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### A comparative study of proximal femoral nailing versus dynamic hip screw device in the surgical management of intertrochanteric fractures

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#### Abstract;

**Introduction:** Trochanteric fractures are one of the most common injuries sustained predominantly in patients over sixty years of age. Studies have shown that when compared to the dynamic hip screw, proximal femoral nailing had certain advantages over the former.

**Aim:** To compare the surgical treatment of intertrochanteric fractures of the femur with the proximal femoral nail and dynamic hip screw device, with respect to fluoroscopic time, duration of surgery, post-operative shortening and functional outcome.

**Materials and Methods:** The study was conducted in Father Muller Hospital, Mangalore from July 2015 to July 2016 where 60 patients with 60 intertrochanteric fractures of femur were selected. The fractures were fixed with either dynamic hip screw device (DHS) or a proximal femoral nail (PFN). Of the 60 patients in the study, 30 were treated with DHS and 30 with PFN. Fluoroscopy time was recorded intraoperatively.

**Results and Discussion:** The difference in the operative times in both the groups was found to be highly significant and we attributed this difference to the smaller incisions in the PFN group. The fluoroscopy time in the PFN group (average 72.60secs) was significantly higher as compared to that of the DHS group (average 48.60secs). In this study the average limb length shortening of patients in the DHS group was 1.25cm as compared to 0.63cm in the PFN group which was highly significant ( $p=0.009$ ). The overall functional outcome of patients treated with the PFN was significantly better than those treated with DHS ( $p=0.037$ ). This is in accordance to a study by Kukla and co-workers<sup>8</sup> and also Ahrengart and associates.

**Conclusion:** We conclude that in stable intertrochanteric fractures, both the PFN and DHS have similar outcomes. However, in unstable intertrochanteric fractures the PFN has significantly better outcomes in terms of earlier restoration of walking ability. In addition, as the PFN requires shorter operative time and a smaller incision, it has distinct advantages over DHS even in stable intertrochanteric fractures. Hence, in our opinion, PFN may be the better fixation device for most intertrochanteric fractures.

**Keywords:** Intertrochanteric fracture, proximal femoral nailing, dynamic hip screw

#### Introduction

Trochanteric fractures are one of the most common injuries sustained predominantly in patients over sixty years of age. They are three to four times more common in women who are osteoporotic; trivial fall being the most common mechanism of injury<sup>[1]</sup>

Studies have shown that when compared to the dynamic hip screw, proximal femoral nailing had certain advantages over the former. Certain studies also showed that the functional outcome was similar for both the surgical interventions. Hence there still lies a debate as to which is the better mode of surgical management in treating intertrochanteric fractures.

This study is therefore intended to compare the functional outcome of proximal femoral nailing versus dynamic hip screw device in the surgical management of intertrochanteric fractures and to verify the theoretical advantages of the proximal femoral nail over the dynamic

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hip screw device and also whether it actually alters the eventual functional outcome of the patient.

**Aims of the Study**

To compare the surgical treatment of intertrochanteric fractures of the femur with the proximal femoral nail and dynamic hip screw device, with respect to:

- Fluoroscopic time
- Duration of surgery
- Post-operative shortening and Functional outcome.

**Materials and Methods**

The study was conducted in Father Muller Hospital, Mangalore from July 2015 to July 2016 where 60 patients with 60 intertrochanteric fractures of femur were selected.

Patients with polytrauma, pathological fractures and those under the age of 16 years were excluded from the study.

The modes of injury were classified under 3 different categories taking into consideration whether the injury was due to a road traffic accident, trivial fall or a fall from height.

All the patients were initially evaluated as to their general condition, hydration and corrective measures were undertaken. Anteroposterior and lateral radiographs of the affected hips were taken. The patients were then put on skin traction over a Bohler–Braun frame. The fractures were classified as per Jensen and Michealsen’s modification of Evans classification of intertrochanteric fractures. Type I and type II were considered as stable fractures and type III, IV and V were considered as unstable fractures. No open fractures were encountered in this series. Patients were taken up for surgery as soon as their general condition permitted.

The fractures were fixed with either dynamic hip screw device (DHS) or a proximal femoral nail (PFN). Of the 60 patients in the study, 30 were treated with DHS and 30 with PFN. Fluoroscopy time was recorded intraoperatively.

**Surgical Technique**

All patients were positioned supine on a fracture table. The unaffected lower limb was flexed and abducted to allow easy access for the image intensifier. All fractures were reduced by the closed method to confer weight bearing stability and correct varus and rotational deformities. Fixation was by Dynamic hip screw or Proximal femoral nailing.

There was no defined postoperative patient protocol, but all patients were given peri-operative antibiotics for 24 to 48 hours and deep venous thrombosis prophylaxis. Static quadriceps exercises were started on the second and third post-operative day. Sutures were removed after 10 to 14 days. Patients were mobilized non-weight bearing as soon as the pain or general condition permitted.

All the patients were followed up at monthly intervals for a period of 6 months and check x-rays were taken to assess fracture union and signs of failure of fixation.

**Statistical Analysis**

The collective data was analysed by the Z-Test, Student T-test, Chi-square test (X<sup>2</sup>), Wilcoxon Signed Rank Sum test and the Mann Whitney-U test using SPSS software to evaluate the results.

**Results and Analysis**

**Age and Sex Distribution**

The average age for trochanteric fractures is reported to be 66-76 years. In our series, the highest number of patients was

in the 61-80 years age group. Fractures were seen more common in females. This supports the view that bone stock plays an important role in the causation of fractures in the elderly, which occur after a trivial fall [1].

