

# Comparative study on management of intertrochanteric fracture of femur in adults by proximal femoral nailing vs dynamic hip screw

Kunal Subhash Mukherjee<sup>1</sup>, Bikash Chandra Mondal<sup>2\*</sup>, Prabhat Kumar Lal<sup>3</sup>

<sup>1,2</sup>Assistant Professor, Department of Orthopedics, Gouri Devi Institute of Medical Sciences, Rajbandh, Durgapur, West Bengal, INDIA.

<sup>3</sup>Associate Professor, Department of PSM, Darbhanga Medical College, Darbhanga, Bihar

Email: [bikash0811@gmail.com](mailto:bikash0811@gmail.com)

## Abstract

**Background:** Intertrochanteric fractures constitute half of all the hip fractures seen. Controversy lies regarding the choice of method for management of stable fractures. The present study aimed at comparing the results of dynamic hip screw and proximal femoral nailing. **Methods:** The present comparative study included 34 patients treated with DHS and another 34 with PFN. Clinical and radiological outcomes and complications were noted. **Results:** Mean age of the patients was 64.56 years in the DHS group and 61.94 years in the PFN group and the difference was not significant ( $p=0.11$ ). The two groups were also similar in terms of sex ( $p=0.63$ ) and side of injury ( $p=0.47$ ). Mean intraoperative time was less in the PFN group with significant difference ( $p=0.02$ ). Less blood loss was seen in the patients undergoing PFN ( $p=0.00$ ). Superficial infection, chances of bed sore and prolonged drainage were seen more frequently in the DHS group but the difference was not significant statistically ( $p>0.05$ ). Implant failure and femoral head avascular necrosis were more common in the PFN group. Mean Harris Hip Scores were similar at 1 month. However, significantly higher scores were seen in the DHS group at 3 and 6 months ( $p<0.05$ ). Mean HHS was similar at one year. **Conclusion:** DHS offers similar results in stable intertrochanteric fractures with lesser cost and less implant related complications.

**Key Words:** Comparative Study, Dynamic Hip Screw (DHS), Intertrochanteric Fracture, Proximal Femoral Nailing (PFN)

## Address for Correspondence:

Dr. Bikash Chandra Mondal, Assistant Professor, Department of Orthopedics, Gouri Devi Institute of Medical Sciences, Rajbandh, Durgapur, West Bengal, INDIA.

Email: [bikash0811@gmail.com](mailto:bikash0811@gmail.com)

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## INTRODUCTION

Intertrochanteric fracture is a common condition seen by orthopaedic surgeons. It accounts for 5-20% of all fractures and 45-50% of all hip fractures. More than half of these fractures are unstable in nature.<sup>1</sup> The aetiology depends on the age group. While road traffic accidents are responsible in younger age groups, trivial fall may

cause this condition in the elderly. With increase in life expectancy, the incidence of this fracture has also increased.<sup>2</sup> The estimate by Gulberg *et al* indicates that total number of hip fractures will reach up to 2.6 million by 2025 and 4.5 million by 2050. Majority of the cases are above the age of 50 years and it is 2-3 times more common in females as compared to the males.<sup>3</sup> Early mobility is essential in these cases to restore the patient to pre-operative state and to avoid medical complications. This depends upon two major factors, namely quality of the bone and type of implant used. Fixation can be extramedullary and intramedullary. Dynamic Hip Screw is the gold standard method used for fixation of stable fractures and is extramedullary in nature. However, chances of implant failure are more in this procedure if the fracture is unstable in nature.<sup>4</sup> AO/ASIF group introduces Proximal Femoral Nailing in 1997 which is intramedullary in nature. It is frequently being used now a days for the treatment of intertrochanteric

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fractures.<sup>5</sup>Being a load sharing device, PFN gives more biomechanical strength and permits early mobilization. It preserves the vascularity and ensures better rotational stability even in osteoporosed bone of elderly. DHS is a load sparing device and needs extensive soft tissue stripping. However, the biomechanical properties like short lever arm, greater implant strength and additional antirotation screw in the femoral neck provide better stability.<sup>6</sup>Studies have been done to compare the results of these two procedures but varying results were seen. Hence, the present study was conducted to compare these procedures in the management of intertrochanteric fractures in adults.<sup>7-9</sup>

## AIMS AND OBJECTIVES

The present study was conducted to compare the clinical and radiological results of DHS and PFN in intertrochanteric fracture among adults.

## MATERIAL AND METHODS

**Study setting:** The present study was hospital based in nature conducted at the department of Orthopaedics, Gouri Devi Institute of Medical Sciences, Rajbandh, Durgapur. This is a tertiary level health hospital. Patients from nearby districts of West Bengal and adjoining area of Jharkhand come to this institute for treatment. Hence, we have patients from varying background and culture.

