

Original Research Article

Management of complex intertrochanteric fractures of the femur in elderly patients – dynamic hip screws or proximal femoral nails or arthroplasty

Naushad Hussain, Hiren B. Patel*, Nirmal D. Patil

Department of Orthopaedics, TNMC & BYL Nair Hospital, Agripada, Mumbai, India

Received: 25 May 2017

Revised: 02 June 2017

Accepted: 05 June 2017

***Correspondence:**

Dr. Hiren B. Patel,

E-mail: hirenbhpatel@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Ideal management of intertrochanteric fractures in elderly individuals has been debated for several years. Due to difficulty in obtaining anatomical reduction, management of the complex intertrochanteric fractures in elderly patients is challenging and controversial.

Methods: In the present study prospective comparative evaluation has been done between dynamic hip screws (DHS), proximal femoral nail (PFN) and bipolar hemiarthroplasty for overall clinical outcome of patients with unstable intertrochanteric fractures. The total numbers of patients were 90 with each group consisted of 30 patients.

Results: Complication rate and requirement of revision surgery was more in DHS group but this was not found to be statistically significant. Harris Hip Score & hence the functional outcome was found to be more in PFN group as compared to DHS which was statistically significant. Bipolar hemiarthroplasty provides early full weight bearing leading to better HHS at 6 weeks evaluation but almost similar score to PFN in long term.

Conclusions: PFN is better choice of fixation if good bone quality present while extremely osteoporotic patients or extreme comminution at fracture site favours bipolar hemiarthroplasty in elderly patients.

Keywords: DHS, PFN, Bipolar, Intertrochanteric fractures

INTRODUCTION

Fractures around hip joint are one of the commonest injuries sustained by the aged, predominantly in patients over 60 years of age. The goal of treatment of an intertrochanteric fracture must be restoration of the patient to his or her pre-injury status at the earliest possible time. 45% of all hip fractures are intertrochanteric fractures and 35–40% of these fractures is unstable three or four part fractures and associated with high rates of morbidity and mortality. Due to difficulty in obtaining anatomical reduction, management of the unstable intertrochanteric fractures in elderly patients is challenging and controversial. Osteoporosis and instability are the most important factors preventing early weight bearing and

leading to unsatisfactory results in these cases. Complications such as excessive sliding (leading to shortening), varus displacement, nail pull-out, and/or screw breakage are some of the problems commonly seen in these osteoporotic patients who had been treated by dynamic hip screw (DHS).^{1,2} Although this implant is the standard treatment for unstable intertrochanteric fractures, it is associated with high rate of complications and morbidity, and therefore primary hip arthroplasty was also suggested as an alternative treatment by some authors.²⁻⁴ In addition, DHS is not usually recommended in unstable reverse oblique fractures.^{2,5,6}

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. They can also be inserted faster, with less operative blood loss and allow early weight bearing with less resultant shortening on long term follow up.

Biomechanical studies have shown that intramedullary devices are more stable under loading, although associated with more reoperation rates as shown in few studies. Furthermore, the tip of the nail was redesigned to decrease the risk of intra and post-operative fractures of the femoral shaft by a significant reduction in bone stress.

Hence the present study was done at our tertiary care centre to compare the functional outcome of unstable intertrochanteric fractures treated randomly with proximal femoral nail (PFN) v/s dynamic hip screw (DHS) v/s bipolar hemiarthroplasty using Harris hip score (HHS) and to evaluate the advantages, disadvantages and complications associated with fixation of unstable intertrochanteric fractures with proximal femur nailing and dynamic hip screw.

METHODS

The prospective study was conducted in a tertiary institute by collecting data of 90 cases of unstable and complex intertrochanteric fracture who have undergone proximal femur nail and dynamic hip screw randomly at tertiary hospital from December 2014 to April 2016 and followed up till next 6 months postoperatively. The study started after Institutional Ethics Committee approval.

