

# A COMPARATIVE STUDY OF PROXIMAL FEMORAL NAIL AND DYNAMIC HIP SCREW IN THE MANAGEMENT OF INTERTROCHANTERIC FRACTURES OF FEMUR

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## ABSTRACT

### BACKGROUND

Intertrochanteric fractures are commonest fractures especially in the elderly with osteoporotic bones and due to trivial fall. It occurs commonly in patients above 70 years of age. The most commonly used implant is Dynamic Hip Compression Screw (DHS); it is currently the gold standard for fixation of extracapsular hip fractures. DHS has been shown to produce good results; however, complications are frequent particularly in unstable fractures. These implants had their own problems such as high screw cut out from femoral head due to excess collapse at fracture site which in turn shortened the leg and reduced the lever arm of hip abductors. Proximal Femoral Nail (PFN) has theoretical advantages over other devices in the treatment of trochanteric fractures because Nailing has the advantage of providing rotational as well as axial stability in trochanteric fractures allowing faster postoperative walking ability, compared to DHS.

### MATERIALS AND METHODS

From November 2016 to October 2018, a prospective comparative study was done where 30 alternative cases of type III, IV intertrochanteric fractures of hip which were operated using PFN or DHS. Intraoperative complications were noted. We followed up the patients by assessing their functional ability with Harris Hip Score and fracture union by check x rays at 2, 4, 6 and 12 months postoperatively.

### RESULTS

The age of our patients ranged around 60 years. In our series, we found that patients with DHS had increased intraoperative blood loss (134 ml), longer duration of surgery (97 min), and required longer time for mobilization while patients who underwent PFN had lower intraoperative blood loss (61 ml), shorter duration of surgery (89 min), and allowed early mobilization. The average limb shortening in DHS group was 9.25 mm as compared with PFN group which was only 4.75 mm. Patients who are treated with PFN have early weight bearing compared to DHS but at the end of 12<sup>th</sup> month there is no significant difference in their functional abilities.

### CONCLUSION

In patients who are treated with PFN for type III and type IV fractures of inter trochanteric region there is less amount of blood loss, short duration of surgery, early ambulation, low chance of infection and short duration of hospital stay.

### KEYWORDS

Proximal Femoral Nailing, Dynamic Hip Screw, Inter Trochanteric Fractures.

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### BACKGROUND

Intertrochanteric fractures are commonest fractures especially in the elderly with osteoporotic bones and due to trivial fall. It occurs commonly in age group above 70 years. The most commonly used implant is Dynamic Hip Compression Screw (DHS), it is currently the gold standard for fixation of extracapsular hip fractures DHS has been shown to produce good results, however complications are frequent particularly in unstable fractures, these implants had their own problems such as high screw cut out from femoral head due to excess collapse at fracture site which in

turn shortened the leg and reduced the lever arm of hip abductors, The PROXIMAL FEMORAL NAIL (PFN) have theoretical advantages over other devices in the treatment of trochanteric fractures because Nailing has the advantage of providing rotational as well as axial stability in trochanteric fractures allowing faster postoperative walking ability, compared with DHS

### Aims and Objectives

1. To study the principles and management of intertrochanteric fractures with proximal femoral nailing and DHS.
2. To compare Proximal Femoral Nail and Dynamic Hip Screw method of fixation in an intertrochanteric fracture in adults with respect to intraoperative parameters like total duration of surgery, blood loss, and intraoperative complications.
3. To observe the effectiveness of both implants regarding early mobilization of the patients and the assessment of results based on subjective parameters, objective parameters, and radiological findings.

### MATERIALS AND METHODS

From November 2016 to October 2018, a prospective comparative study was done where 30 alternative cases of type III, IV intertrochanteric fractures of hip were operated using PFN or DHS. Intraoperative complications were noted. And we follow up the patients by assessing their functional ability by HARRIS HIP SCORE and fracture union by check x rays at 2, 4, 6 and 12 th months postoperatively

### Inclusion Criteria

1. All adult patients with Grade 3 and 4 (Boyd and Griffin Classification) Intertrochanteric fractures.
2. Patients who are medically fit for surgery.
3. Fractures less than two weeks old.

### Exclusion Criteria

1. Age- Less than 18 years.
2. Grade 1 and 2 (Boyd and Griffin Classification) Intertrochanteric fractures and sub trochanteric fractures.
3. Patients with pathological or compound fractures.
4. Segmental fractures.
5. Individuals who were unable to give consent.
6. Patients with disorders of bone metabolism other than osteoporosis (i.e. Paget's disease, renal osteodystrophy, or osteomalacia).
7. Medically contraindicated for surgery.

