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Cochrane in CORR®: Interventions for Treating Proximal Humeral Fractures in Adults (Review)

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Importance of the Topic

Proximal humeral fractures are common fractures that account for 6% of all adult fractures [4] with an overall incidence of 19 per 100,000 [8]. Neer estimated that

approximately 85% of all proximal humeral fractures were undisplaced, [10] but others have found proportions to be much lower [12]. Proximal humeral fractures are typical osteoporotic fractures, with women about three to four times more often affected

than men, and older patients some 16 times more likely to experience this injury than younger patients [8]. They are the third most common fracture in elderly patients after hip and wrist fractures [4]. There is a rise in the incidence of proximal humeral fractures during the last 40 years [8, 11]. The introduction of locking-plate technology in 2002 and reverse shoulder arthroplasty in 2006 for proximal humeral fractures led to a relative increase of surgical treatment of up to 40% [1, 8], but this trend in practice was not supported by high quality evidence.

The number of displaced fracture fragments and patient age are the most important factors that influence decision-making and long-term clinical outcomes, but there is considerable variation in current clinical practice. This systematic review and meta-analysis compared surgical versus conservative treatment, different methods of surgical treatment, different methods of conservative treatment (including rehabilitation), and different methods of rehabilitation after surgical treatment for proximal humeral fractures in adults.

A Note from the Editor-In-Chief: We are pleased to publish the next installment of Cochrane in CORR®, our partnership between CORR®, The Cochrane Collaboration®, and McMaster University's Evidence-Based Orthopaedics Group. In it, researchers from McMaster University and other institutions will provide expert perspective on an abstract originally published in The Cochrane Library that we think is especially important.

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Upon Closer Inspection

This meta-analysis is a comprehensive update of a prior Cochrane review that was conducted in 2001. Although seven higher quality trials were added, the major limitation of this review is still the size of the trials included, each varying from only 20 patients to 86 patients. Small clinical trials are at risk of producing misleading or erroneous findings due to low numbers of outcome events and consequent statistical fragility. Likewise, each of the included trials was a single-center study, which may pose problems for generalizability across varying populations. There was also limited or incomplete blinding in all included studies. Although patients undergoing some surgical interventions cannot always be blinded, it is often still possible to blind independent outcome assessors, healthcare providers, and data analysts.

The authors pooled the functional outcomes scores across six trials ($n = 270$) that compared surgical treatment versus conservative treatment, but the trials used several different functional outcome instruments. In order to

combine the data, all of the scores were converted to a standardized measure of effect called the standardized mean difference (SMD). SMDs are calculated by dividing the mean difference in scores between the two treatment groups on a particular scale by the estimated between-participants standard deviation (SD) for each trial. Unfortunately, most clinicians are not familiar with interpreting results presented in SD units, and the SDs can be under or overestimated in the presence of substantial between-study heterogeneity [7]. Authors of meta-analyses can aid the interpretation of SMD treatment effects by converting SMD scores back to a familiar scale or comparing them to a known Minimally Important Difference [7], but neither approach was incorporated in this meta-analysis.

Take-Home Messages

This Cochrane study showed no difference between surgical and conservative treatment of complex and/or proximal humeral fractures.

Neither one specific method of surgical management is clearly superior to another.

There is insufficient high-quality evidence to guide the management of patients with proximal humeral fractures. Three additional small randomized controlled trials have been published since this review was updated [2, 3, 13], and recent meta-analyses suggest no benefit of surgical management in displaced three- and four-part proximal humeral fractures in elderly [6, 9]. However, there are currently at least 14 ongoing trials, of which five are large (up to 290 patients) multicenter trials and one is a single-center trial [5] comparing surgical versus conservative treatment in displaced proximal humeral fractures. The other ongoing trials are investigating a variety of surgical approaches, implant choices, and rehabilitation regimes. These randomized controlled trials may help us arrive at stronger recommendations to help guide the management of this challenging fracture type. In anticipation of these results, broad variation in treatment preference is still justified.

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Appendix

Interventions for treating proximal humeral fractures in adults (Review)

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This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2012, Issue 12

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Interventions for treating proximal humeral fractures in adults (Review)
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[Intervention Review]

Interventions for treating proximal humeral fractures in adults

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ABSTRACT

Background

Fractures of the proximal humerus are common injuries. The management, including surgical intervention, of these fractures varies widely. This is an update of a Cochrane review first published in 2001 and last updated in 2010.

Objectives

To review the evidence supporting the various treatment and rehabilitation interventions for proximal humeral fractures.

Search methods

We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register, the Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE and other databases, and bibliographies of trial reports. The full search ended in January 2012.

Selection criteria

All randomised controlled trials pertinent to the management of proximal humeral fractures in adults were selected.

Data collection and analysis

Two people performed independent study selection, risk of bias assessment and data extraction. Only limited meta-analysis was performed.

Main results

Twenty-three small randomised trials with a total of 1238 participants were included. Bias in these trials could not be ruled out. Additionally there is a need for caution in interpreting the results of these small trials, which generally do not provide sufficient evidence to conclude that any non-statistically significant finding is 'evidence of no effect'.

