



**PROXIMAL FEMORAL NAILING VS. DYNAMIC HIP SCREW IN UNSTABLE
INTERTROCHANTERIC FRACTURE OF FEMUR – A COMPARATIVE ANALYSIS**

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ABSTRACT

Intertrochanteric (IT) fractures occurs approximately half of the hip fractures in elderly; among this, more than 50% fractures are unstable. The Dynamic Hip Screw (DHS) had gained widespread acceptance in previous decades. Dynamic Hip Screw has produce good results but complications are frequent and most commonly in unstable intertrochanteric fracture. The Proximal Femur Nailing (PFN) fixation provides a more biomechanically stable construct by reducing the distance between hip joint and implant. The goal of this study is to compare the clinical and radiological outcomes of DHS and PFN for the treatment of unstable Intertrochanteric hip fractures. In our study we included 20 unstable intertrochanteric fractures, in that 10 were treated with Proximal Femur Nailing and 10 were treated with Dynamic Hip Screw. All surgeries were done on traction table and were followed up at regular intervals at 6 weeks, 8 weeks, 12 weeks, 6 months and annually thereafter. The functional results assessed with Harris Hip S core. At latest follow up, Patients with excellent results were 6 (66%) in group A and 3(36%) in group B while patients with good results were 3(28%) in group A and 3(54%) in group B. We statistically observed significant difference between two groups in view of early and late complications and time to union. We obrseved significantly better outcomes in Proximal Femur Nailing group for unstable intertrochanteric fractures and reduction loss is significantly lower. We concluded that Proximal Femur Nailing device may be the better fixation for most unstable intertrochanteric fractures.

KEYWORDS: Intertrochanteric fractures, proximal femoral nail and dynamic hip screw.

INTRODUCTION

Intertrochanteric (IT) fractures occurs approximately half of the hip fractures in elderly; among this more than 50% fractures are unstable.^[1,2] These fractures primarily involved in cortical and compact cancellous trochanteric bone. Due to complex stress configuration and its non-homogeneous osseous structure and also geometry, fractures occur along the path of less resistance. It is predicted that the yearly total number of hip fractures will reach upto 2.6 million by 2025 and 4.5 million by 2050.^[2] In 1990 26% of all hip fractures occurred in Asia alone whereas this figure could rise to 37% in 2025 and 45% in 2050.^[3]

The goal of treatment for any Intertrochanteric fracture is to restore mobility and efficiently. While minimizing the risk of complications and restoring the patient to pre-operative status. Intertrochanteric fractures are mostly treated with operative method.

Non-operative methods can be used in early 19th century when the operative techniques were not evolved enough

for a stable fixation. Non-operative treatment considered in non-ambulatory, terminal diseases with less than 6 weeks of life expectancy, chronic dementia patients, unresolved medical comorbidities, active infectious disease etc. Unstable intertrochanteric fractures can be treated by either Dynamic Hip Screw or Proximal Femoral Nailing. Dynamic Hip Screw was gained widespread acceptance and it produced good results but complications are frequent, particularly in unstable intertrochanteric fracture. The advantage of Proximal Femoral Nailing is that it provides a more biomechanically stable construct by reducing the distance between hip joint and implant.^[4,5] While Dynamic hip screw is a load bearing device, Proximal Femoral Nailing is a load sharing device. Each device offers certain advantages over the other.

Hence we conducted a study in our tertiary care centre to compare the clinical and radiological outcomes of treatment of unstable Intertrochanteric fractures by either of these two methods, i.e. proximal femoral nailing and dynamic hip screw. The objectives of this study were.

- 1) To compare Dynamic hip screw and Proximal Femoral Nailing methods of fixation of unstable Intertrochanteric fracture of femur in adults with respect to intra operative parameters.
- 2) To compare the functional outcome with respect functional return, fracture union and complications in the two groups.
- 3) To decide which implant would be ideal for this fracture type to provide the best results with the less complications.
- 4) To study long-term follow up of two groups with respect to any residual impairment of function and overall tolerability of implant.

MATERIALS AND METHODS

A double blind randomized control study was conducted on the patients with unstable Intertrochanteric fractures were admitted in the orthopedics department. Ethical clearance was obtained from the institutional ethics committee. The study period was 2 years from April 2015 to April 2017. The study was conducted among the study population after obtaining informed and written consent. Our study population consisted of 100 patients (50 in each group). Out of 100 cases, 50 were treated by proximal femoral nailing (group A-PFN) and 50 were treated by dynamic hip screw (group B-DHS). The allocation of patients in each group was done randomly. AO/OTA classification for per trochanteric fractures was used.

