

Journal Club: 4 February 2011
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Edinburgh Journal Club

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Mr Frank Horan, *Editor Emeritus* JBJS British
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British Editorial Society of Bone and Joint Surgery

Birmingham hip resurfacing. a minimum follow-up of ten years.

Treacy RBC, McBryde CW, Shears E, Pynsent PB
J Bone Joint Surg [Br] 2011;93-B:27-33

Reviewer: Miss Chloe Scott StR5 SE Scotland Rotation

Background and Summary

This study is a case series of the first 144 hip resurfacings performed by a single surgeon in 130 patients. The aim was to report 10 year follow up with the primary outcome measure as revision. Secondary outcomes were OHS, UCLA score and radiological outcome.

The implant reported is the Birmingham Hip Resurfacing which is a Cobalt-chrome with molybdenum implant unchanged since 1997. The lead author was involved in its design and as such stands to profit directly from its success. This is disclosed at the end of the paper. 5 year results have been previously published.

Patients were contacted by phone or post and asked if their implant had been revised. In addition, 88% of patients completed the OHS and 81% the UCLA activity score. 62% were assessed radiologically. Measurements included the inclination angle, loosening (radiolucency >2mm in 2 or more zones), femoral neck thinning, femoral notching.

For survival analysis, the endpoint was revision for any reason. Results are represented as a Kaplan–Meier curve with 95% confidence intervals.

Ten of 134 hips were revised giving a total cohort survivorship of 93.5% (89-97%). Aseptic survivorship was 95.5% (91.2-99%) and in men survivorship was 98% (95-100). It is reported that female sex and smaller head size were significantly associated with failure. RR per year in women 5.38X. Patient reported outcome was favourable with a modified OHS of 4.2% and UCLA activity score of 7.0. Radiological assessment showed no cases of loosening, 9 femoral neck notches and 4 patients had neck thinning.

They conclude that the Birmingham resurfacing is a durable alternative to THR, especially in younger males with high function.

Strengths

This is the first long term follow-up of a popular and potentially controversial implant. These results, and the discussion thereof within the orthopaedic community, is therefore important.

Weaknesses

Revisions are not represented transparently in the paper and many key features of the patients revised, such as age and sex, were omitted. The elevated failure rate in women (8/37 (22%)) is not mentioned in the results, but only towards the end of the discussion. It is not quoted in the abstract. No survivorship or confidence limits for women are quoted. There appears to be a higher revision risk if the underlying diagnosis was AVN (2/10 patients) but this is neither commented on nor discussed. The response rates to the OHS and UCLA score are surprisingly low when the authors claim that "contact was made with all patients [by phone +/- post] for the purposes of survival analysis and thus all revisions in this cohort are accounted for". This is also true of the disappointing radiological follow up numbers.

This cohort of patients are young fit patients with better function than most typical arthroplasty patients. They would therefore be expected to score well on OHS and UCLA activity scales. This would have been better represented as improvements in score rather than absolute values.

This is an important paper reporting the results of a popular implant and as such promotes discussion. However, the way in which the suboptimal results are represented is not transparent, and poor results, especially in women, are hidden away and not discussed to the extent required by an author who will gain financially from the implants success.

Early results for treatment of three and four part fractures of the proximal humerus using the PHILOS plate system

Moonot P, Ashwood N, Hamlet N.

J Bone Joint Surg [Br] 2007;89-B:1206-9.

Reviewer: Mr Nicholas Clement Research Fellow SE Scotland

Source: Queens Hospital Burton-on-Trent

Of note senior author fellowship trained in Berne Switzerland (AO group)

Summary: The authors present a case series of 32 patients that underwent ORIF of 3 and 4 part proximal humeral fractures with a proximal humeral plate.

Problem: Proximal humeral fractures predominantly occur in the elderly. Should surgical fixation be indicated, poor results have been reported because of poor fixation in the osteoporotic bone.

Aim: To report the outcome of this new locking plate for proximal humeral fractures.

