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## PFN v/s DHS in stabilization of intertrochanteric fractures: A comparative study

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### Abstract

**Background:** Trochanteric fractures are the most common injuries predominantly in patients over sixty years of age because of trivial fall and osteoporotic nature of bones. The aim of the study is compare the functional outcome of inter trochnateric fractures treated with proximal femoral nail (PFN) and dynamic hip screw (DHS).

**Methods:** The study was conducted on 40 cases of inter trochanteric fractures, 20 were treated with PFN and 20 were treated with DHS. Patients were operated on standard fracture table under image intensifier control.

**Results:** Average age of patient was 62.6 years. 62.5% of the total patients were females. The most common mode of injury was trivial fall. There were 23 stable fractures and 17 unstable fractures. Mean Fluoroscopy time taken for PFN and DHS were 73.75 and 57.5 minutes respectively. The mean duration of surgery in the DHS and PFN were 91.25 and 68.25 minutes respectively. The DHS patients had significantly more blood loss (average 380ml) intraoperatively compared to PFN group (average 127.05ml). 3 patients (15 percent) in the DHS group had malunion whereas 1 patient (5 %) in the PFN group had malunion. 2 patients of the DHS group had wound infections as compared to single patient in the PFN group. The average range of motion the hip joint was 84.00 degree in the DHS group and 99.25 degree in the PFN group at 6 months of follow up.

**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.

**Keywords:** inter trochanteric fractures, proximal femoral nail, dynamic hip screw

### 1. Introduction

Inter 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>. Little attention was paid to these fractures in the past, as they occur through the cancellous bone with excellent blood supply and they healed without any active treatment. The goal of surgical management of an intertrochanteric fracture is the restoration of the patient to his or her pre-injury status as early as possible. This led to internal fixation of these fractures to increase patient comfort, facilitate nursing care, decrease hospitalization and reduce complications of prolonged recumbency<sup>[2]</sup>. The greatest problems for the orthopaedic surgeon treating this fracture are instability and the complications of fixation that result from instability<sup>[3]</sup>. Stability refers to the capacity of the internally fixed fracture to resist muscle and gravitational forces around the hip that tend to force the fracture into a varus position. The type of implant used has an important influence on complications of fixation. Sliding devices like the dynamic hip screw have been extensively used for fixation. Intramedullary devices like the proximal femoral nail have been reported to have an advantage in such fractures as their placement allowed the implant to lie closer to the mechanical axis of the extremity, thereby decrease the lever arm and bending moment on the implant. The purpose of the present study is to verify the theoretical advantages of the proximal femoral nail over the dynamic hip screw device and also whether it actually alters the eventual functional outcome of the patient.

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**2. Materials and Methods**

The study was conducted in Maharajah’s Institute of Medical Sciences and Hospital, Vizianagaram from January 2016 till June 2017 where 40 patients with intertrochanteric fractures were selected. 20 patients have undergone proximal femoral nailing. 20 patients have undergone dynamic hip screw fixation.

**2.1 Inclusion criteria**

- 1) Adult males and females over 18 years of age
- 2) Patients with fresh traumatic Intertrochanteric fractures
- 3) Patients who were able to walk prior to fracture

**2.2 Exclusion criteria**

- 1) Pathological fractures
- 2) Active infections
- 3) Unstable medical illness

The mode 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. Antero posterior and lateral radiographs of the affected hip were taken. The patients were then put on skin traction over a Böhler – 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.

The fractures were fixed with either dynamic hip screw fixation or proximal femoral nailing. Allocation of the fractures to each treatment group was done by random selection. Of the 40 patients in the study, 20 were treated with dynamic hip screw fixation and 20 with proximal femoral nailing. The length of the incision, duration of surgery, blood loss and fluoroscopy time was recorded intraoperatively. All patients received injectable antibiotic (cephalosporins) given one hour before surgery and continued post operatively for 2 to 3 days. Oral cephalosporins were continued for next 3 to 4 days.

All the patients were followed up at 6 weeks 3 months and 6 months intervals for a period of 6 months and check x- rays were taken to assess fracture union and signs of failure of fixation. Walking ability of each patient was recorded and compared with pre-injury walking ability using the Sahlstrand<sup>7</sup>grading. Post-operative pain was evaluated using the four-point pain score as also used by Saudan<sup>[8]</sup>.

**3. Results**

Most of the patients are in the age groups of 41-60 and 61- 80 years. Age is not a significant factor in PFN and DHS groups. 62.5% of the total patients were female in this series. The most common mode of injury was trivial fall. All fractures were classified as per Jensen and Michealsen’s modification of Evans classification<sup>[9, 10]</sup>. There were 23 stable fractures and 17 unstable fractures. The pre-injury walking ability of the patients was classified as per grades described by Sahlstrand<sup>[7]</sup>. Pre-injury walking ability was similar in both the groups.