### Sample Size

30 cases.

### Sample Procedure

A prospective study and patients are followed up periodically postoperatively.

### Patients Assessed By

Harris Hip Evaluation Score after treatment.

### Methodology

After thorough radiological and clinical examination. The patients with type III and type IV BOYD AND GRIFFINS Intertrochanteric fractures surgery was performed and the details of the surgical procedures as follows: After induction of anaesthesia, the patient was placed on the fracture table with adduction of the affected limb by 10-15 degrees, traction, and rotation, closed reduction of the fracture were done. A 5-cm longitudinal incision was taken proximal to the tip of the trochanter for PFN. A lateral approach to the proximal femur was used from the greater trochanter and extended distally for DHS and intertrochanteric fracture was reduced by PFN for 15 patients and DHS for another 15 patients.

### Post-Operative Regimen

Postoperatively patient was on intravenous antibiotics for 2 days. The patient was taught quadriceps and hip & knee bending exercises on the 1st postoperative day. Check x-ray was done 48 hours after the surgery and it was satisfactory. The patient was discharged on the 10th postoperative day following suture removal. And advised for follow up for every 4 weeks for check x ray whether fracture united or not and advised weight bearing.

### RESULTS

Our study consisted of 30 cases of Grade 3 and 4 (Boyd and Griffin) intertrochanteric fractures of femur treated surgically either by Proximal Femoral Nail or Dynamic Hip Screw in the department of orthopaedics, KURNOOL GOVERNMENT HOSPITAL from November 2016 to May 2018. All patients were available for follow-up.

Age in Years	No. of Patients
40-50	2
50-60	6
60-70	12
70-80	7
80-90	3

**Table 1. Age Distribution**

Side	PFN	DHS	Total
Left	4	12	16
Right	11	3	14

**Table 2. Side Distribution**

$\chi^2: 8.5$  p: 0.03

	PFN	DHS	Total
Male	12	6	18
Female	3	9	12

**Table 3. Sex Distribution**

$\chi^2: 5$  p: 0.02

Mode of Injury	PFN	DHS	Total
Fall on Side	7	13	20
RTA	7	1	8
Fall from Height	1	1	2

**Table 4. Mode of Injury**

$\chi^2=7.6$  p: 0.022

Boyd's and Griffiths	DHS	PFN	Total
Grade 3	12	5	17
Grade 4	3	10	13

**Table 5. Boyd and Griffin Classification**

$\chi^2=6.6$  p: 0.009

Criteria	DHS (Avg.)	PFN (Avg.)
Duration of Surgery	130	115
Blood Loss	460	210
Reduction		
Easy	9	8
Difficult	6	7
Radiation Exposure	98 sec	61 sec

**Table 6. Intraoperative Details**

	Number of Cases	Percentage
Jamming of Nail	1	6.66%
Varus Angulation	1	6.66%
Fracture of Lateral Cortex	1	6.66%
Open Reduction of Fracture	5	13.33%
Fracture Neck of Femur	0	0%

**Table 7. Intra Operative Complications (PFN)**

Intra-Op Complication	No. of Cases	Percentage
Non-Anatomical Reduction	8	53.33%
Varus Angulation	1	6.66%

**Table 8. Intra Operative Complications (DHS)**

	No. of Cases	Percentage
Delayed Union	3	20%
Shortening	2	13.33%
Implant Failure	0	0%
Varus Angulation	1	6.66%
Z Effect	1	6.66%
Reverse Z Effect	0	0%

**Table 9. Delayed Complications- Proximal Femoral Nailing**

Delayed Complications	No. of Cases	Percentage
Non-Union	0	0%
Delayed Union	2	13.33%
Implant Failure	2	13.33%

**Table 10. Delayed Complications: Dynamic Hip Screw**

	PFN	DHS
Duration from Day of Surgery to Mobilization (In Days)	3	4

**Table 11. Duration from Day of Surgery to Mobilization**

10-15

Full Weight Bearing	DHS	PFN
10-15 Weeks	12	9
16-20 Weeks	2	4
20+ Weeks	1	2

**Table 12. Cross-Tabulation for Duration of Full Weight Bearing Walking Post Surgery**

Group	N	Mean	Std. deviation	Std. Error Mean
<b>NWB Walk</b>				
PFN	15	20.24	0.82	0.16
DHS	15	43.91	21.44	4.47
<b>PWB Walk</b>				
PFN	15	74.48	28.43	5.69
DHS	15	60.87	28.59	5.96

