

Journal Club: 07 March 2013

Attendees: Mr A. Khan, Mr. H.Kapoor, Mr M.Blomfield, Mr. J.Eyre, Mr. A.Rao, Miss A.Fishlock, Miss K.Lowery, Mr G.Hannant, Mr I.Abdulkareem, Dr F.Barnett, Mr. Carl Fenton, Mr. Jan, Leeds General Infirmary, Great George Street, Leeds, United Kingdom

Theme: Upper limb trauma: Proximal Humerus Fractures

Foruria et al. The pattern of the fracture and displacement of the fragments predict the outcome in proximal humeral fractures. *J Bone Joint Surg [Br]* 2011;93-B:378-86.

Reviewer: Mr Carl Fenton

Summary

1. Purpose

To evaluate the functional outcomes, using validated scoring systems, of proximal humerus fractures that have been treated non-operatively based on CT reconstruction of images of the shoulder. To see if fracture pattern and displacement of the fragments based on 3D CT reconstruction, had an effect on these outcomes. The primary outcomes of interest were pain and function in relation to the fracture pattern.

2. Methods

This was a prospective case series of 93 patients collected over a period of 7 months in 2005 at a single hospital. All of the patients were treated by a single surgeon and no attempts at reduction of the fracture were made. The patients were then immobilised in a commercial available shoulder immobiliser then followed a standardised treatment protocol. These patients underwent radiological evaluation using CT scanning from which 3D reconstructions were made. The fracture morphology and displacement were evaluated from this using standardised protocol. Following treatment the patients were followed up and their function was assessed using validated scoring systems including VAS, SF-36 and shoulder specific scores; the Disabilities of the Arm, Shoulder and Hand (DASH) index and the American Shoulder and Elbow Society (ASES) score. The follow up period was for a total of 12 months with scoring, clinical evaluation and CT performed both at baseline on the day of admission and 12 months following the injury. There was no randomisation or crossover and the researcher or patients were not blinded to the treatment they were receiving. Differences in outcomes between the types of fracture were analysed using the Chi-squared test and multivariate analysis was used to determine associations between the factors.

The patients were selected on the basis that they were to have non-operative management. In all there were 132 patients with shoulder fractures seen in the department during this period, 10 of were deemed to be suitable for surgical management. Of the remaining 122 people, 111 met the criteria for entry following which 11 were lost to follow-up and 7 died of unrelated causes.

All patients were aged 18 years or older, had a unilateral injury and with no other associated injuries. They were also required to have no cognitive impairment as defined by a pre-determined clinical score. Patients who were deemed suitable for surgery were not included in the study. Those who had pre-existing disease were eligible for the study and these were factored into the final analysis.

3. Results

The researchers identified 6 patterns of fracture in 84 of the patients (9 did not have an identifiable fracture pattern than could be classified due to variable undisplaced lines of fracture). These were: a) posteromedial impaction fracture, b) posteromedial impaction with fracture of both tuberosities, c) a

lateral neck impaction fracture with fracture of the greater tuberosity, d) lateral neck impaction with fracture of both tuberosities, e) fracture of the greater tuberosity and f) an anteromedial impaction fracture. The commonest fracture pattern was a posteromedial impaction fracture.

4. Conclusions

The union rate in all patients was high with an overall rate of 98% (91 of the 93 patients united). There was evidence of avascular necrosis in 6 patients (5 who the fracture involved less than 20% of the head). The worst outcomes occurred in patients with valgus impacted fractures followed by varus impacted fractures with 62% and 38% respectively likely to have a 10 point reduction in the DASH score or an unsatisfactory result. This was compared to 17% in all other groups combined with a p-value reported as <0.001). Pain scores were shown to increase if the height of the GT was increased as compared to the articular surface and the distance from the acromion.

5. Critique

Strengths

- Clear aims and objectives for the study.
- Clear methods for the study.
- Use of validated scoring systems to ensure that measurements were easy to interpret and applicable to readers of paper who are likely to be familiar with these systems.
- Appropriate statistical analysis of the data.
- Paper had sufficient numbers in order to provide appropriate statistical power to the data.
- Apparently rigorous application of radiological measurement to determine accurately, the level of displacement of the fragments.
- The procedures were standardised with clear protocols for both the investigation and therapy for all patients included in the trial.
- Explanations for all patients not included in the trial including those lost to follow-up.

Methodology Concerns

- The researchers were not blind to the nature of the injury; this may have introduced some bias into the study regarding outcomes from scoring.
- No clear criteria for surgical versus non-operative intervention.
- The researchers discovered some minor differences in the fracture patterns as those described by Neer¹ but these differences were not great enough in order to require a new classification system as the authors had set out to do.
- The results have been presented in an overly complex fashion with large amounts of data which may have not been necessary to present.
- The results from this paper do not differ so greatly as to require changes in classification systems.

6. Our conclusions

The evaluation of these patients was based on CT imaging and a 3D reconstruction of the fracture patterns with detailed determination of the morphology based on these. In practice it would not be suitable to perform CT imaging of patients to determine the fracture pattern although it may act as guide to determine when CT imaging is required for example when there is multifragment fracture with displacement of the tuberosities. Over all the quality of the paper is good but does not differ significantly from previous research in the area enough to change the practice significantly.

