



TIP APEX DISTANCE AS A PREDICTOR OF FAILURE IN PERI-TROCHANTERIC FRACTURES TREATED WITH PFN-A.

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ABSTRACT Intertrochanteric fractures constitute around 50% of the hip fractures and half of which are unstable. In this study, we aim to determine the tip apex distance as a predictor of failure in patients with peri-trochanteric fractures treated with PFN-A. A total of 50 patients with peri-trochanteric fractures were enrolled in the study, who underwent surgical fixation with PFNA and were followed up at 6 weeks, 3 months and 6 months. Position of helical blade and TAD were calculated on the post operative radiographs. The mean TAD in our study was 22.5 ± 6.7 mm, with 66% patients having a TAD < 25 mm. The most common placement of the helical blade in the femoral head was in Centre-Centre position observed in 22 patients (44%) of the study population with 5 cases of cut-out failure observed in the study. The relationship between TAD and cut-out failure in PFNA was found to be statistically insignificant ($p = 0.09$).

KEYWORDS : Inter-trochanteric Fractures, PFNA, TAD, Cleveland index.

INTRODUCTION:

Proximal femoral fractures are a big challenge in traumatology both for orthopaedic surgeons and anaesthetists. Around 50% of the hip fractures in the elderly are intertrochanteric fractures. With increasing age and low bone mineral density unstable fractures are common. In earlier times conservative treatment was given for these fractures which resulted in malunion and various morbidities like bed sores, deep vein thrombosis etc because of recumbency. The primary goal of treatment is to return the patient to his or her level of function before the fracture which could be best accomplished with surgery followed by early mobilization.

Discussion about the ideal implant for the treatment of trochanteric fractures continues, mainly due to the fact that there is insufficient knowledge on the biological and biomechanical factors that lead to the uneventful healing of this type of fracture mostly in elderly patients. Currently available devices all have their own specific problems. However, in the recent times it has been widely seen that Proximal Femoral Nail Antirotation (PFNA) as implant of choice in the treatment of trochanteric fractures, mostly due to its intra-medullary design with a sliding helical shaped column-blade permitting controlled impaction which allows early postoperative weight bearing, with reduced operative time, reduced iatrogenic tissue trauma and reduced blood loss.

MATERIALS AND METHODS:

A total of 50 patients with inter-trochanteric fractures presenting to Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana-Ambala from March 2020 were enrolled in the study. All patients were subjected to relevant investigations after which were taken up for surgical fixation of the fracture with PFNA. Patients were followed up at 6 weeks, 3 months, and 6 months and post operative radiographs were obtained. Position of helical blade and TAD were calculated on the post operative radiograph. Clinical outcomes were measured with the Oxford hip score.

RESULTS:

The study population had a total of 50 patients and constituted of 28 females and 22 males indicating a female preponderance. The mean age of the study population was 60.28 ± 11.11 years with majority of the patients in the 61-70 years age group. While majority of female patients were in the 60-70 years of age group.

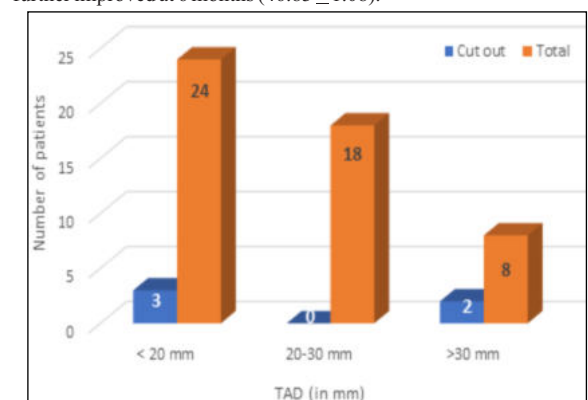
Trivial fall was observed to be the most common mode of injury contributing to 82% of the total cases. While trivial fall was the most

common mode of injury amongst females, motor vehicle accidents was the most common mode of injury amongst males. Right sided fracture injuries were observed in 62% of the study population and left side fracture injuries were observed in 38% of the study population.