Method: They prospectively compiled 32 patients with 3 (n=20) and 4 (n=12) part fractures during a 3 year period. The mean age was 60 years old. Operative technique is described, but interestingly the distal screws were not locked. The authors claim that this was an attempt to reduce the rigidity of the fixation and aid union. There was a standardised rehabilitation protocol. Outcome measures were Constant score, union, and complications at a mean follow up of 11 months.

Results: All but one united at an average of ten weeks. The mean Constant score was 66.5, with 84% having satisfactory or excellent results. There were 7 (21.9%) complications: 3 impingement, 2 malunions, 1 migration, and 1 patient suffered AVN.

Discussion: The authors claim the PHILOS plate gives a satisfactory outcome and allows early mobilisation. Other fixation methods are discussed and compared to the PHILOS plate. Tension band wiring, non-locking plates and Plan Tan plate have all yielded poor results for similar fractures patterns. The Polaris nail is discussed however this would not be applicable for 3 and 4 part fractures, and the relevance of this is uncertain. Two other studies have reported the outcome for the PHILOS plate:

- Bjorkenheim – 72 patients, 10% complication rate, Constant score 72
- Koukakis – 20 patients, 10% complication rate, Constant score 76

The reported complication rate is higher, double, compared to the aforementioned studies.

Strong points

- No patient lost to follow-up
- Standardised surgery and rehabilitation
- Constant score achieved with similar to that expected for normal population

Weak Points

- Inclusion criteria: who was chosen, surgeon discretion?
- Not randomised: would conservative treatment have yielded similar outcomes without the risk of surgery (as 3 and 4 part fractures managed conservatively result in a Constant score of 65 and 55 respectively [Court-Brown 2001])
- Mean age (60 years) is some ten years younger than that expected of a standard population presenting with proximal humeral fractures

Upadhyay A, Jain P, Mishra P, Maini L, Gautum VK, Dhaon BK

Delayed internal fixation of fractures of the neck of femur in young adults: a prospective, randomised study comparing closed and open reduction
J Bone Joint Surg [Br] 2004;86-B:1035-40.

Reviewer: Mr A Duckworth Research Fellow, SE Scotland

Source: From two centres in New Delhi, India: Lok Nayak Hospital and Sushrut Trauma Centre

Background to study: There are noted rates of non-union and AVN associated with displaced (Garden type-III and type-IV) fractures of the neck of femur in young adults. Controversy still exists regarding many aspects of management for these injuries including the mode of fixation, the surgical approach used and the method of reduction. At the time of study early fixation was recommended to reduce the risk of AVN. The benefits of a closed reduction were seen as less invasive, a shorter operating time and a lower risk of non-union. However, with an open a more accurate reduction may be possible with a lower risk of AVN.

Aims: There were two aims of the authors:

- To compare open and closed reduction for these injuries
- To analyse the risk factors associated with non-union and AVN

Study design: Prospective randomised trial

Inclusion criteria: Displaced femoral neck fractures; 15-50yrs of age; Operation within one week of injury; Index of Osteoporosis (Singh, Nagrath Maini) of 4-6

Exclusion criteria: Excluded osteomalacia and metabolic bone disease; Follow-up of less than two years

Number of patients: Over a 3½ yr period 102 patients with displaced NOF#s were identified. Four were lost due to inadequate follow-up. In four patients a closed reduction was not possible so they were converted to open and subsequently excluded. Two polytrauma patients were excluded. Therefore, the study compromised 92 patients, 82.6% male following predominantly high energy injuries. There were 44 in the ORIF group and 48 in the closed group.

Follow-up: Performed over a two year period. Patients were mobilised post-op using a standardised mobilisation protocol and were not allowed to FWB until clinical and radiological evidence of union.

Operative technique: Aim was to have standardised methods for closed and open management in both centres. For the closed technique the patient was placed on the fracture table and a Steinmann pin was placed in the distal femur to control reduction. For the open reduction the patient was supine and a Watson-Jones approach was used with a K-wire in the head acting as a

joystick to aid reduction. Fixation used 3 (calcar, posterior cortex, superior part of neck) cannulated cancellous screws at a 130 degree angle in a parallel and triangular configuration. Radiographs were assessed by an independent blinded observer and assessed for posterior comminution, reduction (using Garden Alignment index) and position of the screws.