**Type of Fracture**

Our series consisted of 34 stable and 26 unstable intertrochanteric fractures as classified according to Jensen and Michealsen’s [2, 3] modification of Evans classification. The distribution of stable and unstable fractures in both groups was similar. Out of the 34 stable fractures, 16 were in the DHS group and 18 in the PFN group. Out of the 26 unstable fractures, 14 were in the DHS group and 12 in the PFN group.

**Duration of Surgery**

The duration of surgery in the DHS group ranged from 40 minutes to 90 minutes with a mean of 66.66 minutes. The duration of surgery in the PFN group ranged from 40 minutes to 75 minutes with a mean of 52 minutes.

Method	N	Mean (min)	Std. Deviation	Z
DHS	30	66.667	13.84437	3.07200 P = 0.02s
PFN	30	52.0000	8.61892	

**Fluoroscopy Time**

The fluoroscopy time in the PFN group (average 72.60secs) was significantly higher as compared to that of the DHS group (average 48.60secs).

Method	N	Mean (sec)	Std. Deviation	Z
DHS	30	48.60	6.174	4.631 P =.001 hs
PFN	30	72.60	11.488	

**Post-Operative Shortening**

In this study the average limb length shortening of patients in the DHS group was 1.25cm as compared to 0.63cm in the PFN group which was highly significant (p=0.009). This could be due to the increased sliding of the lag screw in the DHS group, allowing greater fracture impaction, as compared to the PFN [4].

Method	N	Mean (cm)	Std. Deviation	Z
DHS	30	1.2533	0.75675	2.597 P =.009 s
PFN	30	0.6333	0.26637	

**Functional Outcome**

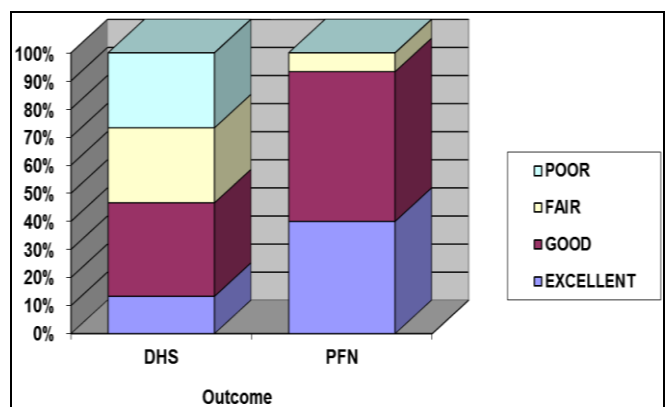


Fig 1: Functional Outcome

The overall functional outcome of patients treated with the PFN was significantly better than those treated with DHS

( $p=0.037$ ). However when we compared the stable and unstable fractures separately, we found that there was no significant difference in the outcomes of the stable fractures in the two groups ( $p=0.198$ ).

### Discussion

The goal of this study was to compare the functional outcomes of patients with intertrochanteric fractures treated by two different fixation devices, the extra medullary dynamic hip screw and the intramedullary proximal femoral nail. Our study consisted of 60 patients with 60 intertrochanteric fractures out of which 30 were treated with DHS and 30 with PFN. Majority of the patients in our study were between 61-80 years with a mean age of 67.13 years with seventy per cent of the patients being females. Trivial fall was the most common mode of injury. The left hip was involved in 56.7 per cent of the patients.

The difference in the operative times in both the groups was found to be highly significant and we attributed this difference to the smaller incisions in the PFN group. Baumgaertner *et al.*<sup>[5]</sup> also found that the surgical times were 10 per cent higher in the DHS group in their series. Saudan and colleagues<sup>6</sup> found that there was no significant difference between the operative times in the two groups in their study. The DHS required 24 per cent less fluoroscopy time. This was similar to the series by Baumgaertner and associates<sup>[5]</sup> who also found a significant difference in the fluoroscopic times in their series, with 10 per cent higher times for the PFN group.

Eight of the patients in the DHS group with poor results, all had 2cm or more of shortening. Six of these patients had malunion of the fractures. The patients in the PFN group neither had a shortening of more than 1cm nor a malunion. This goes against the findings of O'Brien and group<sup>[7]</sup> who had concluded that no difference existed between sliding hip screws and intramedullary hip screws in terms, malunion, nonunion, failure of fixation, general post-operative complications.

While comparing the unstable fractures in the two groups we found that the functional outcome of the patients in the PFN group was significantly better than the outcome of the patients in the DHS group with good results for all the unstable fractures treated with PFN compared to only fair and poor results for the unstable fractures treated with DHS. This is in accordance to a study by Kukla and co-workers<sup>[8]</sup> and also Ahrengart and associates<sup>[2]</sup>. The smaller incisions, shorter operative times, relatively less blood loss and less postoperative pain with the PFN indicate that the PFN has an advantage over the DHS even in the treatment of stable intertrochanteric fractures where the functional outcomes are similar. In addition, with unstable intertrochanteric the PFN has a definite advantage over the DHS in terms of less limb length shortening, earlier restoration of pre-injury walking ability and a better overall functional outcome<sup>[4]</sup>

### Conclusion

We conclude that in stable intertrochanteric fractures, both the PFN and DHS have similar outcomes. However, in unstable intertrochanteric fractures the PFN has significantly better outcomes in terms of earlier restoration of walking ability. In addition, as the PFN requires shorter operative time and a smaller incision, it has distinct advantages over DHS even in stable intertrochanteric fractures. Hence, in our opinion, PFN may be the better fixation device for most intertrochanteric fractures.

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