Table/ Figure 1: Demographics

	Value
Age (years)	
Mean	60.28
Range	22 to 70
Gender (n (%))	
Female	28 (56%)
Male	22 (44%)
Side (n (%))	
Right	31 (62%)
Left	19 (38%)
AO Type	31A2(70%)

The most common fracture pattern involved was AO Type 31A2 seen in 70 % of the cases. The mean TAD was 22.5 ± 6.7 mm, with 66% patients having a TAD < 25 mm. The most common placement of the helical blade in the femoral head was in Centre-Centre position (Cleveland zone 5) observed in 22 patients (44%) of the study population. The functional assessment of the patients by oxford hip score significantly improved in 3 months follow up (44.90 ± 2.87) and further improved at 6 months (46.83 ± 1.08).



Table/Figure 2: Cut Out Failures Among Different TAD Groups.

There were 5 cases of cut-out failure observed in the study population of which 3 cases were medial cut out and 2 cases were cephalad cut-out. The relationship between TAD and cut-out failure in PFNA was found to be statistically insignificant ($p = 0.09$). There were 5 cases of non-union observed in the study group, out of which 2 cases were lost to follow up following complications. 2 cases of post operative superficial infection were reported which were treated with regular dressing and antibiotic coverage and resolved uneventfully.

DISCUSSION:

The trochanter area, which consists of greater trochanter and lesser trochanter representing the transitional zone between femur neck and shaft. The intertrochanteric region has abundant blood supply and osteogenic properties hence fracture union occurs more often than not. In the recent times it has been widely seen that PFNA as implant of choice in the treatment of trochanteric fractures, mostly due to its intramedullary design with a sliding helically shaped column-blade permitting controlled impaction which allows early postoperative weight bearing, with reduced operative time and reduced iatrogenic tissue trauma.



Table/Figure 3: Pre-operative, Immediate Post-op, And 3 Months Post Operative X-rays Showing Medial Perforation.

These fractures commonly occur in the elderly age groups and osteoporotic bones. In this study the mean age of study population was 60.28 ± 11.11 years. In the present study, 56% of the study population were females, which is comparable to the existing literature, owing to early osteoporosis in the female population following an history of trivial fall as the most common mode of injury. In the present study also, in 82% (41 patients) of the patients the most common mode of injury was found to be trivial fall, followed by motor vehicle accident (9 patients). The most common fracture injury sustained by patients was classified into AO Type 31A2 which was observed in 70% of the patients. This compares favourably with other similar studies conducted previously. In the present study, the mean TAD was observed to be 22.56 ± 6.7 mm and a TAD of <20 mm was observed in 58% patients, which was in accordance to the available literature and guidelines. In the present study the position of the helical blade in the femoral head was measured by Cleveland method on lateral radiographs. The Cleveland zone 5 (centre - centre) was the most common placement of the helical blade on postoperative radiographs which was observed in 22 patients in the study population (44% patients). In our current study, 5 cases of cut-outs were observed amongst the overall study population of 50 patients resulting in a 10% cut out rate. In our study, out of these 5 cases of cut-out, 3 cases had medial cut-out and 2 cases had cephalad cut-out. Of these 2 cases under went Hemi arthroplasty and 1 case underwent total hip arthroplasty, and 2 were lost to follow up. Our study is one of the several recent studies that show that cut-out still occurs, despite a tip apex distance that would be ideal for sliding hip screw. In our series, three cut-outs (3 medial perforation) occurred in cases where the TAD was less than 20 mm and center-center positioning of the tip of the blade. One hypothesis is that due to the different geometry of the blade compared to a threaded hip screw, the blade 'behaves' differently under load; this potentially results in medial perforation or axial cut-out when inserted too close to sub-chondral bone. There were no cut-outs in the range of 20-30 mm, and this would be considered 'too far' from apex when using a sliding hip screw such as DHS. The other two cut-outs were seen in cases where the TAD was more than 30mm. The failures in these cases were cephalad cut-out. The failure in the group of > 30 mm could be attributed to less purchase of helical blade in the head and varus collapse.

CONCLUSION:

The PFNA is a suitable fixation device for the treatment of unstable proximal femoral fractures. There were still a relatively large number

of cut-outs, and the tip-apex distance in the failures showed a bimodal distribution, not like previously demonstrated with dynamic hip screw. We propose that the helical blade behaves differently to a screw, and placement too close to the subchondral bone may lead to penetration through the head.

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