**Duration and type of study:** The present follow-up study was conducted between May 2017 to September 2019. Data collection was done between June 2017 to July 2018.

**Study subjects:** Study subjects included patients reporting to the Orthopaedics Department of the institute and suffering from intertrochanteric fracture of femur.

**Inclusion criteria:** Patients above 18 years of age suffering from intertrochanteric fracture of femur were included in the present study.

**Exclusion criteria:** Those patients who did not give consent for the study, who had fracture > 2 weeks duration and those who had associated fracture of femoral shaft were excluded from the study.

**Sampling:** All the patients reporting during the study period and fulfilling selection criteria were included in the present study. A total of 68 patients were included.

## RESULTS

A total of 68 patients were included in the present study. 34 patients belonged to DHS group and another 34 to PFN group. Table-1 shows the background details of the patients. Mean age of the patients was 64.56 years in the DHS group and 61.94 years in the PFN group and the difference was not significant ( $p=0.11$ ). The two groups were also similar in terms of sex ( $p=0.63$ ) and side of injury ( $p=0.47$ ). The patients were operated within 3.9 days of trauma in the DHS group and 4.2 days in the PFN group and the difference was not significant ( $p=0.3$ ).

They were randomly distributed into either DHS group or PFN group. Thus, 34 patients had undergone DHS and another 34 patients had PFN.

**Data collection procedure:** The patients were visited in the wards and detailed socio-demographic and clinical history was obtained. Routine biochemical and radiological evaluation was done and the findings were noted. Anaesthetic evaluation of patients was done and the surgery was performed at the earliest available opportunity. Surgery was performed on the standard fracture table with patient in supine position. DHS with a side plate having 4 holes was used in the first group. In the other group, a modified ultra-short PFN suitable for the Asian population was used. Closed reduction was first attempted. In the cases where it was not possible, indirect reduction was done by percutaneous or mini-open techniques before making entry for the PFN and DHS. Similar rehabilitation protocol was used in both the groups with dynamic quadriceps and ankle pump exercises from the first day itself. Early mobilization was done with non-weight bearing and later partial weight bearing depending on the patient's compliance.

**First follow-up** was done four weeks after discharge and then every six weeks till the completion of six months postoperatively. Radiological evaluation of the fractured site was done and weight bearing was gradually increased.

The intra operative, early (within first month after surgery), and late complications were noted. Functional outcome for each group was assessed with Harris Hip Scores

**Data analysis:** Data entry was done in Microsoft Excel 2010 and data analysis was done using Statistical Package for Social Sciences (SPSS) v 16.0. Numerical variables were expressed as Mean and SD and categorical variables as frequency and percentages. Appropriate statistical tests were done as needed.  $p$ -value of  $<0.05$  was considered to be statistically significant. Ethical consideration and permission: Approval from Institutional Ethics Committee was obtained for the study. Informed consent was taken from the study subjects after informing them about the study and its importance. Confidentiality of records was maintained.

**Table 1: Background profile and preoperative details of the patients**

Observations	DHS Group (n=34)	PFN Group (n=34)	Significance
Mean age (in years)	64.56 ± 6.26	61.94 ± 7.09	t=-1.61, p= 0.11
Sex			
-Male	20	18	$\chi^2= 0.53, p=0.63$
-Female	14	16	
Interval between trauma to surgery (in days)	3.9 ± 1.72	4.2 ± 1.44	t=1.04, p= 0.3
Side			
-Right	18	15	$\chi^2= 0.63, p=0.47$
-Left	16	19	

Table-2 shows the intraoperative details. It is observed that mean intraoperative time was less in the PFN group with significant difference (p=0.02). Less blood loss was seen in the patients undergoing PFN (p=0.00). Mean incision length was also found to be significantly less in this group (p=0.00). However, mean duration of (p=0.18) and mean duration to full weight bearing (p=0.11) was similar in these two groups.

**Table 2: Intraoperative details**

Observations	DHS Group (n=34)	PFN Group (n=34)	Significance
Mean intraoperative time (min)	109.7 ± 29.4	91.9 ± 23.2	t= -2.3, p= 0.02
Mean blood loss (ml)	273.6 ± 89.9	149.0 ± 76.1	t= -6.1, p= 0.00
Mean hospital stay (days)	13.4 ± 2.6	12.6 ± 2.3	t= -1.3, p= 0.18
Mean incision length (cm)	8.3 ± 1.9	4.6 ± 1.2	t= -9.6, p= 0.00
Mean duration to full weight bearing (weeks)	7.2 ± 1.1	6.8 ± 0.9	t= -1.6, p= 0.11

Table-3 lists the early and late complications seen in the two groups. The groups were similar regarding urinary tract infection (p=1.00) and death (p=1.00). Superficial infection, chances of bed sore and prolonged drainage were seen more frequently in the DHS group but the difference was not significant statistically (p>0.05). Implant failure and femoral head avascular necrosis were more common in the PFN group. However, these differences were not significant (p>0.05).

