

# Can an Inferior Calcar Stabilising Antirotation Screw Improve Stability in Unstable A2 Inter Trochanteric Fractures when Fixed with a Dynamic Hip Screw?

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## ABSTRACT

**Objective:** To determine the effect of a calcar stabilising anti rotation screw on reducing the complication rate in intertrochanteric hip fractures.

**Study Design:** An observational study.

**Place and Duration of study:** Hinchinbrooke Hospital, Northwest Anglia Foundation Trust, Huntingdon, UK, from July 2019 to December 2020.

**Methodology:** All A2 Intertrochanteric fractures according to the AO31 classification fixed with dynamic hip screw (DHS) were included. Exclusion criteria were A1 and A3 fractures, pathological, and per-prosthetic fractures. Fifty-four patients were divided into two groups. Group one (21) patients were managed with a DHS and a calcar stabilising screw. Group two (33) were managed with a dynamic hip screw (DHS) only. Both groups had a 12 months follow-up. Study variables were age, gender, ASA and preoperative mobility status, and tip-apex distance; while outcome measures were mechanical failures including cut-out needing revisions and medialisation associated with pain.

**Results:** No patients in the group one suffered mechanical failure compared to 27% in group two.

**Conclusion:** A calcar stabilising screw reduces the failure rate of A2 unstable intertrochanteric fractures when used in conjunction with the DHS.

**Key Words:** Intertrochanteric fractures, Hip fracture, A2 unstable fracture, Dynamic hip screw, Calcar stabilising screw, Mechanical failure.

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## INTRODUCTION

Fractures of the neck of femur are common injuries affecting a population often frail with multiple comorbidities.<sup>1,2</sup> Achieving optimal reduction and stable fixation can facilitate early mobilisation and avoid difficult revision procedures.<sup>3</sup> NICE recommends using the A31 AO classification to plan management. The DHS is recommended for the A1 and A2 types while the intramedullary fixation for A3 fractures.<sup>1</sup> Although intramedullary devices are gaining popularity in A2 fractures with no supporting evidence.<sup>4</sup> They are associated with a higher complication rate.<sup>5</sup>

Factors like adequate reduction, tip to apex distance, bone quality, the degree of comminution and the fracture pattern all play a role in predicting outcome.<sup>3</sup> Screw migration leading to lag screw cut-out remains the most common reason for the failure of the DHS implant. Using an antirotation screw was found to be effective in reducing the complication rate in these unstable fractures.<sup>6</sup>

The aim of this study was to determine the effect of a calcar stabilising antirotation screw on reducing the complication rate in intertrochanteric hip fractures.

## METHODOLOGY

A retrospective study was conducted at Hinchinbrooke Hospital, Northwest Anglia Foundation Trust, UK, between July 2019 and December 2020, on all 54 patients with A2 type of inter-trochanteric fractures.

Inclusion criteria were all A2 intertrochanteric fractures treated with a DHS. Exclusion criteria were A1 and A3 fractures, pathological fractures, and per prosthetic fractures.

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This cohort was divided into two groups. Group one, (21 patients) had an additional 4.5 mm antirotation screw introduced through the first hole in the plate to run inferior and parallel to the sliding screw to capture the calcar providing rotational stability (Figure 1). This was done after the dynamisation of the DHS fixation by releasing the traction to promote bone contact.



**Figure 1: Postoperative X-ray for left A2 fracture fixed with DHS and calcar screw.**

Group 2 (33 patients) had DHS fixation without antirotation screw fixation, both had 6-hole 135-angled DHS fixation by Zimmer.

The decision to use a calcar screw was based on intraoperative findings by the operating surgeon to stabilise A2 fractures when deemed rotationally unstable.

The classification of the fracture and patient allocation in the two study groups was made by blinded independent senior consultant orthopedic surgeons. All surgical procedures were performed by senior surgeons experienced in hip fracture fixation, with the aid of an image intensifier, and followed up for 12 months.

Patients in both groups were assessed by their age, gender, ASA, and preoperative mobility status. Tip-apex distance was also among the parameters measured to ensure that both groups were comparable with regard to the adequacy of fixation. Three independent consultants assessed the intra- and the postoperative X-ray findings.

Statistical conclusion was based on the range with mean alongside t-test for measurable variables and counts with percentage as well as Chi-square for categorical variables. The level of significance used was  $p < 0.05$ . using SPSS software.