Length of incision for PFN patients required significantly smaller skin incision. Mean values for PFN and DHS were

68.25 and 91.25 min respectively. Duration of surgery for PFN required less operative time compared to DHS. Mean Fluoroscopy time taken for PFN and DHS were 73.75 and 57.5 minutes respectively. DHS fixation had significantly less fluoroscopy time taken when compared to PFN. 10% of cases treated with DHS found to have developed wound infection whereas only 5.0% of cases developed wound infection when treated with PFN. Thirteen patients treated with PFN achieved their pre-injury walking ability after six months follow up whereas only six patients achieved their pre-injury walking ability treated with DHS. One screw back out was seen as a post-operative complication in DHS. Excellent to Good results were seen in 95% of patients treated with PFN and only 45% of patients treated with DHS. Functional outcome of stable fractures is non-significantly better in PFN group compared to DHS group. But Functional outcome of unstable fractures is significantly better in all patients in PFN group when compared to DHS group.

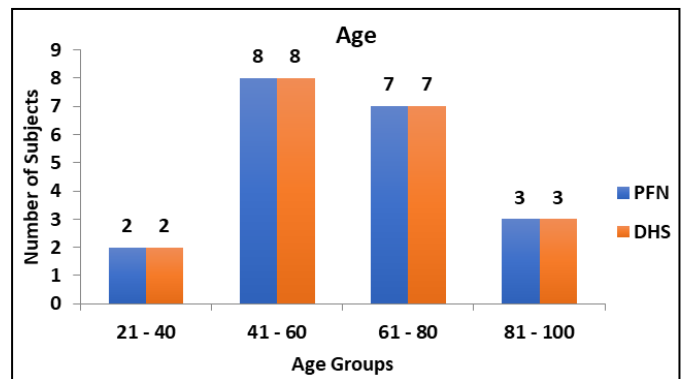


Fig 1: Age distribution

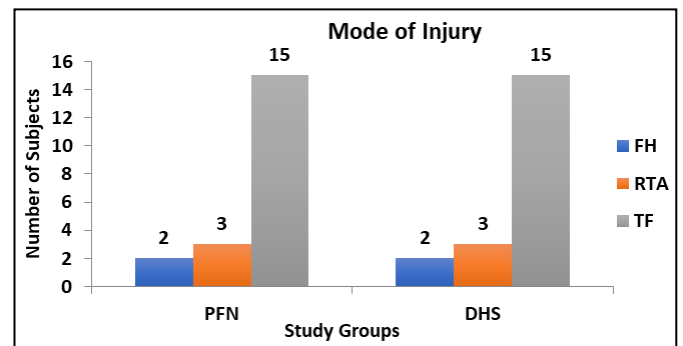


Fig 2: Mode of injury

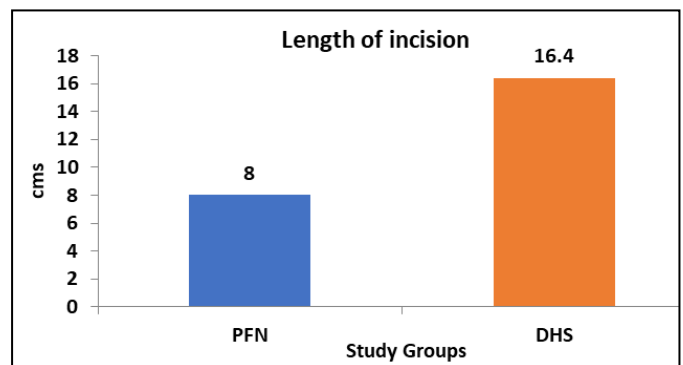


Fig 3: Length of incision

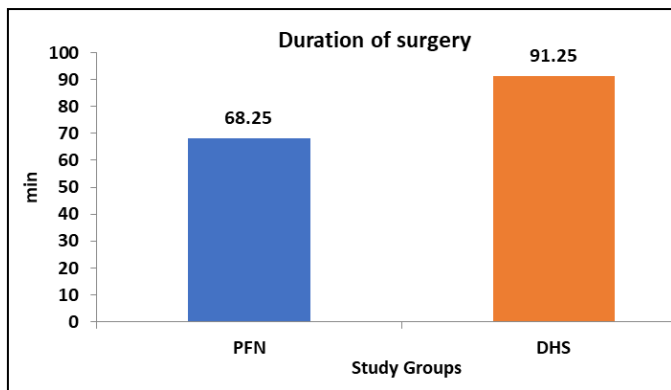


Fig 4: Duration of surgery

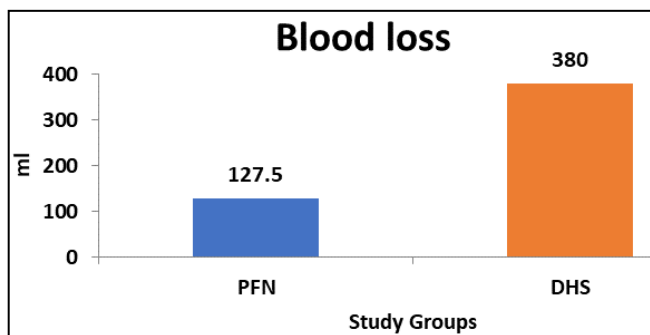


Fig 5: Blood loss

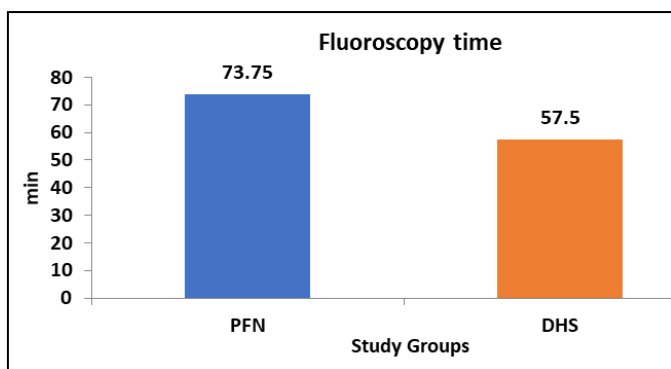


Fig 6: Fluoroscopy time (min)

Table 1: Fracture union

Union	Group		Total
	PFN	DHS	
Malunion	1(5.0%)	3(15.0%)	4(10.0%)
Union	19(95.0%)	17(85.0%)	36(90.0%)
Total	20	20	40
Fishers exact test	p-value = 0.61(NS)		