Surgically fit post-traumatic patients more than 70 years of age who has been diagnosed as having complex/unstable intertrochanteric fractures which include postero medial large separate fragmentation, basicervical patterns, reverse obliquity, displaced greater trochanteric fractures and failure to reduce fracture before fixation or with sub-trochanteric extension were included in study. Patients with following conditions were excluded viz., patients who had less than 6 months of follow-up, bilateral fractures, pathological or compound fractures, fractures associated with polytrauma, pre-existing femoral deformity preventing hip screw osteosynthesis or intra-medullary nailing and sub-trochanteric fractures, fractures extending 5 cm distal to the inferior border of the lesser trochanter.

Clinical and radiological assessment as per the patient proforma done for comparison in terms of

- Union defined as appearance of bridging callus and disappearance of fracture line.
- On postop follow-up neck-shaft angle will be calculated and variations will be noted after same post op mobility protocol was followed for both group of patients.
- Limb length discrepancy will be measured.

- Any intraoperative or postoperative blood transfusion will be noted.
- Any complications if any arise during follow up will be noted viz., early- intraoperative blood loss, immediate postoperative blood transfusions, infection, late infection, hip pain, readmission, screw cut out, varus collapse.

Statistical analysis

After the data regarding mentioned variables was procured preoperatively and postoperatively, it was tabulated and analyzed. Data were statistically described in terms of mean (\pm SD), frequencies (number of cases) and percentages when appropriate. Pre and post comparison of ordinal data was done using Wilcoxon's sign rank test while Fisher's exact test, chi-square test were used for comparing qualitative variables. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 20.

RESULTS

In the study of total 90 cases of unstable and comminuted peritrochanteric fractures, according to AO classification, 15 patients were 31A2.2 type while number of 53 and 22 patients was included in 31A2.3 and 31A3.1 type (Table 1). Each group included 30 patients. Among them, 3 cases (3%) showed failure of union among them 2 patients underwent DHS while one underwent PFN fixation. 73 cases went well without any complication while 5 cases with DHS screw cut-out among them 2 underwent non-union, 3 cases with Z-effect in PFN fixation (Figure 1-4). Total number of 6 cases (6.6) had infection, 3 of them underwent DHS fixation while 3 patients underwent bipolar hemiarthroplasty (Table 2).



Figure 1: 72 year male with DHS plating with GT wiring.



Figure 2: DHS screw superior cut-off with non-union, postoperative 3 months.



Figure 3: 74 year male with PFN fixation.



Figure 4: 87 year male with cemented bipolar with GT wiring.

Table 1: AO type.

Types	Frequency	Percentage
31A2.2	15	16.7
31A2.3	53	58.80
31A3.1	22	24.40
Total	90	100

Table 2: Complications and their distribution.

Complications	Frequency	Percentage
DHS		
Infection	3	3.3
Screw cut out with malunion	3	3.3
Screw cutout with nonunion	2	2.2
PFN		
Infection	0	0
Non-union PFN	1	1.1
Z Effect	3	3.3
Bipolar		
Infection	3	3.3
Dislocation	1	1.1
DVT/PE	1	1.1
Death	0	0
No	73	81.1
Total	90	100

Complications and their distribution including shortening and need for blood transfusion in each group is mentioned below (Table 3-5). It suggest that DHS fixation has more rate of complications (26.6%) than other two while requirement of blood transfusion is most in bipolar group.

Table 3: Association of modality of treatment and complication.

Modality treatment	Complications		Total (%)
	Yes (%)	No (%)	
PFN	4 (13.3)	26 (86.6)	30 (100.0)
DHS	8 (26.6)	22 (73.3)	30 (100.0)
Bipolar	5 (16.6)	25 (83.3)	30 (100.0)
Total	17 (18.8)	73 (81.1)	90 (100.0)

Fisher's exact value p=0.244 (non-significant).

Table 4: Association of modality of treatment and h/o blood transfusion.

Modality treatment	H/o blood transfusion		Total (%)
	Yes (%)	No (%)	
PFN	1 (3.3)	29 (96.7)	30 (100.0)
DHS	12 (40)	18 (60)	30 (100.0)
BIPOLAR	16 (53.3)	14 (46.7)	30 (100.0)
Total	29 (32.2)	61 (67.8)	90 (100.0)

Chi sq =10.769; df =1; p=0.002 (highly significant)

At 6 weeks-mean score in PFN was higher 45.4 as compared to 39.5 in DHS group and 76.8 in bipolar

group. At 6 months-mean score in PFN, DHS, bipolar groups were 90.3, 81.6, 92.4 respectively (Table 6 and 7).

