CRD summary
The authors concluded that the quality of evidence about treatments for proximal humeral fractures was low and insufficient to make recommendations, and that further good-quality research is required. The limited and diverse evidence appeared to support the authors’ conclusions but the acknowledgement of missing studies make it difficult to comment on the reliability of these conclusions.

Authors' objectives
To evaluate current evidence assessing primary interventions for the treatment of proximal humeral fractures.

Searching
PubMed and EMBASE were searched for studies published in English between 1985 and 2004. Search terms were reported.

Study selection
Randomised controlled trials (RCTs), prospective and retrospective studies and case series that evaluated primary treatments for fractures of the surgical neck, or proximal to the surgical neck, of the humerus in skeletally mature patients were eligible for inclusion.

The review categorised treatments as non-operative, percutaneous fixation, open reduction internal fixation with subgroups of intramedullary, plating and miscellaneous fixation, and humeral head replacement. Details of specific treatments were provided in the review. Fractures were grouped according to the Neer proximal humeral fracture classification as 2, 3, 4, and combined groups of class 2 and 3, or 3 and 4. Studies that did not distinguish between 2,3 and 4 part fractures were excluded from the outcome analysis. The review assessed Neer ratings (excellent, satisfactory, unsatisfactory and poor), pain ratings (none, mild, moderate and severe), eight specified complications, and range of motion (flexion, abduction and internal and external rotation). Studies of patients with similar types of fracture used different methods to measure outcomes and studies involved patients with different characteristics.

Most fractures in the included studies (70%) resulted from a fall from standing height. The average age of patients was 62.8 years.

Two reviewers independently selected studies.

Assessment of study quality
Two reviewers independently assessed and scored studies using the Structured Effectiveness Quality Evaluation Scale (SEQES) criteria. Disagreements were resolved by consensus. This scale assesses 24 items related to study design, participants, intervention, outcomes, analysis and recommendations. Each item was awarded a score between 0 (not met) and 2 (fully met).

Data extraction
Two reviewers independently extracted data on the absolute change and statistical significance of outcomes. For each study, where possible, numbers of patients with outcomes of interest and degrees of range of motion were presented in tables.

Methods of synthesis
The studies were grouped by type of fracture and type of treatment and combined in a narrative synthesis.

Results of the review
Sixty-six studies were included in the review (n=2,653 patients, with 2,155 completing follow-up). Two randomised controlled trials (RCTs) were included (n=70 patients). The average quality score was 15/48. Methodological flaws
included lack of the following: comparison group; randomisation; blinding; appropriate enrolment of patients; and independent assessment of outcomes.

**Two-part proximal humeral fractures** (five publications including two retrospective trials and three case series, n=227 patients): Results from one retrospective study showed that 22 patients treated with plate fixation had lower Neer scores than other treatments.

**Three-part proximal humeral fractures** (five case series, n=101 patients): One case series showed that nine patients treated with buttress plating had the highest Neer and pain scores.

**Four-part proximal humeral fractures** (nine case series, n=89 patients): Humeral head replacement had lower average values for both abduction and internal rotation.

**RCTs**: One RCT (n=30 patients with type 2, 3 and 4-part fractures) reported that patients who had undergone percutaneous external fixation using a half-frame had significantly improved Neer scores and quality of reduction, compared to patients who had undergone closed reduction and a sling. One of the 12 surgically-treated patients developed a deep infection. One RCT (n=40 patients with predominantly 3-part fractures) reported similar outcomes for non-operative treatment and a tension-band osteosynthesis but reported a higher complication rate in the surgically-treated group.

**Authors’ conclusions**
The quality of evidence was low and insufficient to make recommendations about treatments for proximal humeral fractures. Good-quality research is required.

**CRD commentary**
The review question was clearly stated and inclusion criteria defined for study design and participants. Inclusion criteria for interventions were broad and no inclusion criteria were specified for outcomes. Limiting the research to English-language reports in two databases raised the possibility of publication and language bias. Some relevant studies were apparently missed. A Cochrane Review (see Other Publications of Related Interest, Handoll et al, 2003) on the same topic apparently identified 12 RCTs. The authors of the current review stated that some of the Cochrane studies were not accessible to them but "would be unavailable to most clinicians". Appropriate methods were used to minimise reviewer error and bias during the review process. Study validity was assessed and methodological flaws summarised and taken into account when evaluating the evidence. In view of the diversity among studies, a narrative synthesis was appropriate. Apart from the limited search the review was well conducted. The limited and diverse evidence appeared to support the authors' conclusions, but the acknowledgement of missing studies made it difficult to comment on the reliability of these conclusions. Recommendations regarding the need for further research appeared appropriate.

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

**Research**: The authors stated that there is a need for well-designed studies (ideally RCTs) use standardised outcomes to compare different treatments for different types of proximal humeral fractures.

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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.