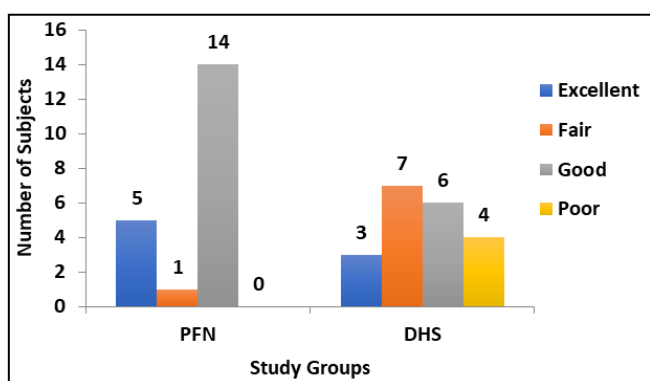


Fig 7: Functional outcome

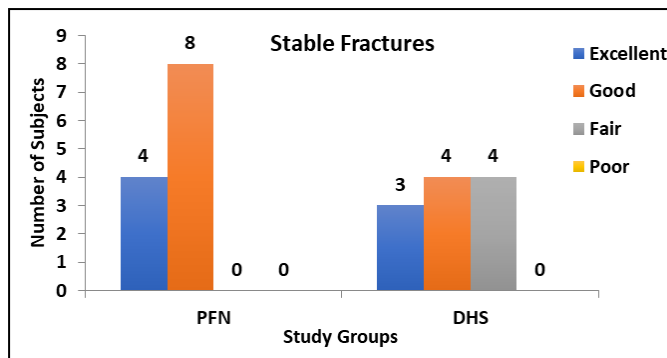


Fig 8: Functional outcome of stable fractures

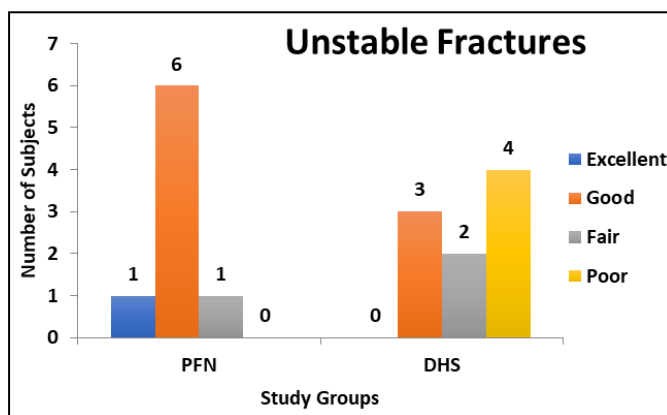


Fig 9: Functional outcome of un stable fractures

4. Discussion

40 patients were included, 20 were treated with DHS and 20 were treated with PFN. The age of the patient ranged from 32 to 85 years with an average of 62.6 years. Our study nearly correlates with White and colleagues [11] study with average age is 75.4 years. There were 15 males and 25 females showing female preponderance, correlates with Dahl and colleagues [6], in their study 65% of patients were females, explained by the fact that females are more prone for the osteoporosis after menopause. Our series consisted of 23 stable and 17 unstable intertrochanteric fractures as classified according to Jensen and Michealsen’s modification of Evans classification. Out of the 23 stable fractures, 11 were in the DHS group and 12 in the PFN group. Out of the 17 unstable fractures, 9 were in the DHS group and 8 in the PFN group. The length of the incision in the DHS group ranged from 15 cm to 18cm with a mean of 16.04 cm as compared to mean of only 8.0cm in the PFN group. The smaller incision in the PFN group meant that there was less intra operative blood loss. This was comparable to the study conducted by Baumgaertner *et al* [12]. The duration of surgery in the DHS group ranged from 85 minutes to 105 minutes with a mean of 91.25 minutes. The duration of surgery in the PFN group ranged from 60 minutes to 85 minutes with a mean of 68.25 minutes. The difference in the operative times in both groups was found to be highly significant and we attributed this difference to the smaller incisions in the PFN group. Baumgaertner *et al* [12]. Also found that the surgical times were 10 per cent higher in the DHS group in their series. Saudan and colleagues [8] found that there was no significant difference in the operative times in the two groups in their series. The fluoroscopy time in the PFN group (average 73.75 sec) was significantly higher as compared to that of the DHS group (Average 57.5 sec). This was similar to the series by Baumgaertner and associates who also found a significant

difference in the fluoroscopic times in their series, with 10 per cent higher times for the PFN group.

The DHS patients had significantly more blood loss (average 380ml) intraoperatively compared to PFN group (average 127.05ml). This is similar to the series by Baumgartner and associates [12] who also found a significant difference in the intra operative blood loss in their series, with 150ml higher for the DHS group. There was no significant difference between the two groups with regards to time of fracture union as all fracture united at 12 weeks in case of DHS and 12.15 weeks in case of PFN. 3 patients (15 percent) in the DHS group had malunion whereas 1 patient (5 %) in the PFN group had malunion. 