Dynamic Hip Screw Failure: Should We Blame The Surgeon Or The Patient?

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Citation

A Bhatti, S Quraishi, S Tan, D Power. *Dynamic Hip Screw Failure: Should We Blame The Surgeon Or The Patient?*. The Internet Journal of Orthopedic Surgery. 2003 Volume 2 Number 1.

Abstract

Aims: To examine the roles of fracture stability, anatomical reduction and screw position on cut through failure of Dynamic Hip Screw (DHS) implants.

Methods: This is a retrospective study of consecutive patients treated with a DHS implant following intertrochanteric fractures of the proximal femur. Fracture stability was assessed from fracture configuration in the initial presentation films. Adequacy of reduction and screw position within the head and neck were recorded using standardized measurements on AP and lateral radiographs taken intra-operatively and post-operatively. Outcome of surgical fracture fixation was assessed at a minimum of 12 months post-operatively.

Results: 135 patients were treated during the study period but 40 had died by 12 months and radiographic records were incomplete in 8 patients.87 patients were included in the final analysis. 32 fractures were incompletely reduced. In 6 cases (6.9%) out of 32,fracture fixation was seen to have failed by way of the screw cutting out of the femoral head.Analysis of screw position in this group showed a 5.4% failure of screws placed centrally and 8.0% failure of screws placed off centre.

Conclusions: Incomplete reduction is a strong predictor of implant failure by cut out (p=0.0018).

INTRODUCTION

The Dynamic Hip Screw (DHS) is widely accepted in the treatment of intertrochanteric fractures of the proximal femur. The telescoping screw and plate allows collapse and impaction of the fracture leading to greater construct stability. The commonest mode of failure is cutting out of the screw from the femoral head[1], with a reported incidence of 2.25%[2]to 12.6%[1]. Fracture reduction and implant placement have both been shown to affect the rate of failure by cutting out. However, conflict exists in the literature as to the optimal reduction and screw placement to prevent failure.

The aim of this study was to examine the roles of fracture stability, anatomical reduction and screw position on cutting out failure of DHS implants.

PATIENTS AND METHODS

All patients admitted to our unit who had undergone DHS fixation of an intertrochanteric fracture within a specified twelve-month period were retrospectively identified. A total of 135 cases were found. At a minimum period of one year following surgery forty (29.2%) had died, these cases were deemed to have insufficient period of follow up and were excluded from our analysis. Of the remaining 95 patients a further 8 patients were excluded because of insufficient or missing radiographs. Complete information was available on 87 patients.

There were 17 men and 70 women. The average age was 71. All the fractures had been reduced closed on a traction table and DHS insertion performed via a lateral approach under fluoroscopic control. No supplementary fixation had been used

Fractures were classified according to the Evans classification as stable and unstable[3].

ASSESSMENT OF REDUCTION

Post fixation radiographs were assessed for fracture reduction. Fractures were considered to be reduced if fragments were in anatomical relationship on both anteroposterior and lateral views . For the purpose of our analysis fractures were divided into anatomically reduced and non-anatomically reduced groups.

ASSESSMENT OF SCREW PLACEMENT

The femoral head was divided into nine columns based on anteroposterior and lateral projections i.e. superior, middle and inferior zones in the anteroposterior plane and anterior, middle and posterior zones in the lateral plane. For the purpose of our analysis screws were divided into central and off centre groups.

RESULTS

In 6 cases (6.9%) fracture fixation was seen to have failed by way of the screw cutting out of the femoral head. No other modes of fixation failure were seen.

45 fractures were classified as stable and 42 as unstable. There was no difference in the number of failures between the 2 groups.

55 fractures were anatomically reduced and 32 were non-anatomically reduced. All cases of failure came from the non-anatomically reduced group (Table 1).

37 screws were centrally positioned and 50 were off centre. Figure 1 illustrates the number of screws placed in each column of the femoral head. The cases which failed are shown in brackets. The central screw positioning group had 2 failures as opposed to 4 failures in the off centre group.

No statistically significant difference was observed in failure rate between the different screw position groups.

The difference in failure rate between the anatomically reduced and non-anatomically reduced groups was highly statistically significant (Fisher's Exact Test, $p=0.0018$).

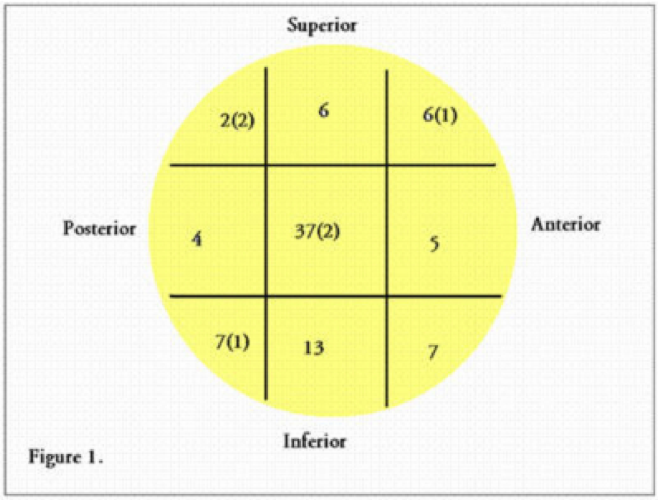
Figure 1

Table 1: Relationship between fracture reduction and screw cut out.

	Screw cut out	No screw cut out	Total
Anatomical Reduction	0	55	55
Non-anatomical reduction	6	26	32

Figure 2

Figure 1: Screw placement in different segments of the femoral head



DISCUSSION

The aim of surgical treatment for intertrochanteric fractures of the femur is to internally fix a stably reduced fracture. Kaufer described 5 variables which determine the mechanical integrity of the fracture-implant construct following fixation of these fractures[4]. Of these 5 variables 3 are directly determined by the surgeon: 1) reduction, 2) implant used and 3) implant position.

The ideal position of the implant within the femoral head has been the subject of some controversy in the literature. Several investigators have suggested a central position to be optimal [5,6]. McElvenney suggested that eccentric screw placement allowed tilting of the fracture and impeded union[5]. The posteroinferior placement is favoured by others in preventing cut out during adduction and external rotation[7,8]. Parker used objective measures of screw placement in his analysis of cut outs and concluded that screws should be placed centrally or inferiorly in the anteroposterior plane and centrally on the lateral plane[9].

Conflict also exists in the literature as to the most reliable position of fracture reduction. Evans described the varus position as enhancing fracture stability by ensuring medial bony continuity[3]. Contrary to this Parker stated that reduction in slight valgus is preferred to anatomical position and that varus must be avoided[10].

It is, of course, an over simplification to consider reduction and implant positioning as independent variables of construct stability. The initial fracture reduction achieved is directly related to the subsequent position of the screw i.e.

varus and retroverted reduction will lend themselves to superior and anterior screw placement respectively. Thomas investigated the relationship between these 2 factors. He stated that anatomical position or alignment of proximal and distal fragments in the lateral plane were necessary for good screw placement[11].

The results of this study support the premise that fracture reduction is the prime determinant of construct stability. In contrast to previous reports, this study did not demonstrate the positioning of the DHS screw within the femoral head to be a significant factor in determining failure by cut out. We acknowledge that this result is most likely due to the relatively low number of failures analysed. The association between non-anatomical reduction and failure was however highly statistically significant. It is our conclusion that achieving adequate reduction imparts inherent bony stability and allows for optimal screw placement resulting in lower implant failure rate.

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