**Table 3: Complications seen**

Complications	DHS Group (n=34)	PFN Group (n=34)	Significance
		Early	
Superficial Infection	3	2	$\chi^2= 0.22, p=0.64$
Bed sore	4	1	$\chi^2= 1.94, p=0.16$
DVT	0	0	$\chi^2= 0.00, p=1.00$
UTI	1	1	$\chi^2= 0.00, p=1.00$
Prolonged drainage	1	0	$\chi^2= 1.00, p=0.32$
		Late	
Implant failure	2	4	$\chi^2= 0.73, p=0.39$
Femoral head AVN	0	1	$\chi^2= 1.00, p=0.32$
Mean shortening	5.8 ± 1.0	5.4 ± 0.9	t= -1.7, p= 0.09
Death	1	1	$\chi^2= 0.00, p=1.00$

Table-4 shows mean Harris Hip Scores at 1,3 and 6 months after surgery. It is seen that the scores were similar at 1 month. However, significantly higher scores were seen in the DHS group at 3 and 6 months (p<0.05). It was similar at one year (p=0.55).

**Table 4: Mean Harris Hip scores**

Mean Harris score at	DHS Group (n=34)	PFN Group (n=34)	Significance
1 month	22.7 ± 1.9	23.4 ± 1.2	t= 1.8, p= 0.07
3 months	50.2 ± 2.3	46.8 ± 1.1	t= -7.7, p= 0.00
6 months	86.0 ± 2.7	83.1 ± 1.4	t= -6.9, p= 0.00
1 year	98.3 ± 4.4	98.9 ± 3.9	t= 0.6, p= 0.55

## DISCUSSION

Intertrochanteric fractures constitute about half of all the hip fracture cases. Various techniques have been devised to treat this condition including DHS, PFN and bipolar implants. Each of these have their associated advantages and risks. PFN has emerged as excellent method to treat unstable fracture cases. Its advantage over DHS in management of unstable intertrochanteric fractures is

controversial. The present study included 34 patients treated with DHS and another 34 patients treated with PFN who were suffering from stable intertrochanteric fracture. The two groups were similar regarding their mean age (64.56 years in the DHS group and 61.94 years in the PFN group, p=0.11). The two groups were also similar in terms of sex (p=0.63) and side of injury (p=0.47). The mean duration between trauma and surgery

was 3.9 days of trauma in the DHS group and 4.2 days in the PFN group and the difference was not significant ( $p=0.3$ ). Sharma *et al* observed that mean age was 62.27 years in DHS group and 60.67 years in the PFN group. Sex ratio was 65.5% in DHS and 60.61% in the PFN group. The study conducted by Mansukhani *et al* included 29 males and 21 females with a mean age of 73.03 years (61-82 years) and 77.9 years (60-92 years) respectively, and all had a fall at home. All patients were comparable to each other in terms of their demographics.<sup>7</sup> Santosha *et al* found that the mean age in both the groups was  $59.88 \pm 16.90$  years, In DHS group, there were 5(10%) females and 45(90%) males. In the PFN group, there were 13(26%) females and 37(74%) males. There was a male preponderance in both the groups in comparison to the females. In PFN group, there were 30(60%) patients who injured because of fall, while 20(40%) were injured due to RTA. [1] Bakshi *et al* observed that 72.5% patients were aged more than 50 years and 27.5% below 50 yrs in which 55% were males and 45% were females. 62.5% of cases were due to low velocity and 37.5% due to high velocity trauma. Most of patient belongs to type 2 AO classification.<sup>8</sup> In the present study, mean intraoperative time was less in the PFN group with significant difference ( $p=0.02$ ). Less blood loss was seen in the patients undergoing PFN ( $p=0.00$ ). Mean incision length was also found to be significantly less in this group ( $p=0.00$ ). However, mean duration of ( $p=0.18$ ) and mean duration to full weight bearing ( $p=0.11$ ) was similar in these two groups. Sharma *et al* found that mean length of incision was smaller in PFN group ( $p < 0.01$ ) but radiation exposures were significantly more in PFN group ( $p < 0.01$ ). Duration of surgery was lesser in PFN group which was statistically significant ( $p < 0.01$ ). Average blood was significantly more in DHS group ( $p < 0.01$ ) with 2 patients requiring blood transfusion postoperatively as compared to nil in PFN group. Mean hospital stay was slightly more in DHS group but this was not found to be statistically significant. Mean duration of allowing full weightbearing was slightly longer in DHS group but it was not significant on statistical analysis. Mansukhani *et al* reported that the mean duration of surgical time in PFN group (86.7 minute) was much lower, in comparison to DHS group (104.2 minute) ( $p$ -value= 0.098).<sup>7</sup> Santosha *et al* also observed that in DHS group, there were 8% patients who had blood loss between 50-100 ml, in 12% the blood loss was between 101-200 ml, in 32% patients it was between 201-300 ml, in 32% patients it was between 301-40 ml and in 16% patients, it was more than 400 ml. In PFN group, there were 88% patients who had blood loss between 50-100 ml, in 12% the blood loss was between 101-200 ml and none of the patients had a blood loss of more than 200 ml. Mean blood loss among the