According to AO/OTA classification

31A1 - fractures are simple, two-part fractures.

31A2 - fractures have multiple fragments.

31A3 - fractures includes reverse oblique and transverse fracture patterns.



Figure 1: Pre-op - unstable IT fracture (a)

For Dynamic hip screw, the length of compression screw was measured from tip of head to base of greater trochanter on AP view X-ray. Neck shaft angle is determine by using goniometer on X-ray AP view on

Inclusion criteria

- 1) Patients who were in the age group of more than 55 years of either sex
- 2) Unstable Intertrochanteric fracture type 31-A 1/2/3 (OTA classification)

Exclusion criteria

- 1) Patients unfit for the surgery
- 2) Open/ pathological/ bilateral fractures
- 3) Polytrauma patients
- 4) Pre-existing hip/femoral deformity
- 5) Sub-trochanteric fractures

The relevant information are collected from all included patients like history, general, systemic and local examination findings. Initial radiograph of the hip joint was conducted besides routine pre anesthetic evaluations. The 100 patients were divided in to two groups, 50 in each. The division of the patients in these groups was random. The patients under group A were treated by Proximal Femoral Nailing and patients under group B were treated by Dynamic hip screw. All cases were included in our study were operated after stabilization of general status as soon as possible. The average delay of surgery in our study was 4days (mean \pm 10days).

All surgeries were done on the traction table following closed reduction, confirmed with fluoroscopy on two different views. For Proximal Femoral Nailing, the nail diameter was obtained by measuring diameter of the femur at the level of isthmus on an AP X-ray and standard length Proximal Femoral Nailing was used in all our cases. Neck shaft angle was measured in unaffected side in AP X-ray by using goniometer.



Figure 2: Post-op - Proximal femoral nailing (b)

unaffected side and length of side plate was determined to allow purchase of at least 8 cortices on the shaft, distal to the fracture.



Figure 3: pre – op unstable intertrochantric fracture.



Figure 4: Post-op – Dynamic hip screw.

Post-operatively, all patients were subjected to physical methods such as early mobilization. Patients were encouraged for ankle and calf exercises from day one and mobilized non-weight bearing from the second post-operative day depending upon pain tolerance of the patient. Surgical site suction drain was removed after 24 hr. The wound was inspected on the 3rd and 6th post-operative day. Sutures were removed on the 11th-13th day. Patients followed up at 4 weeks, 8 week, 12 weeks, 6 months and annually thereafter.

Various parameters assessed on each follow up visit were

Clinical

1. Wound condition
2. Functionality
3. Harris hip score

Radiological

1. Union
2. Amount of collapse
3. Complication

Functional outcome was assessed with Harris Hip Scores on following parameters.

- Pain
- Limp

- Support Sitting
- Distance walked
- Stairs
- Enter public transportation
- Put on socks and shoes
- Absence of deformity
- Range of motion

Grading of Harris Hip Score

<70 Points - Poor

70-79 Points – Fair

80-89 Points - Good

90-100 Points - Excellent

OBSERVATIONS AND RESULTS

The study involved 100 cases of unstable intertrochanteric femur fracture of either sex followed up from April 2015 to April 2017. Out of 100 cases, 50 were treated by proximal femoral nailing (group A) and 50 were treated by dynamic hip screw (group B). The results were statistically analyzed using students-t test and the two tailed p values were evaluated.

In our study maximum age was 78 years and minimum was 51 years. The average age was 66.8 years. In either group, 26 were OTA 31-A2 and 24 were 31- A3 type fractures. The Singh's index for osteoporosis showed that, both groups inclusive, there were 46 patients with grade 4 and above. In this study, Harris hip score at latest follow up was excellent in 33 patients (66%) in group A and 18 (36%) in group B, patients with good results were 14 (28%) in group A and 27 (54%) in group B, patients with fair results were 3(6%) in group A and 4 (8%) in group B and patients poor results were 1(2%) in group B and no patient with poor results in group A.(Table-1)

Table 1: Harris hip scores at latest follow up.

Harris Hip score	PFN group	DHS group
Excellent	66%	36%
Good	28%	54%
Fair	6%	8%
Poor	Nil	2%

In the DHS group, 1 month Harris hip score(mean = 24.5) was less than that of the PFN group (mean=35.23) i.e. $p < 0.0001$. In 6 month, hip score in DHS (mean = 78.8) was also less than that of PFN (mean = 82.8) i.e. p value =0.021. (Table 2).