Eight trials evaluated conservative treatment. One trial found an arm sling was generally more comfortable than a less commonly used body bandage. There was some evidence that 'immediate' physiotherapy compared with that delayed until after three weeks of immobilisation resulted in less pain and potentially better recovery in people with undisplaced or other stable fractures. Similarly, there was evidence that mobilisation at one week instead of three weeks alleviated short term pain without compromising long term outcome.

Interventions for treating proximal humeral fractures in adults (Review)
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Two trials provided some evidence that unsupervised patients could generally achieve a satisfactory outcome when given sufficient instruction for an adequate self-directed exercise programme.

Six heterogeneous trials, involving a total of 270 participants with displaced and/or complex fractures, compared surgical versus conservative treatment. Pooled results of patient-reported functional scores at one year from three trials (153 participants) showed no statistically significant difference between the two groups (standardised mean difference -0.10, 95% CI -0.42 to 0.22; negative results favour surgery). Quality of life based on the EuroQol results scores from three trials (153 participants) showed non-statistically significant differences between the two groups at three time points up to 12 months. However, the pooled EuroQol results at two years (101 participants) from two trials run concurrently from the same centre were significantly in favour of the surgical group. There was no significant difference between the two groups in mortality (8/98 versus 5/98; RR 1.55, 95% CI 0.55 to 4.36; 4 trials). Significantly more surgical group patients had additional or secondary surgery (18/112 versus 5/111; RR 3.36, 95% CI 1.33 to 8.49; 5 trials). This is equivalent to an extra operation in one of every nine surgically treated patients.

Different methods of surgical management were tested in seven small trials. One trial comparing two types of locking plate versus a locking nail for treating two-part surgical neck fractures found some evidence of better function after plate fixation but also of a higher rate of surgically-related complications. One trial comparing a locking plate versus minimally invasive fixation with distally inserted intramedullary nails found some evidence of a short-term benefit for the nailing group. Compared with hemiarthroplasty, tension-band fixation of severe injuries using wires was associated with a higher re-operation rate in one trial. Two trials found no important differences between 'polyaxial' and 'monaxial' screws combined with locking plate fixation. One trial produced some preliminary evidence that tended to support the use of medial support locking screws in locking plate fixation. One trial found better functional results for one of two types of hemiarthroplasty.

Very limited evidence suggested similar outcomes from early versus later mobilisation after either surgical fixation (one trial) or hemiarthroplasty (one trial).

Authors' conclusions

There is insufficient evidence to inform the management of these fractures. Early physiotherapy, without immobilisation, may be sufficient for some types of undisplaced fractures. It remains unclear whether surgery, even for specific fracture types, will produce consistently better long term outcomes but it is likely to be associated with a higher risk of surgery-related complications and requirement for further surgery.

There is insufficient evidence to establish what is the best method of surgical treatment, either in terms of the use of different categories of surgical intervention (such as plate versus nail fixation, or hemiarthroplasty versus tension-wire fixation) or different methods of performing an intervention in the same category (such as different methods of plate fixation). There is insufficient evidence to say when to start mobilisation after either surgical fixation or hemiarthroplasty.

PLAIN LANGUAGE SUMMARY

Interventions for treating proximal humeral (top end of upper arm bone) fractures in adults

Fracture of the top end of the upper arm bone is a common injury in older people. It is often called a shoulder fracture. The bone typically fractures (breaks) just below the shoulder, usually after a fall. Most of these fractures occur without breaking of the skin. Often the injured arm can be supported in a sling until the fracture heals sufficiently to allow shoulder movement. More complex fractures may be treated surgically. This may involve fixing the fracture fragments together by various means. Alternatively, the top of the fractured bone may be replaced (half 'shoulder' replacement: hemiarthroplasty), or sometimes together with the joint socket (total 'shoulder' replacement). Physiotherapy is often used to help restore function.

This review includes evidence from 23 small randomised trials with a total of 1238 participants. All trials had weaknesses that could affect their results.

Eight trials evaluated conservative (non-surgical) treatment. One trial found an arm sling was generally more comfortable than a less commonly used body bandage. There was some evidence that 'immediate' physiotherapy compared with physiotherapy delayed until after three weeks of immobilisation resulted in less pain and faster recovery in people with 'stable' fractures. Similarly, there was evidence that mobilisation at one week instead of three weeks alleviated pain in the short term without compromising long term outcome. Two trials provided some evidence that patients could generally achieve a satisfactory outcome when given sufficient instruction to pursue exercises on their own.

Interventions for treating proximal humeral fractures in adults (Review)

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Six trials, involving 270 participants with more severe fractures, compared surgical versus conservative treatment. Pooled results from three trials for patient-reported measures of function and quality of life were inconclusive. There was no difference between the two groups in mortality. However, more surgical group patients had additional or secondary surgery. This was equivalent to an extra operation in one of every nine surgically treated patients.

Seven trials tested different methods of surgical treatment. There was weak evidence of some differences (e.g. in complications) between some interventions (e.g. different devices or different ways of using devices).

There was very limited evidence suggesting similar outcomes for early versus later mobilisation after either surgical fixation or hemiarthroplasty.

Overall, there is some evidence to support earlier arm movement for less serious fractures. Otherwise, there is not enough evidence to determine the best treatment, including surgery, for these fractures.

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