subjects of the DHS group and the PFN group were found to be 292.50 and 108.50 ml respectively. Significant results were obtained while comparing the mean blood loss in between the subject group of control group respectively ( $P$ - value  $< 0.05$ ).<sup>1</sup> Mean duration of surgery in the patients of DHS group and the PFN group were found to be 63.35 and 54.70 minutes respectively by Baskhi *et al*. Significant results were obtained while comparing the mean duration of surgery in between the subjects of the DHS group and the PFN group ( $P$ - value  $< 0.05$ ).<sup>8</sup> In the present study, the groups were similar regarding urinary tract infection ( $p=1.00$ ) and death ( $p=1.00$ ). Superficial infection, chances of bed sore and prolonged drainage were seen more frequently in the DHS group but the difference was not significant statistically ( $p>0.05$ ). Implant failure and femoral head avascular necrosis were more common in the PFN group. However, these differences were not significant ( $p>0.05$ ). Sharma *et al* reported that incidence of technical errors was higher in PFN group (9.67% as compared to 3.48% in DHS group) but prolonged drainage and superficial infections were commoner in DHS group; although the difference in incidence of these complications was not statistically significant. No case of iatrogenic fracture, DVT, deep infections, non-union or malunion was noted. Mortality rate was similar in both groups (one death in each group), was not related to any surgery related cause and occurred after three months post-operatively. Incidence of loss of reduction and implant failure and subsequently re-operation was higher in PFN group, but not of significance. Santosha *et al* found that in DHS group, 92% patients had no complications, 2% had DVT and 2% had cut out of screw, 4% had infection. In PFN group, 2% had infection, 98% shows no complication. In DHS group, in 4% patient the union time was 2-3 months, in 52% it was 3-4 months and in 44%, it was more than 4 months. The mean time for union in DHS group was  $4.16 \pm 0.47$  months. In PFN group, in 52% patients the union time was 1-2 months, in 44% patient the union time was 2-3 months and in 4% it was 3-4 months. The mean time for union in PFN group was  $2.20 \pm 0.50$  months. In the DHS group, skin puckering with superficial infection was seen in 5% patient while in the PFN group.<sup>1</sup> Non- union occurred in 5% patient as reported by Bakshi *et al*.<sup>8</sup> Mean Harris Hip Scores were similar at 1 month in the present study. However, significantly higher scores were seen in the DHS group at 3 and 6 months ( $p<0.05$ ). Functional results were assessed by Sharma *et al* in all patients using Harris hip score at the one month, three months, six months and one yearly follow ups. In the D.H.S group, the one month mean hip score was slightly less than that of the P.F.N group, though not statistically significant ( $p$  value  $> 0.05$ ). However, at three monthly and six-monthly

follow-ups, the DHS group had higher mean scores than PFN group. At one year, these scores were similar in the two groups. <sup>9</sup> No significant difference (p-value=0.959) was observed by Mansukhani *et al* in the mean postoperative mobility score amongst the groups at the end of 12 months. <sup>7</sup> Mean Harris Hip Score among the patients of DHS group and the PFN group were found to be 83.75 and 84.4 respectively by Bakshi *et al*. No significant results were obtained while comparing the mean HHS in between the DHS group and the PFN group (P- value > 0.05). <sup>8</sup> Similar findings were reported by Mundla *et al*. <sup>10</sup>

### CONCLUSION

PFN has emerged as excellent technique for management of unstable fractures of intertrochanteric region. The controversy still exists about its utility in stable fractures. As it is a technically demanding operation, chances of post-operative implant related complications have been reported to be higher. The present study concludes that in stable intertrochanteric fractures, PFN offers shorter surgery, smaller incision and lesser blood loss. But, implant related problems were more. The two surgeries offered similar outcomes. One must consider the cost of PFN and the similar results it offers as compared to DHS. The socioeconomic condition of the population limits choosing PFN. Hence, judicious use of PFN is recommended in intertrochanteric fractures keeping in mind, the stability of fracture, cost of surgery and the advantages that can be gained.

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