Endpoints: Reduction and screw placement, Union, AVN, Infection, Guide wire breaks, DVT

Analysis Groups: Compared two groups - open with closed reduction. Stepwise logistic regression was used to determine risk factors for AVN and non-union. An improvement of 50% primary outcome was considered significant and the power was determined as 27%.

Findings: The open and closed groups were comparable in terms of patient and fracture demographics. One difference was a significant increase in the duration of surgery in the open group. The mean time to surgery in both groups was over 24hrs, with the mean time in the open group 47hrs and in the open group 52hrs. No difference in the quality of the reduction or screw placement was found. The overall non-union rate was 17.4% and the AVN rate was 16.3%. No difference was found in any endpoint between the open and closed groups. Risk factors for non-union were found to be posterior comminution, poor reduction and poor screw placement. No factors were found to significantly increase the risk of AVN. A delay of greater than 48hrs did not affect the rate of AVN or non-union.

Conclusions: The authors conclude that a delay of more than 48 hours to surgery does not influence the rate of non-union and AVN in young patients with displaced femoral neck fractures. No benefits were found to either open or closed reduction in these patients.

Study critique

Strengths

- Large prospective randomised trial
- Follow-up time was good with blinded review of main outcome measures
- Operative technique was standardised and recognised
 - The use of Steinmann pin distal femur for closed reduction is not used in all institutions
 - Some surgeons may use the Smith-Peterson approach over the Watson-Jones approach
- Strong conclusions were made and have since been backed up with meta-analysis for closed vs. open and delayed fixation
- Relevant to clinical practice

Weaknesses

- Not powered do determine early vs delayed fixation
 - Actual aim was to determine influence of open vs. closed
 - However, it would unlikely be possible to get ethical approval for a trial comparing early with delayed fixation

- Four patients were excluded, as a closed reduction was not possible. These patients could have been kept in the trial and assessed on a basis of an intention to treat
- Two different centres were used to improve numbers but a standardised assessment and management becomes more difficult to control
- The influence of closed vs. open could have been employed in the multi-variant analysis
 - The demographics of the patient population may not match some centres in the UK, where large numbers of these fractures are seen in the 40-60 age group following low-energy injuries which are associated with poor bone quality

Will study change clinical practice: Very possibly. This is a relevant study with notable findings regarding both open versus closed reduction for these injuries in young patients. The study also contradicts the belief that early reduction in these injuries is associated with an improved outcome.

Naique SB, Pearse M, Nanchahal J

Management of severe open tibial fractures: the need for combined orthopaedic and plastic surgical treatment in specialist centres

J Bone Joint Surg [Br] 2006;88-B:351-7.

Reviewer: Mr Paul J Jenkins Research Fellow SE Scotland

Background to Study: The management of severe open tibial fractures is challenging. Many are initially managed in district general hospital prior to transfer for plastic surgical treatment. The authors hypothesise that early treatment with debridement, stabilisation and plastic surgical treatment under one team, at one procedure may lead to better outcomes.

Study design: Retrospective case comparison series over 4.5 year period (minimum 8 months)

Inclusion criteria: Grade IIIb tibial fractures

Exclusion: Grade IIIa or c

Number of patients: 73 IIIb fractures in 72 patients. 26 fractures in primary group and 47 fractures in tertiary group.

Follow-up: Time range 8 months to 48 months. 71% follow-up in person, with the remainder contacted by phone.

Operative treatment: Depends on treatment group. Those admitted to unit had primary debridement and flap closure (variety of techniques). Those admitted to another unit first had their first debridement with stabilisation (temporary or definitive), followed by transfer for plastic surgery care.

Endpoints: Enneking score, flap complications, union, infection, revision of fixation

Analysis Groups: Split into those admitted directly to unit, and those who were admitted after initial treatment in another unit. Subgroup analysis depended on timing of debridement, stabilisation type and soft tissue reconstruction type.

