

Journal Club: 06 February 2013

Attendees: : Mr A. Khan, Mr P. Harwood, Mr M. Blomfield, Mr C. Fenton, Miss A. Fishlock, Miss K. Lowery, Mr G. Hannant, Mr I. Abdulkareem, Miss R. Hallas, Dr F. Barnett

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Theme: Upper limb trauma – Fractures of the Distal Radius

Kreder HJ, Hanel DP, Agel J, McKee M, Schemitsch EH, Trumble TE, Stephen D. Indirect reduction and percutaneous fixation versus open reduction and internal fixation for displaced intra-articular fractures of the distal radius: a randomised, controlled trial. *J Bone Joint Surg [Br]* 2005;87-B:829-36.

Reviewer: Miss A.Fishlock

Summary

1.Purpose

To compare indirect reduction and percutaneous fixation with open reduction and internal fixation for displaced intra-articular distal radius fractures.

2. Methods

Patients aged between 16 – 75 years presenting to one of the three participating centres were screened for inclusion in the study, following initial closed reduction in the emergency department. Patients who demonstrated fractures with a minimum of 2mm of either step off or gap were deemed eligible. They also included fractures with $\geq 10^\circ$ of dorsal angulation, or comminution involving more than one-third of the AP diameter of the shaft.

Exclusion criteria included any history of previous distal radius fracture, congenital deformity or other severe wrist problems, if the patient was not fit for surgery, if definitive fracture fixation could not be completed within less than 1 week from injury, patient was mentally incompetent or unable to answer a written questionnaire. Furthermore, patients with open fractures, other significant injuries or associated injuries (to

the ipsilateral limb) were also excluded. Patients were randomised into each group using blinded envelopes.

Primary outcome - At the first visit after operation a sensory and motor examination was recorded. All patients were asked to complete the MFA and the SF-36 questionnaires. Secondary outcomes including the hand function test, grip strength, lateral pinch strength, three-jaw chuck and pad-to-pad pinch strength tests were recorded at each interval.

3. Results

A total of 1269 patients were screened in A&E. Of these 247 met the inclusion criteria and 179 were enrolled in the study. There were 88 patients enrolled in the indirect group and 91 in the open group. Fracture and patient characteristics were deemed to be similar in each group. 166 patients presented to the 6-month follow-up (93%), 140 at 1 year (78%) and 118 at two years (66%). Patients who underwent internal fixation were statistically more likely to require bone grafting (50% vs 13%). There was no statistically significant difference in the radiological restoration of anatomical features or the range of movement between the groups. During the period of two years, patients who underwent indirect reduction and percutaneous fixation had a more rapid return of function and a better functional outcome than those who underwent open reduction and internal fixation, provided that the intraarticular step and gap deformity were minimised.

4. Conclusions

Open reduction should be preceded by an attempt at minimally invasive percutaneous reduction. If an acceptable reduction is achieved with minimally invasive technique the open reduction is unnecessary and function may be superior in the longer term. Furthermore, follow-up is not required beyond one year, unless problems have arisen during the course of the treatment.

5. Critique

Strengths

- Good form of randomisation – blinded envelopes based upon computer-generated number sequences
- Good statistical analysis utilised
- Patients were analysed according to the 'intention to treat' principle. Hence patients were analysed within the group they were randomised to
- N = more than the calculated sample size

Methodology Concerns

- Large age range - mean should have been used rather than median
- Very specialised ORIF technique cannot be translated to our practice

- Many different implants used in the ORIF group - difficult to make comparisons
- Patients were mobilised very late – often at 8/52
- Bias introduced due to high numbers of cross over
- Patients should have been evaluated within sub-groups (i.e. trauma/osteoporotic fractures)
- Practice in Canada very different to our practice in England – therefore results cannot be translated to our healthcare system

Egol K, Walsh M, Tejwani N, McLaurin T, Paksima N. Bridging external fixation and supplementary Kirschner-wire fixation versus volar locked plating for unstable fractures of the distal radius, a randomised prospective trial. *J Bone Joint Surg [Br]* 2008;90-B:1214-21.

Reviewer: M Blomfield

Summary

1. Purpose

A prospective randomized controlled trial to evaluate the outcome of displaced unstable fractures of the distal radius. The criteria included in evaluation included radiological, clinical, and functional outcomes for patients treated with either bridging external fixation +- K-wire fixation or a volar locking plate for displaced fractured distal radius.

