potentially relevant papers by examining their titles or abstracts (**Figure**). Studies that did not fulfill our inclusion criteria were discarded.

We obtained full texts for 76 studies and undertook a prospective cited reference search in Web of Science for each study to identify more recent articles. A total of 187 papers were then evaluated further for duplicate data and inclusion criteria.

Trials that met our inclusion criteria:

1. Were randomized and controlled
2. Studied acute limb injuries
3. Compared groups whose only treatment difference was mobilization (studies that compared surgery and immobilization against nonsurgical early mobilization were not included; studies with internal fixation were included only if internal fixation was applied to both groups)
4. Had loss to follow-up of $\leq 20\%$, except where analysis was clearly intention to treat
5. Studied populations not focussed solely on young children, (studies in which the given age range included a small number of patients as young as 11 or 12 years were accepted—in these studies the median age was much higher)
6. adequately reported data collection and statistical analysis.

By these criteria, we excluded 138 studies (a list of which is available from the authors). Finally, 49 studies were included.

Study methods quality and validity

Two authors independently scored the validity of each of the included 49 studies, meeting to discuss and resolve any disagreements. We relied on published data, without writing to authors to clarify or obtain information. Included studies were evaluated against 11 standard criteria.²³ Each criterion was scored 0–2. However, the practical maximum possible score was 18 because it was impossible to blind patients or their caregivers to mobilization. We considered the quality of 16 studies scoring 11 to be high.

■ RESULTS

Across the 49 eligible studies, the different interventions were well described and differentiated, and data collection methods were clearly explained. Duration of immobilization in a cast was described (if at all) from 10 days to 8 weeks. Mobilization strategies varied and included active exercise, orthoses, crutches, or bandages.

Study quality was poor in many respects: several did not include important demographic data (including age, sex, or the numbers randomized to control and experimental group). Most did not report data about the methods of randomization. Many studies used inadequate randomization methods, with only 5 reporting optimal methods. Loss to follow-up was addressed poorly (not described or intention-to-treat analysis was not used). Outcome assessment was not blinded (a serious shortcoming in view of the subjective assessment of some patient outcomes). Reporting of inclusion criteria was inadequate in a few studies.

Given these deficiencies, our discussion emphasizes conclusions supported by studies of high quality.

Reporting of the studies

We divided the 49 studies into 4 groups: lower-limb fractures, other lower-limb injuries, upper-limb fractures, and other upper-limb injuries (**Table W**, at www.jfponline.com). Each group was further divided into trials using some form of limb support (such as a brace, splint, or a short period of immobilization) or minimal or no support (bandage, crutches, or tape) in the early mobilization group.

Most studies used some form of dynamic treatment for the injured limb, with highest use in lower-limb injuries (74%); 2 studies included both supported and unsupported mobilization.²⁴⁻²⁶ In studies of upper-limb fractures, support was used in 50%. In high-quality studies, 12 out of 16 studies used some support, but results were consistent with studies that did not. The smaller number of studies using minimal support makes comparison with supported mobilization difficult, but results suggest that supported mobilization may result in an earlier return

to work or sport, whereas minimally supported patients achieved better composite scores and muscle strength. There was too much clinical heterogeneity to sensibly combine the results; however, we were interested to see whether mobilization was useful across a heterogeneous group of conditions.