Findings: Six flap failures. No statistical difference between groups. All the failures did however happen in the tertiary group, but this was confounded by 5 out of 6 flaps in this group created after 5 days. More patients in the tertiary group had revision of stabilisation (but this may also have been for temporary external fixation to definitive, as well as inadequate stabilisation). There was no statistical difference in time to union (29 vs. 26 weeks). There was no difference in Enneking reconstruction score.

Conclusions: The authors conclude that this provides evidence for early treatment of such fractures in a specialist unit where the debridement, stabilisation and reconstruction is undertaken under one combined team.

Study critique

Strengths:

- Access to large group of patients with complex injury
- Ability to assess patients by reconstruction time, stabilisation method and referral type

Weaknesses:

- Retrospective data
- Short follow-up for some patients
- Poorly written with loss of focus of primary research question (place of initial treatment)
- Multiple underpowered subgroup analysis
- No attempt at power calculation, even to suggest for future studies
- Failure to present data in tabular format
- Over interpretation of statistically insignificant data
- Potentially underpowered
- Conclusions relating to treatment group may in fact just reflect a problem with delay to flap coverage. Initial debridement may be appropriate followed by secondary coverage, as long as cover is provided within 5 days.

Will study change clinical practice: This paper should not be used to support a restriction on district general primary treatment

Rajasekaran S, Dheenadhayalan J, Babu JN, Sunararajan SR, Venkatramani H, Sabapathy SR

Immediate primary skin closure in type-IIIa and B open fractures: Results after a minimum of five years

J Bone Joint Surg [Br] 2009;91-B:217-24.

Reviewer: Mr Paul J Jenkins Research Fellow SE Scotland

Background to Study: The treatment of open fractures has historically been directed at reducing the risk of severe life and limb threatening infection. Advances in treatment came in the field of military surgery. The current classification and treatment is based on these historical principles and guided by the Gustillo and Anderson classification system. In general the application of this system is fraught with confusion in definitions based on several papers. Recent evidence has suggested that the current infectious organisms found in many infected open fractures have been acquired in a hospital setting rather than at time of initial injury. The authors hypothesised that certain types of open fracture may be safely closed at time of initial debridement.

Study design: Case series

Inclusion criteria: Type IIIa & b open fractures that had a low Ganga Open Fracture Score.

Exclusion: Any skin loss at time of fracture, or at debridement. Diabetics. Sewage/gross contamination

Number of patients: 738 considered with open fractures. 185 met inclusion criteria. Of this there were 79 tibial fractures. 12 patients lost to follow-up.

Operative treatment: Debridement by experienced surgeon. No explicit excision of skin if not damaged. Cefuroxime antibiotic prophylaxis. Closed with sutures without tension. Suction drain used.

Endpoints: Wound complications. Fracture healing complications

Findings: 87% Excellent wound results. 6.4% superficial infection rate. 4% delayed union. 3.5% non-union requiring reintervention.

Conclusions: In certain highly selected cases, grade IIIa and b fractures, treated by an experienced surgical team with a high throughput of cases may be successfully closed at initial debridement. The Gustillo and Anderson system is inadequate at offering direction regarding prognosis and treatment.

Study critique

Strengths:

- Well designed and executed study
- Large numbers of open fractures
- Clear inclusion and exclusion criteria
- Good follow-up
- Introduction of useful classification of open fractures based on skin, bone, musculotendinous units and comorbidity

Weaknesses:

- Not a prospective RCT, so comparison is not possible with secondary closure in their unit
- Inclusion of open fractures to bones other than tibia mask the impact of infection and non-union in this bone.
- Results are only applicable to units with great experience of open fractures. They would not be applicable to low volume surgeons, inexperienced in debridement and assessment.

Will study change clinical practice: Possibly. A surgeon faced with a grade IIIa or b wound, with minimal skin trauma, a simple fracture pattern, stable reduction and adequate debridement without skin loss, may be justified in performing a primary closure.