## RESULTS

It was an elderly population with more ladies in each group. No significant differences between the two groups in the cofounders including age, gender, tip-to-apex distance ASA grade, and preoperative mobility.

There was a significant difference in complication rate in favour of group one with 9/33 (27%) patients of the DHS-only group developing complications, and the other group having only one patient (4.7%) suffering from a general post-surgical complications (Table I).

**Table I: Group comparison.**

Total n = 54	DHS only n = 33	DHS with anti-rotation screw n = 21
Age in years (Mean and Range)	83 (49-97)	83 (63-98)
Gender M: F	12 (36.4%): 21 (63.6%)	5 (23.8%): 16 (76.2%)
Side L: R	17 (51.5%): 16 (48.5)	17 (81%): 4 (19%)
Complications	9 (27%)	1 (4.7%)
Lag screw cut-out + pain	3 (9%)	0
Migration of lag screw / collapse + pain	6 (18%)	0
Pulmonary embolism	0	1 (4.7%)

Overall complication rate significant difference: Chi-square = 4.309, p-value = 0.03 significant  $p < 0.05$ . Cut-out complication rate: insignificant Chi-square 0.3 p-value 0.9. DF=2. Significant difference in the side treated left hips found more in group 1. p-value 0.02

## DISCUSSION

Hip fractures are the most common cause of orthopedic admissions in the UK. Inter trochanteric fractures are the most common type. The DHS is considered the gold standard operative method. Nonetheless higher failure rates are still reported in the unstable types. The calcar femorale is the weight-bearing bone of the femoral neck. This cancellous spiral structure transmits stresses to the femoral shaft.<sup>7,8</sup> The description of the relation between the calcar femorale and the shaft has changed from curved to angular.<sup>9</sup> This means; the intertrochanteric region has to resist important shearing and rotational forces arising in the hip joint.<sup>9</sup> The compression provided by the DHS while fixing these fractures is not sufficient to resist this significant rotational force in A2 fractures. This caused a higher failure rate of 3-26%.<sup>10-12</sup>

The posteromedial fragment does play a pivotal role in hip stability, this explains the high failure rate in A2 fractures.<sup>13</sup> Using a nail will not provide enough rotational stability to this fragment.<sup>14</sup> Meanwhile, achieving the necessary alignment of the calcar and securing the rotational stability using a calcar screw delivers the required controlled compression. This prevents excessive collapse of the sliding screw in A2 fractures.

This method aims to restore the calcar; provide a better torque effect as a result of the increased distance between the two-point fixation and avoids the chances of cut-out or impingement of the superior antirotation screw. The down-

side of this technique is a slight increase in operative time which may lead to increased blood loss, although the majority of blood loss in these unstable fractures is preoperative.<sup>15</sup> No metal work failure or medial migration of the antirotation screw was encountered in the group. With an additional antirotation screw, there was only one case where a general postoperative complication of pulmonary embolism occurred. On the other hand, nine out of 33 patients in the DHS only group had complications like lag screw cut-out, migration, and pain. So, can be summarised that the elderly population with an average age of 83 years fared better when an additional Stabilising screw placed for the management of the stable fracture, supporting the weight-bearing portion of the bone.

Many factors were analysed to ensure the two groups were comparable in order to limit the influence of the confounders. However, the limitation of this study remains the small sample size but the implications are so profound that it deserves a larger study. There was no conflict of interest while conducting this research. Retrospective data collection was also a major study limitation.

## CONCLUSION

Inferior antirotation screws in unstable Intertrochanteric fractures provide better stability to the Dynamic hip screw fixation and reduces the complication rate in these fractures.

### ETHICAL APPROVAL:

Both the research and development Department (409), Peterborough City Hospital. As well as the quality governance and compliance department at North West Anglia Foundation trust where this research was conducted have granted Ethical Approval before starting this study.

### PATIENTS' CONSENT:

Formal Consent was obtained regarding the procedure performed in this research. No identifiable data was published therefore no breach of confidentiality was encountered.

### COMPETING INTEREST:

The authors declared no competing interest.

### AUTHORS' CONTRIBUTION:

ZAA: Designed and wrote the article.

SBD: Collected and analysed the data.

KS: Wrote and supervised the project.

VK: Analysed the data and supervised the project.

All the authors have approved the final version of the manuscript to be published.

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