Patient-centered outcomes

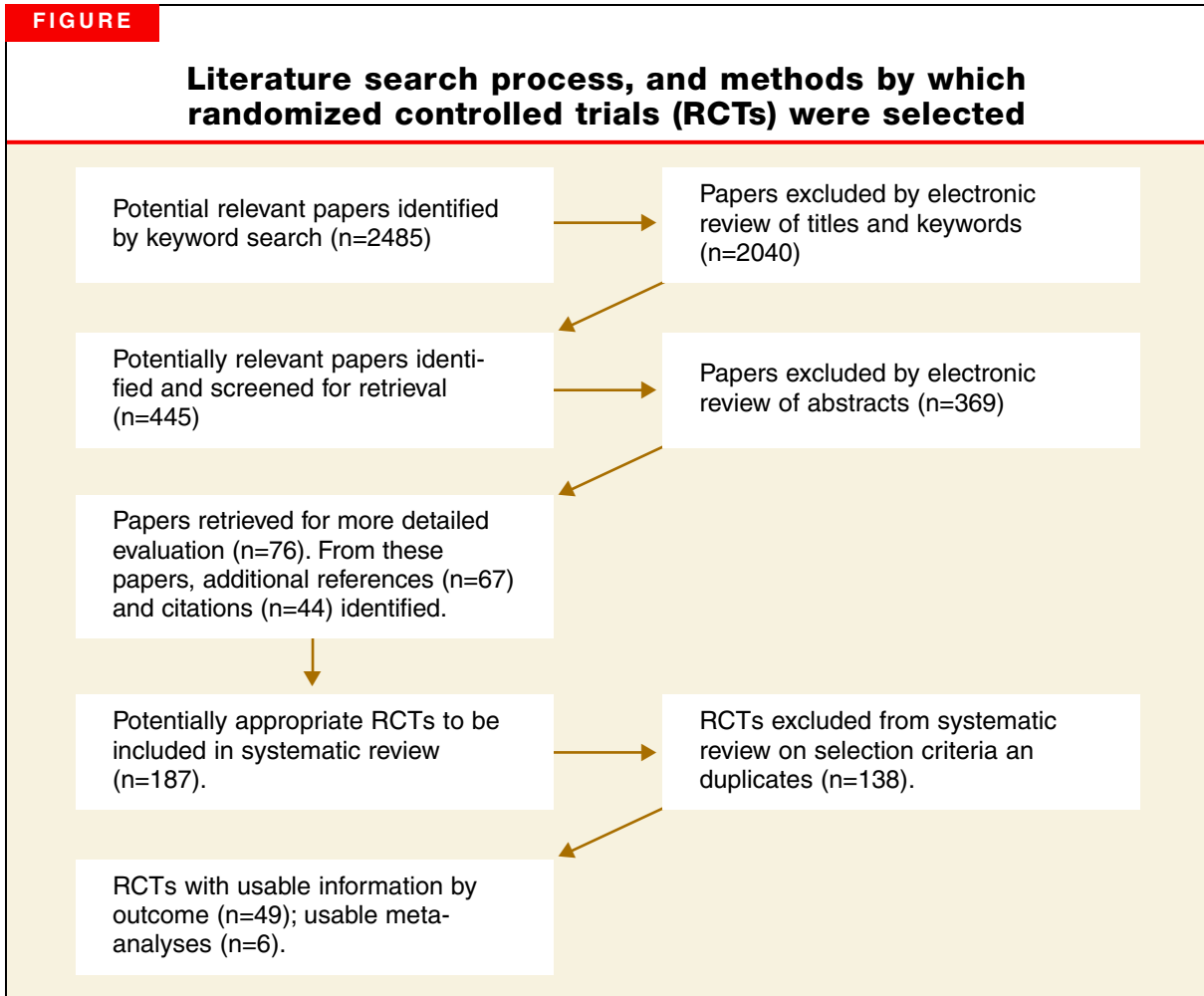
No study reported any significant improvement with rest on swelling and pain. To the contrary, 13 studies reported significant improvement with early mobilization compared with rest,^{16,17,27-37} and 9 studies reported enhanced patient satisfaction.^{16,30,36,38-43} High-quality studies that reported pain levels found no difference or favored early mobilization.^{25,26,30,31,39,44-51} This was significant in only 2 studies of lower-limb nonfractures.^{25,26,30} No study reported adverse patient opinion in an early mobilization regime,^{28,31,38,40,44-46,48,51-56} and patients appreciated their ability to use the affected limb.^{34,43,49}

Functional outcomes

Ten studies measured global function, using composite scores including subjective and objective criteria—pain, stiffness, swelling, use of supports, and ability to climb stairs, play sport, work, and undertake activities of daily life (**Table W**). Seven studies reported significant improvements with early mobilization—after 6 months (6 studies),^{28,35,42,46,52,57} or 12 months (1 study).³² Four studies of high quality found significant benefit for early mobilization in composite scores, most of these for lower-limb fractures.^{46,47,52,54} Significantly more patients with acute ankle sprain, who were immobilized in a cast, sought medical and physiotherapy advice in the initial 3 weeks, compared with those mobilized early with a functional brace.⁵⁰

Return to work and sport

Thirteen studies reported that early mobilization resulted in a significantly earlier return to work (about 30%–60% earlier),^{16,17,30,33,35,36,38-40,52,57-59} especially in lower-limb nonfracture injuries. In 1 study of ankle fractures, patients randomized to wear a cast reported better performance of daily



activities at 6 weeks than those mobilized with crutches.²⁸ Perhaps, this reflects practical difficulties associated with using crutches.