Table 2: Comparative hip scores at serial follow up.

Harris hip score	PFN group	DHS group
One month follow up	35.23	24.5
Six months follow up	82.8	78.8

A comparison of time to union demonstrated no statistically significant differences between study groups ($P= 0.542$). Out of 22 A3 fractures, in group B reduction loss occurred in 6 hips and in group A it was seen in 2 cases. Thus in unstable IT fractures reduction loss is

significantly lower in group A than group B ($p < 0.005$).

Comparative analysis

• Duration of Surgery

Duration of surgery was more for DHS compared to PFN. The duration of surgery as calculated from the time of incision to skin closure was counted in each case. The average duration of surgery for the proximal femoral nailing (Avg. time 58.73 min) was significantly shorter than dynamic hip screw (Avg. time 89.03 min), p value < 0.0001 .

• Intra operative blood Loss

Blood loss was measured by mop count and collection in suction drain. The average blood loss in the PFN group was 116 ml and in the dynamic hip screw group was 253 ml. Blood loss was less in PFN which is statistically significant, p value < 0.0005 .

• Intra operative complications in proximal femoral nailing

There was failure to achieve close reduction in 3 patients where open reduction was performed. There was no iatrogenic fracture, difficulties in distal locking or any other intra-operative complication.

• Intraoperative complications in dynamic hip screw

In 4 of the 50 cases there was improper placement of Richard's screw. Difficulties were encountered in reverse oblique fractures as the fracture site extended to entry point. There was varus angulation in 5 of 50 patients. On table surgeon had to switch to proximal femoral nailing in 2 cases in reverse oblique fracture. These cases were considered with proximal femoral nailing group for further follow up.

• Infection

There were 3 cases of superficial infection seen in the dynamic hip screw group. They were seen within 10 days of surgery and were treated by local debridement and antibiotics and did not require implant removal. No case of infection was seen in proximal femoral nailing group.

• Sliding

The sliding in both groups was compared at the end of 1 year on the X-rays as described by Hardy *et al*^[3], there was an average of 5.50 mm of sliding in the proximal femoral nailing group as compared to 8.10 mm in the dynamic hip screw group ($p < 0.0005$).

• Shortening

The average shortening in the proximal femoral nailing group was 5.35 mm as compared to 9.62 mm in the dynamic hip screw group. So shortening is less in proximal femoral nailing group which is statistically significant. (p value < 0.0005)

• Implant Failure

There was 4 of 50 case of implant failure in proximal femoral nailing group and revision surgery was required for two of those. The 'Z' pattern of implant failure was seen in both. In the dynamic hip screw group there were 2 of 50 cases of implant failure, of which one was due to screw cut out and other was due to plate breakage. In both the cases revision surgery was required.

DISCUSSION

The development of the dynamic hip screw in the 1960s saw a revolution in the management of intertrochanteric fractures. The device allowed compression of the fracture site without complications of screw cut-out and implant breakage associated with a nail plate. However, the extensive surgical dissection, blood loss and surgical time required for this procedure often made it a contraindication in the elderly with co-morbidities. The implant also failed to give good results in unstable and the reverse oblique fractures.

In the early 90s intramedullary devices were developed for fixation of Intertrochanteric fractures. These devices had numerous biomechanical and biological advantages over the conventional dynamic hip screw.^[4-6] Long term studies, however, revealed that the use of these devices was associated with higher intra operative and late complication often requiring revision surgery. This has led to modifications in the device and technique of the intramedullary devices.

In our study we found

- Less operative time in proximal femoral nailing group.
- Less operative blood loss in proximal femoral nailing group.
- Early return to daily activities in proximal femoral nailing group.
- Less complication in proximal femoral nailing group as compared to DHS group..

In contrast, the plate and screw device will weaken the bone mechanically. The common causes of fixation failure are instability of the fractures, osteoporosis, and the lack of anatomical reduction, failure of fixation device and in-correct placement of screws.

CONCLUSION

Though proximal femoral nailing and dynamic hip screw have similar outcomes in stable fractures,³ Proximal femoral nailing has better functional outcome with unstable fractures. Proximal femoral nailing requires shorter operation time and lesser soft tissue dissection; it has distinct advantages over dynamic hip screw even in stable inter-trochanteric fractures. Hence from our study it may be concluded that, is proximal femoral nailing better fixation device for most unstable intertrochanteric fractures.

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