The use of ice in the treatment of acute soft-tissue injury: a systematic review of randomized controlled trials

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CRD summary
This review explored the effects of ice treatment upon pain, swelling and range of movement after acute soft-tissue injuries. The authors found little evidence that adding ice to compression increased its effectiveness. There is some evidence that ice plus exercise is effective after surgery and for ankle sprains. The review was well conducted and the conclusions are likely to be reliable.

Authors' objectives
To assess the evidence base for the use of ice (cryotherapy) in the treatment of acute soft-tissue injuries.

Searching
The following databases were searched up until April 2002: MEDLINE (from 1966), Proquest (from 1986), ISI Web of Science (from 1981), CINAHL (from 1982), AMED (from 1985), the Cochrane Database of Systematic Reviews, DARE and the Cochrane Controlled Trials Register; the search terms were reported. In addition, 10 journals were handsearched.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion.

Specific interventions included in the review
Treatments eligible for the review were in-patient, out-patient or home-based cryotherapy, used alone or in conjunction with other therapies or placebo. The eligible comparators were no treatment, placebo, a different method of cryotherapy, or physiotherapy. The actual treatments included were: cryocuffs or cold compressive devices, crushed ice, commercial ice machines, commercial or gel ice packs, and ice submersion. Continuous and intermittent treatments were included. The timing of the intervention relative to injury or post-surgery varied between the studies. The total duration of the cryotherapy treatment ranged from 20 minutes to 336 hours (median 48 hours).

Participants included in the review
The inclusion criteria stated that the participants had to be recovering from acute soft-tissue injuries or orthopaedic surgical interventions. The injuries and surgical procedures included in the review were: ankle sprains, total knee arthroplasties, total hip arthroplasties, arthroscopies, anterior cruciate ligament reconstruction (ACL), and carpal tunnel or lateral retinacular releases.

Outcomes assessed in the review
For a trial to be included in the review, at least one of the following outcomes had to be measured: subjective or objective function, pain, swelling, or range of movement.

How were decisions on the relevance of primary studies made?
One author reviewed the full articles and decided if the trial should be included in the review. There was no blinding with respect to authors, place of publication, or results.

Assessment of study quality
Trial quality was assessed using the Physiotherapy Evidence Database (PEDro) scoring scale. Two reviewers independently assessed trial quality. Any disagreements were resolved by discussion, or by consultation with a third
Data extraction
One author extracted the data into summary tables. The mean values and standard deviations for the main outcomes were extracted. Effect estimates and corresponding 95% confidence intervals (CIs) were calculated for each outcome, using standardised mean differences (SMDs) for continuous outcomes and risk ratios (RRs) for binary outcomes.

Methods of synthesis
How were the studies combined?
The trial results were presented in a narrative summary. No pooling of the results was undertaken because of differences in the trial populations, treatment types and doses, and outcome measures, or insufficient reporting of the data.

How were differences between studies investigated?
No formal statistical tests were used to assess differences between the trials. The authors described clinical differences between the trials and grouped the results by treatment comparison.

Results of the review
Twenty-two RCTs, involving a total of 1,469 participants, met the inclusion criteria. The numbers of participants in the included trials ranged from 21 to 143.

The average quality score was 3.4 out of 10.

There was a small amount of evidence that the use of ice was effective in treating ankle sprains. One trial found evidence of a statistically significant reduction in swelling with ice and simultaneous exercises in comparison with thermotherapy (SMD 1.38, 95% CI: 0.35, 2.29) and a contrast bath (SMD 2.35, 95% CI: 1.13, 3.37). There was no other evidence of any benefits of treatment with ice alone, upon pain or range of movement after an ankle sprain.

One trial found that ice in combination with knee exercise after arthroscopy led to improvements in pain, swelling and range of movement, compared with no treatment, but the effect sizes were small and not statistically significant.

Another trial found that continuous ice application led to statistically significant reductions in pain (SMD 1.09, 95% CI: 0.4, 1.7) and wrist swelling (SMD 2.2, 95% CI: 1.43, 2.9) after carpal tunnel release, compared with intermittent ice application (20-minute sessions over the first 3 days).

One trial found that a single application of ice and compression after an ankle sprain, in addition to standard rehabilitation, resulted in a statistically significant reduction in pain (RR 1.5, 95% CI: 1.24, 1.76) immediately post-treatment in comparison with standard rehabilitation alone. This trial also concluded that ice combined with compression was no more effective than standard rehabilitation with respect to pain and swelling at discharge. This conclusion was supported by another two trials that found ice and compression to be no more effective after ankle sprains and ACL, than standard rehabilitation. Twelve trials compared ice and compression with compression alone, but only eight used the same mode of compression in both treatment groups. Of these eight trials, two found statistically significant benefits for ice and compression after ACL, but both trials were of a poor quality.

Authors’ conclusions
The authors’ conclusions appear to be that there is marginal evidence that treatment with ice and exercise is most effective after ankle sprain, and post-surgery. There is little evidence to suggest that the addition of ice to compression has any significant effect, and the available evidence is limited to the treatment of hospital in-patients. Few studies assessed the effectiveness of ice treatment on closed soft-tissue injuries, and there was no evidence of an optimal type or duration of treatment.
This review had a clearly stated research question. The inclusion criteria were well defined with respect to the study design, injuries, treatment and outcomes. The search was thorough, although its restriction to English language papers represents a potential source of bias. Study quality was assessed using a recognised scale and was performed by two reviewers, which reduces the potential for errors and bias. The results of the quality assessment were well described and comprehensive details of the individual studies were presented.

Differences between the studies were described, and the narrative synthesis presented was appropriate since different cryotherapy protocols were used in varied populations. The results were appropriately presented by treatment comparison. Only a few studies demonstrated a benefit of cryotherapy. The authors discussed the potential limitations of individual study results, thus their conclusions are likely to be reliable.

**Implications of the review for practice and research**

Practice: The authors did not state any implications for practice.

Research: The authors stated that more high-quality studies are needed to ensure that clinicians and sportsmen follow evidence-based guidelines for the treatment of acute soft-tissue injuries.

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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.