Table 5: Association of modality of treatment and shortening.

Modality Treatment	Shortening		Total
	Yes (%)	No (%)	
PFN	1 (3.3)	29 (96.7)	30 (100.0)
DHS	1 (3.3)	29 (96.7)	30 (100.0)
Bipolar	4 (13.3)	26 (86.7)	30 (100.0)
Total	6 (6.6)	84 (93.4)	90 (100.0)

Fisher’s exact value p=0.356 (non-significant).

Table 6: Association of modality of treatment and Harris hip score at 6 weeks.

Modality treatment	HHS (6 weeks)		P value
	Mean	SD	
PFN	45.4	2.6	<0.001
DHS	39.5	2.2	(very highly significant)
Bipolar	76.8	2.4	(very highly significant)

t=10.972; df =68.

Table 7: Association of modality of treatment and Harris hip score at 6 months.

Modality treatment	HHS (6 months)		P value
	Mean	SD	
PFN	90.3	4.4	<0.001
DHS	81.6	5	(very highly significant)
Bipolar	92.4	3.8	(very highly significant)

t=7.702; df =68

DISCUSSION

Majority of these fractures were caused by domestic fall. We have used AO classification in series because it appears to be more descriptive. In our study in DHS group maximum patients were of AO type 31-2.3 which was 58.8% of the total (Table 1). In our study there was 1 case of fixation failure in PFN group due to poor technical performance. 3 cases of Z effect due to longer proximal cannulated cancellous screws. Cases of Z effect were managed conservatively with protected weight bearing and fracture united. In DHS group there were 5 cases screw cut out, all were revised with

hemiarthroplasty as they were of >65 years old. Hence failure rate seen more with DHS as compared to PFN requiring revision surgeries.

Several authors reported on the complication of femoral shaft fracture with intramedullary nail and recommended against its use but in our study no such complication occurred. Complication rate is seen to be higher in DHS than PFN and bipolar but is not statistically significant.

In this study shortening was found in 11.5% patients in DHS group and in 2.86% patients in PFN group. Considering the fact that additional surgical exposure can theoretically prolong the operative time and thus the blood loss in DHS than PFN it can also be noted that in our study, history of blood transfusion post operatively in DHS group the p value for which was significant according to Pearson’s chi-square test with p value 0.004.

All the patients were subjected to Harris hip score at 6 weeks and 6 months. At 6 weeks, HHS mean score is considerable high bipolar group suggestive of excellent early pain relief with bipolar compared to fixation methods. At 6 months-mean score in PFN, DHS, bipolar groups were 90.3, 81.6, 92.4 respectively. This suggested long-term HHS-score is equivocal in all methods with highest in bipolar group.

Bridle and associates prospectively compared fixation of 100 intertrochanteric fractures treated randomly by either dynamic hip screw or intra medullary device like the proximal femoral nail and found no difference in operating time, blood loss, wound complications and final mobility.⁷ In their study cut-out occurred in 3 cases with DHS and in 2 cases with intramedullary device. However 4 cases of fracture femur occurred close to the tip of the intramedullary device.

No difference was found in the outcomes comparing stable and unstable fracture patterns in a series by Adams et al and they reported that only 21% of their 197 patients regained their pre-fracture independence.⁸

Sudan and associates showed that there was no statistically significant difference intraoperatively, radiologically or clinically between patients treated with dynamic hip screw or intramedullary hip screw in their study of 206 patients as shown in Table 8.⁹

Table 8: Comparison with various studies.

	Boldin et al ¹⁰		Sudan et al ⁹		Present study					
	PFN	%	PFN	%	DHS	%	PFN	%	DHS	%
Infection	-	-	-	-	-	-	-	-	3	3.3
Z effect	3	5.45	-	-	-	-	3	3.3	-	-
Varus collapse	-	-	-	-	-	-	-	-	5	5.5

According to Ahrengart and associates, intramedullary device more frequently preserved the fracture position

obtained pre-operatively.¹¹ They also concluded that in the less communitated fractures the compression hip screw

method was the preferred method of treatment whereas the intramedullary nail was an alternative treatment for more comminuted fractures.

