

## Original Research Article

# To analyze and use the parameters in post-operative unstable intertrochanteric fractures treated using dynamic hip screw fixation as guidelines for re-operation

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### ABSTRACT

**Background:** The treatment of unstable intertrochanteric fractures is challenging due to the difficulty in obtaining anatomical reduction. The purpose of this study was to analyse and use the parameters (lateral femoral wall integrity and tip-apex distance) in post-operative unstable intertrochanteric fractures treated using dynamic hip screw (DHS) fixation as guidelines for re-operation.

**Methods:** This was a prospective study and included 40 patients with unstable intertrochanteric fractures treated using DHS fixation from December 2014 to September 2016. The AO/OTA classification was used to classify each of the patients and their lateral femoral wall integrity and tip-apex distance was assessed in the post-operative radiographs.

**Results:** In this study, 3 patients out of 40 (7.5%) had screw pull out within 5 months of surgery. 2 pull outs occurred when the screw was in the antero-superior zone and 1 when it was in the centre to centre zone. Thus, the rate of screw pull out was higher in the antero-superior zone. The 3 patients with screw pull out had a mean tip-apex distance (TAD) of 36.01 mm as compared to 32.96 mm of those who did not have screw pull out. We further found that pre-operatively 6 patients out of 40 (15%) had lost lateral femoral wall integrity whereas post-operatively 26 patients out of 40 (65%) had lost it. In summary, there is a 5 times higher risk of losing lateral femoral wall integrity if DHS is the implant of choice.

**Conclusions:** On conclusion, unacceptable TAD limit with loss of lateral femoral wall integrity was found to be a definite indicator of DHS implant pull out. And also found that by using the DHS as an implant of choice, there is a 5 times higher risk of losing lateral femoral wall integrity intra-operatively and that its use for the treatment of unstable intertrochanteric fractures must be guarded.

**Keywords:** Unstable intertrochanteric fractures, Dynamic hip screw, Tip apex distance, Lateral femoral wall integrity

### INTRODUCTION

Intertrochanteric fractures are defined as 'fractures involving upper end of femur through and in between both trochanters with or without extension into upper femoral shaft'. 45% of all hip fractures are intertrochanteric fractures and 35-40% of these fractures are

unstable three or four part fractures and associated with high rates of morbidity and mortality.<sup>1,2</sup>

Due to difficulty in obtaining anatomical reduction, management of unstable intertrochanteric fractures is challenging.<sup>3,4</sup> Common complications seen in patients treated with dynamic hip screw (DHS) are excessive

sliding (leading to shortening), varus displacement, nail pull out, screw cut out and/or screw breakage.<sup>5,6</sup>

The purpose of this study was to analyse and use the parameters in postoperative unstable intertrochanteric fractures using DHS fixation as guidelines for re-operation.

**METHODS**

This prospective study was conducted at Sri Ramachandra University from December 2014 to September 2016. The inclusion criteria included patients with unstable intertrochanteric fractures treated using DHS fixation and the exclusion criteria were patients with stable intertrochanteric fractures and unstable intertrochanteric fractures treated with other modalities.

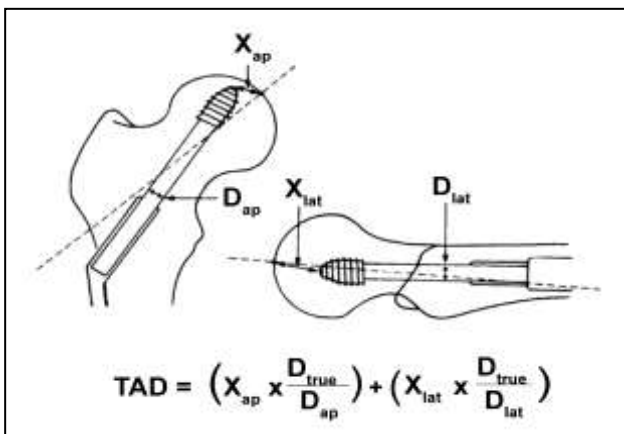
A group of 40 patients were involved in the study, out of which 29 (72.5%) are male and 11 (27.5%) are female. In our study, the injury was caused by trivial fall in 21 patients (52.5%) and by road traffic accidents in 19 patients (47.5%). The mean age was 65.37 years with the limits being 46-84 years.