2 patients of the DHS group had wound infections as compared to single patient in the PFN group, which was not statistically significant. We attributed the higher number of wound infections in the DHS group to the longer incisions and subsequently more soft tissue handling in this group as compared to the PFN group. However all were only superficial wound infections and healed without any further surgical intervention. Saudan and associates<sup>8</sup> also did not find any significant difference between the infection rates in the two groups in their series. One patient (5 percent) in our study had a hip screw back out. However these patients were relatively mobile and hence re-operation was not necessary. There was no implant cut out in the PFN group which was similar to the series by Menezes and co-workers [13] (0.7 %).

The average range of motion the hip joint was 84.00 degree in the DHS group and 99.25 degree in the PFN group at 6 months of follow up. Hence, in our study the patients in the PFN group regained a significantly better range of motion as compared to those in the DHS group (p=0. 006). This is comparable to the results put forth by Saudan and colleagues.

**Functional outcome**

The overall functional outcome of patient treated PFN was significantly better compared to DHS (P=0.06). However when we compared the stable and unstable fractures separately, we found that there was no significant difference in the outcomes of the stable fracture s in the two groups (p=0.09). 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 87.5% of the unstable fractures treated with PFN compared to only fair and poor results for 66.8% of the unstable fractures treated with DHS.

This suggests that the use of PFN may be favoured in stable fracture when compared to DHS. It has been a matter of debate for over a decade regarding ideal management plan to treat unstable trochanteric fractures. The successful treatment of trochanteric fractures depends on many factors, including the patients factor (age, general health, time from fracture to treatment, comminution, bone quality, concurrent medical treatment), surgeon factor (competency, stability of fixation) and the implant factor.

Our study prospectively compares the PFN device and the DHS device allocated in patients with unstable trochanteric fractures. The findings showed that fracture fixation in DHS patient required a significantly longer operative time and were associated with significantly greater intraoperative blood loss than PFN patients. 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 earlier restoration of pre-injury walking ability and a better overall functional outcome.



Fig 10: PFN radiographs pre-op, immediate post-op, 6 weeks follow up



Fig 11: Range of movements following PFN after 6 weeks



Fig 12: Range of movements following DHS after 6 weeks



Fig 13: pre op x-ray



Fig 14: DHS fixation

## 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. The PFN device reduced iatrogenic tissue trauma and reoperation rate, although it was associated with higher x-ray exposure compared with DHS. In addition, as the PFN requires shorter operative time, less blood loss, a smaller incision and less postoperative pain, it has distinct advantages over DHS even in stable intertrochanteric fractures. Hence, in our opinion, PFN may be the better fixation device in the treatment of intertrochanteric fracture.

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