**Table 13. Group Statistics for Non-Weight Bearing and Partial Weight Bearing Walking Post-Surgery**

Duration of Hospital Stay	PFN	DHS
	9 Days	11 Days

**Table 14. Duration of Hospitalization**

	No. of Cases	Percentage
Good	11	77.33%
Poor	4	26.66%

**Table 15. Anatomical Results (PFN Series)**

	No. of Cases	Percentage
Good	10	66.66%
Poor	5	33.33%

**Table 16. Anatomical Results (DHS Series)**

	DHS	PFN	Total
Count Good Percentage Within Group	11 73.33%	10 66.66%	21 70%
Count Poor Percentage Within Group	4 26.66%	5 33.33%	9 30%
Count Within Group	15 100%	15 100%	30 100%

**Table 17. Cross Table and p Value for Anatomical Results**

	No. of Cases	Percentage
Excellent	6	40%
Good	5	33.33%
Fair	2	13.33%
Poor	2	13.33%

**Table 18. Functional Results (PFN Series)**

	No. of cases	Percentage
Excellent	4	26.66%
Good	7	46.66%
Fair	1	6.66%
Poor	3	20%
<b>Table 19. Functional Results (DHS Series)</b>		

	PFN	DHS	Total
Excellent Count %	6	4	10
Within Group	40%	26.66%	33.33%
Good Count % Within	5	7	12
Group	33.33%	46.66%	40%
Fair Count % Within	2	1	3
Group	13.33%	6.66%	10%
Poor Count % Within	2	3	5
Group	13.33%	20%	16.66%
Total Count% Within	15	15	30
Group	100%	100%	100%
<b>Table 20. Cross Tabulation for Functional Results</b>			

## DISCUSSION

The goal of my study was to compare the functional outcome of patient who having inter trochanteric fractures treated with two different fixation devices, the extra medullary dynamic hip screw fixation and the intramedullary proximal femoral nail.

Our study has sample size of 30 patients in which 15 patients were operated with DHS and 15 patients were operated with PFN. All the patients are selected randomly who was admitted to KURNOOL GOVERNMENT HOSPITAL with Intertrochanteric fractures during November 2016 to November 2018.

### Age Distribution

In our study the age group of the patients were ranged from 48 to 89 years with an average age of 60 years. The main cause for the fracture that occurred in very old population are due to the trivial fall. White and colleagues<sup>1</sup> did a study on rate of mortality for elderly patients after fracture of the hip in the 1980's and they concluded that the average age for trochanteric fractures is 75.4 years. Our study has average age for fractures was 60 years which was nearly correlates to White and his colleagues.<sup>1</sup>

### Sex Distribution

In our study, there were 18 males and 12 females showing male preponderance.

Our study has similarities with other studies in relation to the sex distribution.

Series	Males	Females
Boyd and Griffin (1949)	74	226
Murray and Frew 1949	56	46
Scott (1951)	35	65
Robey 1956	46	53
Clawson 1957	75	102
<b>Table 21. Ratio of Males:Females in Other Series</b>		

In western countries, women suffering from osteoporosis far outnumber men, and this is largely thought to be due to the effects of the menopause.<sup>2</sup> The men: women ratio may be distorted in India because men are more likely to be brought for hospital care.<sup>3</sup> The majority of the patients in the series were male as they are more outgoing and engaged in activities like agriculture, driving of motor vehicles and are more likely to be involved or prone to accidents/ fall. Females play a more dormant role and are involved more in household activities.

### Mode of Injury

The most common mechanism of injury in our study was fall on side or a trivial fall which was noted in 20 cases, and the History of RTA noted in 8 cases and history of fall from height was in 2 cases.

Most of the fractures that occurred in younger age group of patients (less than 60 years) due to the fall from height or else a road traffic accident, which reflects the requirement of high velocity trauma to cause a fracture in younger age group.

Keneth J. Koval and Joseph D. Zuckerman (1996) observed that 90% of hip fractures in the elderly result from a simple fall.

### Side of the Fracture

We have studied 30 cases of different types of intertrochanteric fractures in our present study. Amongst the 15 cases operated by PFN, 4 patients were found to have proximal femoral fractures on the left side while 11 patients were having fracture on the right side. Amongst the 15 cases operated by DHS, 12 patients were found to have proximal femoral fractures on the left side while 3 patients were having fracture on the right side.