According to the AO/OTA classification, the following fracture patterns involved in the study was given in Table 1.

**Table 1: Fracture patterns.**

S. No.	Type of fracture	No. of cases
1.	A2.1	22 (55%)
2.	A2.2	12 (30%)
3.	A2.3	2 (5%)
4.	A3.1	3 (7.5%)
5.	A3.2	1 (2.5%)

The tip apex distance (TAD) was measured using the following method in the post-operative AP and lateral radiographs.



**Figure 1: Calculating tip apex distance.**

**RESULTS**

In our study, the tip apex distance of different limits was presented in Table 2. The mean tip apex distance was 32.96 mm. Table 3 describes the frequently placed positions of the screws. Sliding hip screws were mostly placed in the centre to centre (60%) and least frequently in the antero-superior (5%).

**Table 2: Tip apex distance.**

S.No.	Tip apex distance	No. Of Cases
1.	Good limit (<25 mm)	10 (25%)
2.	Acceptable limit (26-30 mm)	10 (25%)
3.	Poor limit (31-35 mm)	15 (37.5%)
4.	Unacceptable limit (>35 mm)	5 (12.5%)

**Table 3: Position of the head screw.**

S.No.	Screw position	No. Of Cases
1.	Centre to centre	24 (60%)
2.	Postero-superior	9 (22.5%)
3.	Postero-inferior	5 (12.5%)
4.	Antero-superior	2 (5%)



**Figure 2: Case presentation a) Preoperative X-ray b) Immediate postoperative X-ray c) Screw pull out in 3 months.**

**DISCUSSION**

In this study, the AO/OTA classification was used to classify a group of 40 patients as in other studies and noticed that 22 fractures were of type A2.1, 12 patients were of type A2.2 and 2 patients were type A2.3, 3 patients were of type A3.1 and 1 was of type A3.2.<sup>7</sup>

In the present study, 36 patients out of 40 (90%) had sustained type A2.1, A2.2 and A2.3 fractures. 2 out of 2 (100%) of type A2.3 as compared to 8 out of 12 (66.6%)

of type A2.1 who had an intra-op fracture of the lateral femoral wall.

We found that while using DHS as the implant of choice, there was a 5 times higher risk of losing lateral femoral wall integrity which was noticed in other studies as well, as 6 patients (15%) lost it pre-operatively and 26 patients (65%) had lost it post-operatively.<sup>8</sup>

In our study, the mean TAD was 32.96 mm for all 40 patients with a 7.5% pull out rate whereas it was 29.50 mm with an 8.5% pull out rate in other studies, which occurred within 5 months of surgery.<sup>9</sup>

In this study, screws were most frequently placed in the centre to centre (60%) and least frequently in the antero-superior (5%). The highest pull out occurred in the antero-superior (2 out of 3) zone which was comparable to other studies.<sup>10</sup>

The rate of pull out was higher in the antero-superior (100%) zone than in the centre to centre (4.1%). However, placement of screws in any of the other zones (35%) had no predictive significance with respect to pull out. 1 patient of type 31, A2.1 and TAD of 30.4 mm with the lag screw in centre to centre had screw pull out as lateral femoral wall integrity was lost post-operatively.

## CONCLUSION

In this study, unacceptable TAD with loss of lateral femoral wall integrity was found to be a definite indicator of DHS implant failure. TAD was alone not a reliable indicator for screw pull out. It was observed that there was a 5 times higher risk of losing lateral femoral wall integrity when DHS was used as the implant of choice. It was advisable to avoid DHS fixation in AO/OTA Type 31 A2.2 and A2.3 intertrochanteric fractures as incidence of intra-operative loss of lateral femoral wall integrity was statistically significant. We finally recommend that if the lateral femoral wall integrity/Greater trochanter is lost/fractured, use of dynamic hip screw must be guarded.

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