Surgical compared with conservative treatment for acute nondisplaced or minimally displaced scaphoid fractures: a systematic review and meta-analysis of randomized controlled trials

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CRD summary
The review concluded that low quality evidence suggested surgical treatment was favourable for acute non-displaced and minimally displaced scaphoid (wrist) fractures for functional outcomes and time off work, but that surgical treatment was associated with more complications. The review was generally well conducted and the authors’ conclusions are suitably cautious and appear appropriate.

Authors' objectives
To compare surgical treatment with conservative treatment for acute non-displaced or minimally displaced scaphoid fractures.

Searching
MEDLINE, CINAHL, Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Bone, Joint and Muscle Trauma Group database, and EMBASE were searched from 1966 to February 2009. Search terms were reported. Reference lists of retrieved articles were searched and experts in the field were contacted.

Study selection
Randomised controlled trials (RCTs) and quasi-RCTs that compared surgical treatment with conservative treatment in patients with acute non-displaced or minimally displaced scaphoid fractures were eligible for inclusion. Trials that included patients with congenital deformities or degenerative disease were excluded, as were trials that focused on the treatment of delayed union or non-union (definitions reported in review).

The primary outcomes were functional outcomes based on wrist and hand function scores, including: the Disabilities of the Arm, Shoulder and Hand (DASH) score; the Patient Evaluation Measure (PEM); the modified Green and O'Brien score; and the Patient-Related Wrist Evaluation (PRWE). Secondary outcomes were pain, time off work, time to union, costs, return to previous activity, complications, patient satisfaction, and physician-rated functional outcomes (such as range of motion and grip strength).

The included RCTs studied patients with non-displaced fracture of the waist scaphoid, minimally-displaced fracture of the waist scaphoid, or clear bicortical non-displaced or minimally displaced fracture of the waist scaphoid. Surgical treatments included percutaneous screw fixation, and Herbert screw fixation. Conservative treatment was a form of cast immobilisation (where reported). Further characteristics of the included RCTs were available in an online appendix (see URL for Additional Data).

Two reviewers independently performed study selection and disagreements were resolved by discussion.

Assessment of study quality
Two reviewers independently assessed study quality using the GRADE (Grades of Recommendation Assessment, Development and Evaluation) criteria, which scored trials on blinding, allocation concealment and loss to follow-up. Disagreements between reviewers were resolved by discussion or consultation with a third reviewer.

Data extraction
Two reviewers independently extracted data (using a piloted data extraction form) on functional outcomes, complications and various other outcomes, and used to calculate risk ratios (RRs), or standard mean differences (SMDs), depending on the type of data, together with 95% confidence intervals (CIs). Authors of studies were contacted for missing data.
Methods of synthesis
A random-effects meta-analysis was undertaken to calculate the pooled risk ratios, standard mean differences and 95% confidence intervals. Statistical heterogeneity was assessed using the $X^2$ test and the $I^2$ statistic.

Results of the review
Eight RCTs were included in the review (n=419 patients). Trial sample size ranged from 25 to 88 patients. Follow-up ranged from 16 weeks to over 12 years. The quality of evidence was deemed low to very low quality; four trials used intention-to-treat analysis, one trial used blinded outcomes assessment, and loss to follow-up ranged from 0% to 26%.

Compared with conservative treatment, surgical treatment resulted in a statistically significantly greater improvement in functional outcomes (SMD -0.62, 95% CI -0.89 to -0.36; $I^2$=5%; four RCTs), greater grip strength (SMD -2.59, 95% CI -4.24 to -0.94; $I^2$=97%; six RCTs), reduced time to union (SMD -4.20, 95% CI -7.69 to -0.7; $I^2$=96%; three RCTs), and reduced time off work (SMD -1.69, 95% CI -2.7 to -0.68; $I^2$ = 89%; five RCTs).

There was no statistically significant difference between the two treatments for pain (two RCTs), infection (seven RCTs), non-union (six RCTs), malunion (seven RCTs), range of wrist motion (six RCTs), and return to previous activity (two RCTs).

There was no statistically significant difference between treatment in the rate of low grade complications (two RCTs), moderate grade complications (two RCTs), severe grade complications (seven RCTs), or all grade complications (11 RCTs), although there was a trend for greater low and moderate grade complications in the surgical group.

Cost information
There was no statistically significant difference between conservative treatment and surgical treatment for cost of treatment (two RCTs).

Authors’ conclusions
Based on primary trials with limited methodological quality, meta-analysis suggested that surgical treatment was favourable for acute non-displaced and minimally displaced scaphoid fractures for functional outcomes and time off work, but surgical treatment was associated with more complications.

CRD commentary
Inclusion criteria for the review were clearly defined. Several relevant databases were searched, but it was unclear whether language restrictions were applied. Publication bias was not assessed and could not be ruled out. Attempts were made to reduce reviewer error and bias throughout the review process.

Quality assessment was conducted using a standard checklist, which indicated the poor quality of the included evidence. Trials were pooled using random-effects meta-analysis, although statistical heterogeneity was still present in many of the analyses (which the authors acknowledged). The heterogeneity, together with the small sample sizes and low quality of the included trials, limited the reliability of the results, which the authors’ acknowledged and discussed.

The review was generally well conducted and the authors’ conclusions are suitably cautious and appear appropriate.

Implications of the review for practice and research
Practice: The authors stated that the long-term risks and short-term benefits of surgery need to be carefully weighed in clinical decision-making.

Research: The authors stated that a large trial of high methodological rigour is needed to assess the effects of grip strength and range of motion. Future RCTs should use functional outcomes that are evaluated with use of validated outcome instruments as a primary end-point. Trials should also report their outcome data with use of means and standard deviations to increase the generalisability of results.
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