Five studies of lower-limb injury reported an earlier return to sport,^{16,30,39,57,60} as did 3 studies of postoperative Achilles tendon repair^{30,39,60} and 2 of ankle ligament injury or sprains.^{16,57} Five studies reporting a significantly earlier return to work or sport were of high quality, as were all studies of lower limb injuries.^{25,26,30,39,46,52}

Range of movement

Fourteen studies of upper- and lower-limb fractures reported significant improvements in range of movement. Significant differences in range of movement were typically observed within 13

weeks of the injury,^{12,27,29,34,38,42,45,46,49,52,61-64} although a few studies reported differences for longer periods. Similarly for lower-limb nonfractures, significantly better ranges of motion were found within short periods,^{25,33,37,39,43} and also after 12 months.^{30,39-41} Eleven studies reporting this outcome were of high quality,^{25,26,30,31,39,45,46,48-51,54} and 4 studies found significant benefit for early mobilization.^{25,26,30,46,49} The other 7 high-quality studies favored early mobilization, and 1 found no difference.⁴⁵

Deformity and other complications

Four studies found early mobilization reduced deformity: for angular displacement⁶¹ and radial shortening³² in Colles' fractures; displacement of metacarpal fractures⁵⁸ and cosmetic deformity in radial

fractures.⁴² Two studies were of high quality.^{30,65} Ten trials reported no changes in deformity, no loss of fracture reduction, or any other complications with early mobilization of fractures.^{28,31,45,48,50,59,62-64,66} In contrast, for Colles' fractures, significantly greater dorsal angulation⁶¹ and significant increases in radial tilt and decreased radioulnar joint space⁴⁹ were reported for mobilized wrists.

Patient preferences

Patients expressed preference for a brace following anterior cruciate ligament surgery because it helped reduce pain and swelling⁶⁷; they expressed preference for a cast following surgery for ankle fracture because it improved ability to perform everyday activities.²⁸

Patients with distal radius fractures preferred early treatment with a Tubigrip bandage and a back-slab instead of removable splints, which increased pain and decreased mobilization.⁵³ Generally, patients with fractures preferred rigid support immediately after the injury. Some also expected to have a traditional cast applied after learning their injured wrist was fractured.⁵³

Cost of treatment

Full economic evaluations were not usually satisfactorily undertaken in these clinical studies. The cost of early mobilization was more expensive than immobilization in some studies^{8,23} but cheaper in others.^{2,9,10,24,68} It is estimated that direct costs to the patient were lower for early mobilization because of the decreased loss of working time.^{10,44,68,69}

Adherence and supervision

Ten studies excluded patients who were unable to understand the nature of the treatment; had dementia; existing joint disease; drug abuse; alcohol problems; or difficulty with walking aids.^{28,31,38-41,45,46,49,69} Thus, many researchers have assumed that early mobilization requires greater patient responsibility. Some researchers have recommended applying casts for patients deemed "uncooperative" or "unlikely to be com-

pliant," despite their positive findings for early mobilization.^{3,16}

Although 10 trials employed physiotherapy or supervised mobilization sessions,^{25,26,28,29,40,41,46,65,70} 11 studies relied on self-controlled mobilization.^{27,30,31,38,39,42,44,45,48,49,52} In addition, some interventions (eg, braces) intrinsically required more supervision with their removal and reapplication than others (eg, functional casts or semirigid bandages).

■ DISCUSSION

Early mobilization seems to decrease pain, swelling, and stiffness—at least in the short-term—and patients generally prefer it to immobilization. It results in earlier return—to work and to a greater range of motion, which is most significant within the first 2 months of the injury and can be maintained for up to 12 months for nonfracture injuries. Early mobilization does not increase cosmetic or radiological deformity for stable fractures, and patients experience fewer complications and residual symptoms. However, early mobilization may place greater demands on patients and require higher levels of understanding and responsibility, therefore making it unsuitable for some patients.

This systematic review of all upper- and lower-limb injuries, including fractures, consistently found in favor of early mobilization over rest. We acknowledge that the range of injuries reviewed is very limited. However, the clear benefits of mobilization indicated by this review suggest we need research in a wider range of injuries.

Similarly, it would be naïve to assume mobilization is better than immobilization in all circumstances. Harm must occur at *some* level of increased activity. In addition we know that pain and discomfort are often experienced by patients who demand immobilization (a "palliative" form of management). Finding the ideal level and type of activity must be undertaken empirically. Therefore more quality clinical trials are required to determine and evaluate the best regimens for early mobilization.

Newer studies will probably find that mobilization can be employed more often (and perhaps

more vigorously) than we now advise. The best evidence at hand suggests the medical profession generally errs too conservatively on the side of immobilization.

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