2. Methods

Total of 280 patients enrolled, 88 met inclusion criteria for surgery. Patients were then randomized into each group. Patients treated with closed reduction were reviewed at one week and reevaluated for maintenance of reduction. Strict criteria was set to assess the adequacy of reduction (<10° dorsal angulation, <2mm loss of height, <1mm articular step off, no DRUJ instability). The Volar plate group all had a Henrys approach and were allowed to mobilise in a velcro splint immediately post op. External fixators were removed at 6 weeks in clinic. Operations were all performed by one of four Post fellow surgeons.

3. Results

After exclusions due to; loss to follow-up (n = 7), death (n = 1), need for wrist fusion (n = 1), cross over into another treatment group (n = 2), 77 patients formed the basis of analysis. In total 38 patients received external fixation and supplementary K-wire fixation and 39 volar plating. There was no difference in fracture classification within the two groups. All patients completed 1 year of follow up. The mean pain scores recorded at each interval were similar for each group and lacked statistical significance. There were

no differences in the mean DASH scores at each follow-up point, compared with the patients' self-reported baseline levels. There was only a marginal difference at six months. By one year there was no difference. The mean range of movement improved with each successive assessment. For all parameters, the range of movement was better in the internally fixed group. There was no difference in grip strength at any point in time. All but one fracture radiologically united. The rate of complications was similar in each group.

4. Conclusions

This retrospective study found an improved range of movement and radiological outcome at three and six months after fixation with a locking plate. However, even though the improved early range of movement reached statistical significance, the actual differences were of very little clinical significance. These improvements were not associated with a better outcome. Although the complication rate was similar, more patients in the plating group required re-operation. This study concluded there was no evidence to support the theory that one treatment is any better than the other.

5. Critique

Strengths

- Well designed study with power calculation and consequently appropriately sized study groups
- Well defined follow up procedure and assessment of reduction

Methodological Concerns

- Large age range in each study group
- Study numbers were not sufficient to further subdivide the analysis
- Due to the limited study size it was not possible to compare the outcome in the two groups between the more severe fracture classifications

Azzopardi T, Ehrendorfer S, Coulton T, Abela M. Unstable extra-articular fractures of the distal radius: a prospective, randomised study of immobilisation in a cast versus supplementary percutaneous pinning. *J Bone Joint Surg [Br]* 2005;87-B:837-40.

Reviewer: C Fenton

Summary

1. Purpose

This paper sets out to dispel some of the controversies that have arisen as a consequence. It compares, as a randomised controlled trial, closed reduction and immobilisation in a cast versus the same management with additional percutaneous pinning.

2. Methods

This is a randomised controlled (non-blinded) trial with 1 year follow-up. Patients were randomised into two groups by flipping coin. There was no crossover option. Intention to treat analysis was used. The study involved 57 patients in total with 27 in the closed reduction group and 30 in the percutaneous pinning group. Three patients died before the conclusion of the trial and 3 defaulted from final follow-up; all were excluded from the analysis. The mean age of the patients was 71 years (range 60 to 88 years) with women out-numbering men 8:1. The initial degree of displacement similar in all groups. Inclusion criteria included patients older than 60 years with unstable, dorsally angulated, extra-articular fractures of the distal radial metaphysis. Patients were excluded if they had dementia, psychiatric illness, previous fractures of the ipsilateral or contralateral wrist, intra-articular fractures, volar angulation, dorsal angulation <20 degrees and minimal dorsal angulation.

3. Results

The authors found that patients treated with percutaneous wires achieved significant improvements in the radiographic markers of stability at one year including, dorsal angulation, radial length, and radial inclination. They found no improvements in functional outcomes in terms of pain, grip strength, ADLs and SF-36 except for an improved range of ulnar deviation. One episode of pin-track infection resulting in the removal of the pins.

4. Conclusions

The use of percutaneous K-wires provides a minimal amount additional functional gain in the study population.

5. Critique

Strengths

- Homogenous group with applications to clinical practise.
- Focuses on clinically relevant question.
- Unusual but effective method of randomisation if used correctly.
- Objective measures used to define the outcomes.
- Appropriate statistical tests applied.
- Standards of practise uniform throughout.

Methodology concerns

- Small numbers meaning the study is underpowered and liable to Type 1 errors.
- Testing of function was done indiscriminately and applied to both the dominant and non-dominant hands which have been shown to have different functions i.e. the right hand predominantly is used for fine motor movements.
- No blinding, this is recognised as identified by the authors as a possible source of bias.

Final Thought

The trial was clinically relevant but did have the drawback of being significantly underpowered. The results were equivocal in terms of statistical significance. This means that it would be unlikely to change current practice. This paper indicates the need for further research in this area and a larger trial of a similar design would be beneficial.