In 2010 a study by Sancheti et al, concluded that hemiarthroplasty for unstable osteoporotic inter-trochanteric fractures in elderly results in early ambulation and good functional results.¹² Findings in our study supports bipolar hemiarthroplasty as good alternative in elderly patients.

CONCLUSION

The PFN group and bipolar group in our study performed much better in view of union rates, complications, blood transfusion and functional outcome based on HHS than the DHS group. Our conclusion from our study supports the use of PFN for unstable and complex intertrochanteric fracture femur with lesser failure rates, lesser blood loss, less shortening, early union, less revision surgery and better functional outcome. However, during implantation of PFN a more precise technical performance is required for better outcome. However, extremely osteoporotic patients or extreme comminution at fracture site favours bipolar hemiarthroplasty in elderly patients.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Davis TR, Sher JL, Horsman A, Simpson M, Porter BB, Checketts RG. Intertrochanteric femoral fractures. Mechanical failure after internal fixation. J Bone Joint Surg Br. 1990;72(1):26–31
2. Geiger F, Zimmermann-Stenzel M, Heisel C, Lehner B, Daecke W. Trochanteric fractures in the elderly: the influence of primary hip arthroplasty on 1-year mortality. Arch Orthop Trauma Surg. 2007;127(10):959–66.
3. Jones HW, Johnston P, Parker M. Are short femoral nails superior to the sliding hip screw? A meta-analysis of 24 studies involving 3,279 fractures. Int Orthop. 2006;30(2):69–78
4. Chan KC, Gill GS. Cemented hemiarthroplasties for elderly patients with intertrochanteric fractures. Clin Orthop Relat Res. 2000;371:206–15.
5. Rodop O, Kiral A, Kaplan H, Akmaz I. Primary bipolar hemiprosthesis for unstable intertrochanteric fractures. Int Orthop. 2002;26(4):233–7.
6. Davis TR, Sher JL, Horsman A, Simpson M, Porter BB, Checketts RG. Intertrochanteric femoral fractures. Mechanical failure after internal fixation. J Bone Joint Surg Br. 1990;72(1):26–31
7. Bridle SH, Patel AD, Bircher M, Calvert PT. Fixation of intertrochanteric fractures of the femur. A randomised prospective comparison of the gamma nail and the dynamic hip screw. J Bone Joint Surg Br. 1991;73(2):330–4.
8. Adams CI, Robinson CM, Court-Brown CM, McQueen MM. Prospective randomized controlled trial of an intramedullary nail versus dynamic screw and plate for intertrochanteric fractures of the femur. J Orthop Trauma. 2001;15:394–400.
9. Saudan M, Lubbeke A, Sadowski C, Riand N, Stern R, Hoffmeyer P. Pertrochanteric fractures: is there an advantage to an intramedullary nail? A randomized, prospective study of 206 patients comparing the dynamic hip screw and proximal femoral nail. J Orthop Trauma. 2002;16:386–93.
10. Boldin C, Seibert FJ, Fankhauser F, Peicha G, Grechenig W, Szyszkowitz R. The proximal femoral nail (PFN)-a minimal invasive treatment of unstable proximal femoral fractures: a prospective study of 55 patients with a follow-up of 15 months. Acta Orthop Scand. 2003;74(1):53–8.
11. Ahrengart L, Tornkvist H, Fornander P, Thorngren KG, Pasanen L, Wahlstrom P, et al. A randomized study of the compression hip screw and Gamma nail in 426 fractures. Clin Orthop. 2002;401:209–22.
12. Sancheti KH, Sancheti PK, Shyam AK, Patil S, Dhariwal Q, Joshi R. Primary hemiarthroplasty for unstable osteoporotic intertrochanteric fractures in the elderly: A retrospective case series. Indian J Orthop. 2010;44(4):428–34.

Cite this article as: Hussain N, Patel HB, Patil ND. Management of complex intertrochanteric fractures of the femur in elderly patients – dynamic hip screws or proximal femoral nails or arthroplasty. Int J Res Orthop 2017;3:656-60.