A systematic review of medial and lateral entry pinning versus lateral entry pinning for supracondylar fractures of the humerus

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CRD summary
The authors concluded that medial and lateral entry pinning provided the most stable configuration for supracondylar fractures of the humerus, but that care should be taken to avoid nerve injury with both procedures. However, these conclusions may not be reliable given the limitations in the review methodology.

Authors' objectives
To compare the impact of medial and lateral entry pinning versus lateral entry pinning for supracondylar fractures of the humerus on iatrogenic nerve injury, deformity or loss of reduction.

Searching
MEDLINE was searched from 1966 to July 2004 without language restrictions; the search terms were reported. Reference lists of selected articles were checked, as were articles from medical periodicals not identified by MEDLINE. The search was restricted to studies published in peer-reviewed journals.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs), and prospective and retrospective cohort studies were eligible for inclusion.

Specific interventions included in the review
Studies of lateral entry pinning or medial and lateral entry pinning of type II and type III supracondylar fractures were eligible for inclusion. The number of pins used was unclear and appeared to vary within and between studies.

Participants included in the review
Studies of patients with displaced, closed supracondylar fractures of the humerus treated with closed reduction and percutaneous pinning were eligible for inclusion. Studies that included patients with open injuries were eligible for inclusion if it was possible to extract nerve injury rate and outcome results when open injuries were excluded. The age of the participants ranged from 2 to 14 years (mean age 6.2 years).

Outcomes assessed in the review
Studies reporting iatrogenic ulnar nerve injuries or loss of reduction were eligible for inclusion. Studies were excluded if a pre-operative neurological examination had not been carried out, or if they contained only non-operative results. Deformity was defined as varus angulation of greater than 5 degrees or carrying angle loss of greater than 10 degrees. The mean follow-up period was 1.6 years; the minimum follow-up was until pin removal.

How were decisions on the relevance of primary studies made?
Two reviewers independently assessed articles for inclusion. A third reviewer was consulted in the case of disagreement.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
One reviewer extracted the data and a second reviewer checked the extraction. Where studies compared two treatments, each arm was treated as individual cohorts. The number of events for each outcome was extracted.

Methods of synthesis
How were the studies combined?
The authors evaluated differences between proportions using the chi-squared test. They combined data from all studies as though the data were from one large study, and calculated the relative risk (RR) with 95% confidence intervals (CIs) and the number-needed-to-treat.

How were differences between studies investigated?
A separate meta-analysis solely of prospective studies was carried out.

Results of the review
Thirty-five studies (n=2,054) were included: 2 RCTs (n=69), 6 prospective cohort studies (n=215) and 27 retrospective cohort studies (n=1,770). Twelve studies assessed both medial and lateral entry pinning and lateral entry only (n=776), 18 assessed medial and lateral pinning only (n=865) and 5 evaluated lateral entry pinning only (n=413).

The authors reported that in two of the prospective studies the loss to follow-up was 16% and 32%. The remaining prospective studies had a loss to follow-up of less than 10%.

The incidence of iatrogenic nerve injury was 3.5% in the medial and lateral injury group and 1.9% in the lateral entry only group. Medial and lateral entry pinning was associated with a significantly greater risk of iatrogenic nerve injury compared to pinning with lateral entry alone (RR 1.84, 95% CI: 1.01, 3.36, p<0.04). This risk increased when only ulnar injuries were considered. Medial and lateral entry pinning was five times more likely to result in ulnar nerve injury than lateral entry pinning alone (RR 5.04, 95% CI: 2.00, 12.72, p<0.0001).

The incidence of deformity was 3.4% in the medial and lateral entry group compared with 5.9% in the lateral entry only group. Medial and lateral entry pinning was associated with a statistically significant decrease in the risk of deformity (RR 0.58, 95% CI: 0.36, 0.93, p<0.02).

However, when a subgroup analysis was conducted of prospective studies only, no significant differences were found between the different procedures for all of the outcomes.

Authors' conclusions
Medial and lateral entry pinning was the most stable configuration. Care should be taken to avoid iatrogenic nerve injury, irrespective of surgical technique.

CRD commentary
Inclusion criteria were clearly defined for the patients, interventions, study designs and outcomes. Only one database was searched and unpublished studies were excluded, thus relevant studies might have been missed and publication bias cannot be ruled out. Appropriate steps were taken to minimise bias in the study selection process. The data were extracted by one reviewer and checked by another, which also provides a degree of protection against error and bias. However, the reliability and validity of the results were undermined by the lack of a validity assessment, the presence of clinical heterogeneity, and the predominance of retrospective case series studies. Indeed, when only prospective studies were included the results were not replicated. The authors combined the data using individual patient data, but they did not follow a systematic review protocol appropriate to this method, thus the conclusions may not be reliable.

Implications of the review for practice and research
Practice: The most stable configuration involves medial and lateral entry pins. Care should be taken, regardless of technique, to avoid iatrogenic nerve damage.

Research: Further meta-analysis is needed as more prospective randomised trials become available. More adequately powered trials are also needed, though the authors acknowledged that the sample size required (2,000 in each arm) may not be feasible.

Funding
Alberta Heritage Foundation for Medical Research (clinical fellowship award).
Bibliographic details

PubMedID
17314643

DOI
10.1097/bpo.0b013e3180316cf1

Original Paper URL

Additional Data URL
http://journals.lww.com/pedorthopaedics/Abstract/2010/07000/Iatrogenic_Ulnar_Nerve_Injury_After_the_Surgical.5.aspx

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Indexing Status
Subject indexing assigned by NLM

MeSH
Bone Nails; Child; Fracture Fixation /adverse effects /methods; Humans; Humeral Fractures /surgery; Humerus /abnormalities; Treatment Failure

AccessionNumber
12007005796

Date bibliographic record published
07/01/2008

Date abstract record published
09/08/2008

Record Status
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