Hodgson SA, Mawson SJ, Stanley D. Rehabilitation after two-part fractures of the neck of the humerus. *J Bone Joint Surg [Br]* 2003;85-B:419-22.

Reviewer: Miss F Barnett

Summary

1. Purpose

Authors from Sheffield present a prospective randomised controlled trial comparing outcomes for two groups of patients with two-part fractures of the proximal humerus following two different rehabilitation programmes. Neers classification was used for minimally displaced fractures - no bone segment should be displaced more than 1cm or angled more than 45degrees.

2. Methods

86 patients were recruited over 18 months and randomised using sequentially numbered sealed envelopes to group A or group B. Group A received immediate physiotherapy within one week and group B received delayed physiotherapy after three weeks of immobilisation in a collar and cuff sling. Apart from the timing, both groups received the same rehabilitation program under the guidance of the same 16 physiotherapists.

3. Results

At 16 weeks post injury patients receiving immediate physiotherapy had less pain and increased function (measured by the SF36 general health questionnaire and the Constant shoulder score). At 52 weeks the differences between the groups had reduced although patients receiving immediate physiotherapy still had greater function and less pain, although these differences were not statistically significant.

4. Conclusions

It was concluded that patients with two-part fractures of the proximal humerus had better outcomes from immediate physiotherapy. Gains in shoulder function persist at 52 weeks which suggest that patients do not benefit from immobilisation before beginning physiotherapy.

5. Critique

Strengths

- Double blinded
- Randomisation method - sequentially numbered envelopes
- Power calculation
- Same rehab programme apart from start date

Methodology Concerns

- SF36 score not a direct score of shoulder pain/function. Can function 100% with a missing limb!
- Average age 69 - already have pre-existing shoulder problems and osteoporosis by this age.
- Unable to get a "pre-injury" Constant shoulder score so score was calculated and compared to opposite arm. Does not account for hand dominance and pre-existing problems with other arm.
- Paper is from 2002 - results are not well known / used. ?why

6. Our conclusions

Patient advice leaflet on shoulder exercises for time before first physiotherapy session. Patients should be shown how to perform exercises by physio/nurse/Doctor before discharge from A&E/clinic

Moonot P, Ashwood N, Hamlet M. Early results for treatment of three- and 4-part fractures of the proximal humerus using the PHILOS plate system. *J Bone Joint Surg [Br]* 2007; 89-B: 1206-9.

Reviewer: Miss A Fishlock

Summary

1. Purpose

This was a prospective study to evaluate the efficacy of the PHILOS plating system when used to treat 3 and 4-part proximal humerus fractures.

2. Methods

Data collected prospectively between January 2003 and December 2005. Data was collected on a total of 32 patients with displaced 3-part and 4-part proximal humerus fractures treated with ORIF using a PHILOS plate. There were nine men and 23 women with a mean age of 59.9 years (18 – 87 years). Mechanism of injury included simple fall (n = 23), RTC (n = 6) and fall down stairs (n = 3). A total of 20 patients had 3-part fractures, and 12 had 4-part fractures.

Surgery was performed by two consultant surgeons, under GA, in the 'beach chair' position, and utilising a deltopectoral approach. The PHILOS plate was used using a minimum of 4 proximal locking screws. Two patients were found to have poor bone stock and Allomatrix bone substitute was used. Suction drain was utilised and removed at 24 hours. Pendulum exercises were started for day one post op, and the shoulder was mobilised with active assisted exercises, followed after three weeks by active exercises.

All patients were reviewed at two and six weeks, then at three month intervals until union was achieved. Assessment of shoulder function was using the Constant score. The mean follow-up was for 11 months (3 – 24 months).

3. Results

A total of 31 fractures (97%) were clinically and radiologically united, at a mean time of 10 weeks (8 – 24 weeks). The mean Constant score at final review was 66.5 (30 – 92). Twenty-seven patients (84%) had an excellent or satisfactory result, but 5 patients (16%) had a poor result. The mean score in patients aged ≥ 60 years was 66.1 (30 – 81) and in those ≤ 60 years was 67.1 (38 – 92), this was not statistically significant.

Complications included; one patient developed superficial wound infection (treated with PO antibiotics), one patient developed transient axillary nerve palsy, one patient developed a non-union and avascular necrosis of the humeral head, and in one patient a distal screw broke. Three patients developed impingement symptoms requiring removal of metal work.

4. Conclusions

This prospective cohort study suggests that treatment with the PHILOS plate may give a satisfactory outcome in patients with displaced three- and four-part fractures of the proximal humerus. Furthermore, the fixation is usually stable enough to allow early mobilisation.

5. Critique

Strengths

- Prospective study
- Procedures carried out by only two consultant surgeons – standardised technique
- Describes the operative technique very well

Methodology Concerns

- Small n number (n = 32)
- Large age range (18 – 87) – likely to be very different pathologies – locking mode for osteoporotic bone

- Uses the 'Constant score' – Not evaluating function, but is more objective

6. Our conclusions

The attendees thought this was an interesting paper which described a new technique for proximal humerus fixation in 2007. Mainly of historical interest as proximal humeral locking plates are now routinely used in clinical practice.