The Journal of Bone & Joint Surgery

Journal Club: 5 July 2012

Attendees: Mr A L Khan, Mr B Jan, Mr A James, Mr T Goff, Mr I Abdulkareem, Mr S Harrison, Mr J Tebby, Mr M Pantelli
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Theme: Dynamic Hip Screw - Failure - Lessons Learned

Presented Papers:

1. **Davis TR, Sher JL, Horsman A, Simpson M, Porter BB, Checketts RG.** Intertrochanteric femoral fractures: mechanical failure after internal fixation. *J Bone Joint Surg [Br]* 1990;72:26-31.

2. **Pervez H, Parker MJ, Vowler S.** Prediction of fixation failure after sliding hip screw fixation. *Injury* 2004;35:994-8.

3. **Hsueh KK, Fang CK, Chen CM, Su YP, Wu HF, Chiu FY**. Risk factors in cutout of sliding hip screw in intertrochanteric fractures: an evaluation of 937 patients. *Int Orthop* 2010;34:1273-6.

Foreword

The ideal lag screw placement is middle middle, however this can be technically difficult to achieve in every patient. In traditional teaching slight posterior or inferior lag screw placement may be acceptable. Therefore it is useful to know which alternative screw placements are acceptable - as reinforced by the literature.

Paper 1:

Summary

1. Purpose

Assess the causes of mechanical failure according to screw placement, for two fixation devices. And also establish if there are other contributing factors to failure.

2. Methods

Prospective comparative randomised study with patients either receiving a DHS or a Kuntscher Y-nail. Patients were followed up either to uneventful union, death, or implant failure. Age, mobility, and bone density were established pre -operatively.
Failed fixations were compared to age/sex matched controls.
Screw placement was determined on AP and Lateral radiographs, as well as adequacy of reduction, post operatively. The distance from the lag screw tip to the nearest articular surface was also measured.

3. Results

230 patients in the study (40 Men, 190 Women) average age 80.6 years. Overall rate of failure was 16.5% which was attributable to screw cut out in 76% of cases.
Implants placed centrally on both AP and lateral had the lowest rate of cut out when compared to those placed posteriorly ($p < 0.001$) which had the highest rate, followed by anterior-superior. Frequency of cut out was also related to the quality of initial reduction and also with increasing patient age. Distance of the lag screw tip to the nearest articular surface was not deemed important to failure.

4. Conclusions
The most acceptable lag screw placement is centrally on both views, followed by central on the lateral. The quality of the initial reduction will influence the surgeon's ability to achieve the former, and is therefore equally critical.

Critique

Strengths

- Prospective
- Recognised this couldn't be a direct comparative study of the implants
- Multicentre
- Reinforces that good surgical technique and attention to detail positively affect outcome.

Methodological Concerns

- Randomisation is unclear
- No power analysis - ? too few patients
- Exclusion of 2 part fractures from some of the analysis

Paper 2:

Summary
1. Purpose
Establish the reasons for cut out of lag screw from the femoral head, in comparison to a series of patients with uneventful fracture union, looking particularly at technical surgical factors.

2. Methods
Retrospective radiological comparative study of patients with lag screw cut out, against a selected group of united fractures. Assessing lag screw placement, fracture reduction, tip apex distance, and corrected tip apex distance.

3. Results
23 cases of cut out compared with 77 united fractures all treated with dynamic hip screw. Screws positioned anteriorly and/or superiorly were more likely to fail, although the difference was not statistically significant.
Uncorrected tip apex distance >24 mm, or equally a corrected tip apex distance of > 27mm was statistically more likely to result in lag screw failure. (p=0.001)
A more varus reduction position resulted in a higher failure rate.

4. Conclusions
Tip apex distance <20mm is advocated, as are obtained near anatomical fracture reduction, and ensuring lag screw position is centre/centre where possible. Combined these 3 factors are the most important predictors of a good outcome / low rate of failure.

Critique

Strengths

- Well defined outcome measures
- Rationale for statistics & thorough analysis
- Correction for magnification

Methodological Concerns

- ? Selection method of controls
- Retrospective data collection - ? inherent bias
- Single centre
- Small numbers of cases
- Operative technique / implant selection not explicit

Paper 3:

Summary

1. Purpose

Assess risk factors for lag screw cut out in treatment of intertrochanteric neck of femur fractures treated with a 135 degree DHS.

2. Methods

Patients with a unilateral non-pathological intertochanteric neck of femur fracture treated with a 135 degree DHS plate were enrolled in the study. Death, loss to follow up, or failure for reasons other than lag screw cut out were all excluded from results. Pre- and post-operative radiographs were reviewed for reduction quality, tip apex distance, and lag screw position.

3. Results

Of 937 patients, 6.8% (64 patients) had screw cut out. Average tip–apex distance in the cut out group was 35.5 mm compared with that of the united group of 22.1 mm. Lowest cut out rate was in cases where the lag screw was in the middle/middle position (3/134, 2.1%).

4. Conclusions

Tip apex distance is the most important factor, followed by screw position, followed by fracture reduction. The authors advocate a tip apex distance of <15mm as no cut outs were observed in this group.

Critique

Strengths

- Accounted for all patients
- Clear treatment protocol
- Single implant - 135 degree DHS
- Good sample size
- Clear definition of good/bad reduction

Methodological Concerns

- Are results applicable to western population?
- Retrospective data collection
- Fracture pattern not classified.

Final Thoughts:

Tip apex distance of < 15 mm
Screw position should be middle middle
Fracture reduction ultimately effects the achievable lag screw position, which in turn affects the tip apex distance.