### Fracture Pattern

According to Boyd's and Griffin's classification<sup>4</sup> in our series inter trochanteric grade 3 fractures having 17 cases and grade 4 Fractures having 13 cases. Comminuted fractures require difficulty in reduction. Difficulty in reduction were noted in 5 out of 17 cases of grade 3 and 8 out of 13 cases of grade 4 intertrochanteric fractures.

### Duration of Surgery

In the DHS group the duration of surgery ranged from 115 minutes to 160 minutes with a mean of 130 minutes. In the PFN group the duration of surgery ranged from 90 minutes to 135 minutes with a mean of 115 minutes. In both groups the difference in the operative times was found to be highly significant. Baumgaertner et al.<sup>5</sup> also found that the surgical times were 10 per cent higher in the DHS group in their series

### Blood Loss

The DHS patients in our study had significantly more intra-operative blood loss (average 460 ml) compared to PFN group (average 210 ml). This is similar to the series by

Baumgaertner and associates<sup>5</sup> who also found a significant difference in the intra operative blood loss in their series, with 150 ml higher for the DHS group.

### Fluoroscopy Time

The fluoroscopy time in the PFN group (average 61 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<sup>5</sup> who also found a significant difference in the fluoroscopic times in their series, with 10 per cent higher times for the DHS group.

### Complication and Outcome

	<b>Boldin et al</b>	<b>Pavelka et al</b>	<b>Menzes et al</b>	<b>Simmermacher et al</b>	<b>Our Study DHS</b>	<b>Our Study PFN</b>
Bony Union	100%	95%	-%	-%	85%	100%
Delayed Union	-%	5%	2%	-%	13.33%	20%
Implant Failure	3.6%	4%	0.8%	0.6%	13.33%	0%
Failure of Fixation	0%	-%	2%	5%	6.66%	0%
Anatomical Reduction	61.8%	95%	80%	86%	78%	92%
Z Effect	-	-	-	-	-	6.66%
Non-Union	-	-	0.8%	-	-	-

**Table 21. Comparison with Other Studies**

PFN is a novel, modern implant based on the experience of gamma nail<sup>6</sup>

### CONCLUSION

Intertrochanteric fractures of the femur are common in the elderly due to osteoporosis and in the young due to high velocity trauma. As the fracture is more common in the elderly, early reduction and internal fixation increases patient comfort, facilitates nursing care, helps in early mobilization of the patient and decreases the duration of hospitalization. Fracture reduction can be achieved by closed reduction or open reduction. In comminuted fractures the fracture reduction requires stable internal fixation. Fracture union or healing with PFN gives high stability in rotation of the head-neck fragment, by static or dynamic distal locking. PFN prevents varus collapse at the fracture site. Because of the increasing occurrence in younger age groups, higher demand is placed on the treating surgeon to restore near normal function of the leg. Post operatively early mobilization can begin as the fixation is rigid and the implant designs are good.

In the light of these results, one can conclude that the proximal femoral nail, despite few unfavourable results and complications, is a satisfactory method of treatment in intertrochanteric fractures, with comminution and instability. The anatomical and functional rates are comparable with that of DHS.

Proximal femoral nailing creates a shorter lever arm, which translates to a lower bending moment and a

decreased rate of mechanical failure<sup>52</sup>. The nails are load sharing implants, whereas extra-medullary devices are load bearing.

### REFERENCES

- [1] White BL, Fisher WD, Laurin CA. Rate of mortality for elderly patients after fracture of the hip in the 1980's. J Bone Joint Surg Am 1987;69(9):1335-1340.
- [2] Lo CW, Paris PW, Holick MF. Indian and Pakistani immigrants have the same capacity as Caucasians to produce vitamin D in response to ultraviolet irradiation. Am J Clin Nutr 1986;44(5):683-685.
- [3] Malhotra N, Mithal A. Osteoporosis in Indians. Indian J Med Res 2008;127(3):263-268.
- [4] Boyd HB, Griffin LL. Classification and treatment of trochanteric fractures. Arch Surg 1949;58(6):853-866.
- [5] Baumgaertner MR, Curtin SL, Lindskog DM. Intramedullary versus extra-medullary fixation for the treatment of intertrochanteric hip fractures. Clin Orthop 1998;348:87-94.
- [6] Adams C, Robinson CM, Court-Brown CM, et al. Prospective randomized controlled trial of an intramedullary nail versus dynamic screw and plate for intertrochanteric fractures of the femur. J Ortho Trauma 2001;15(6):394-400.