

ORIGINAL RESEARCH**A comparative study on the functional outcome of intertrochanteric fractures treated by proximal femoral nailing or dynamic hip screw fixation****¹Dr. Gangdayal Sharma, ²Dr. Shailesh Kumar, ³Dr. Vidya Sagar, ⁴Dr. Manish Kumar**^{1,2}Senior Resident, ³Assistant Professor, ⁴Additional Professor, Department of Orthopaedics, IGIMS, Patna, Bihar, India**Correspondence:**

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Email: manishorthomicro@gmail.com**Abstract**

Introduction: Intertrochanteric fractures are one of the most commonly occurring injuries in elderly patients and were reportedly high among females and those affected with osteoporosis. In this study, these types of injuries were treated with DHS or PFNA2.

Materials and Methodology: This study is basically designed as a prospective and observational study and the proposed study period was estimated to be around August 2019 – July 2021. All the study participants were affected with type I, type II or type III intertrochanteric fractures who were undergoing PFNA2 or DHS fixation in the Department of Orthopaedics, IGIMS, Patna and were followed up for up to 9 months post-operatively. Quantitative variables were equally summarized as mean and standard deviation whereas qualitative variables were written as percentages and proportions. Using *Harris* hip score the functional outcome has been divided as excellent (90-100), good (80-89), fair (70-79) and poor (<70).

Results: The functional outcome when classified using HHS was 66.6% (good), 6.7% (fair) and 26.7% (poor) for DHS group whereas 15.3% (excellent), 77% (good), 12.5% (fair) for PFNA2 group. In case of unstable fractures DHS group had 57.1% (fair) and 43% (poor) results out of 7 patients. When compared to this PFNA2 group had 77 (good) and 10% (fair) results out of 10 patients.

Conclusion: To conclude, PFNA2 fairly showed a better functional outcome when compared to DHS. Although, DHS gives good functional outcome in stable fractures it is not so fair in the case of unstable fractures. The radiological union is also faster with proximal femoral nailing. Therefore, based on this study, PFNA2 could be the better fixation device when compared to DHS particularly in those unstable fractures.

Keywords: intertrochanteric fracture, dynamic hip screw, proximal femur nail anti-rotation, geriatrics

Introduction

The most common type of fractures that affect the geriatric patients are reported to be intertrochanteric fractures, but they are usually infrequent in the individuals with younger age group. These intertrochanteric fractures are majorly managed conservatively which normally healed with vicious callus, coxa vara deformity is frequently observed and hence resulting in lower limb shortening and limb flaccidity.¹ Various surgical procedures with multiple implants have been widely elaborated in the literature and are used for the treatment of

intertrochanteric fractures. Conservative management is therefore commonly resulted in a vicious callus with varus, external rotation with shortening which results in the short limping gait while walking and a high mortality rate due to the various complications when lying down and prolonged immobilization. The major goal in the management of intertrochanteric fractures will be nearly to restore pre-injury condition rapidly and spontaneously. This has led to internal fixation to enhance the patient comfort by facilitating nursing care, reducing the stay in the hospitals, early mobilization and reducing complications. Various difficulties that were encountered in managing this fracture are the instability and fixation complications. Stability is the capability of an internally attached fracture to withstand gravity and muscle forces which are acting around it and causing the fracture to undergo varus displacement. Various other attributing factors that might constitute mostly to fixation failure are few intrinsic factors such as the fracture reduction of the fractures and osteoporosis and some extrinsic contributing factors such as the implant of choice and insertion technique of the screws.²

The selection and the type of implant being used will affect the final outcome and the complication of that fixation might associate with the fracture and its fixation. Dynamic hip screw (DHS) and sliding plate device has already been widely used for fixation. Therefore, if weight bearing is started early, particularly in the compound and comminuted fractures, the device might pose a tendency to penetrate or retract through the head. Although, the proximal femoral nailing (PFN) is the intramedullary device that has commonly been resulted to have been benefited in such fractures since its placement is very close to its mechanical-axis of the body and thus it minimizes the lever arm aspect on the implant. Additionally, they also take meagre time to insert with little blood loss, allow early weight-bearing movement post-surgery which further result in reduced long-term follow-up.

Internal fixation and early mobilization are reportedly the standard line of treatment. These fractures could be managed by various types of implants like dynamic hip screw (DHS), blade plate, proximal femoral locking plate, gamma nail, proximal femoral nail (PFN) and Proximal femoral nail anti-rotation Asia (PFNA2).³⁻⁵ Broadly the implants can be classified into Intramedullary and extramedullary devices. Extramedullary devices majorly comprise of DHS, blade plate and proximal femoral locking plate. DHS is a commonly used implant in the management of intratrochanteric fractures which permits the collapse at the fracture site which further results in fracture union. Since this line of management has its own disadvantages.

The main aim and objectives in this study were to compare the functional outcome in patients with intertrochanteric fractures treated by DHS fixation or PFNA2 and to compare radiological union at fracture site occurring with the two internal fixation devices which are used to treat similar kinds of fractures.

Materials and methodology

This study is basically designed as a prospective and observational study and the proposed study period was estimated to be around August 2019 – July 2021. All the study participants were affected with type I, type II or type III intertrochanteric fractures who were undergoing PFNA2 or DHS fixation in the Department of Orthopaedics, IGIMS, Patna and were followed up for up to 9 months post-operatively. A total of 45 patients were constituted as the study group and all the participants were divided to two groups with 22 and 23 participants for DHS and PFNA2.

All the patients underwent standard rehabilitation protocol and they were started mobilization on 2nd post-operative day with strengthening exercise involving quadriceps, knee and ankle mobilization. Drains were removed after 24 hours. Wound inspection was performed on 3rd postoperative day. Stitches were particularly removed after 10-day postoperatively.

Postoperative follow-up was done at 3 months, 6 months, 9 months following the surgery and the scores were assessed by *Harris* hip score (HHS).⁶ Radiographs of fracture were taken at the end of 3 months, 6 months and 9 months to evaluate whether union has happened effectively.

Various inclusion criteria that had been followed in this study are those patients who are above 18 years, all types of intertrochanteric fractures, fractures which are more than 3-weeks old, Patients who gave consent for study. There are some exclusion Criteria also which showed that the patients below 18 years, bilateral fractures, pathological fractures, fractures associated with polytrauma, pre-existing femoral deformity.

The results were entered carefully in MS excel version 3.4.1 and were analysed using SPSS version 20. Quantitative variables were equally summarized as mean and standard deviation whereas qualitative variables were written as percentages and proportions. Using *Harris* hip score the functional outcome has been divided as excellent (90-100), good (80-89), fair (70-79) and poor (<70). Quantitative variables were compared using unpaired Student's t test/Mann Whitney U test. The qualitative variables were compared with Chi square test/Fisher's exact test. P value of less than 0.05 was considered to be significant statistically.

Results

The age of the patients included in the present study were ranged between 46 to 81 years with mean age of 69.27 years in case of DHS and a mean age of 58.72 for PFNA2. Majority of the patients were females in both the DHS group (58.5%) and the PFNA2 group (53.8%). Of the total cases done by DHS, 72.9% (n=16) were stable fractures, and 27.1 % (n=6) being unstable. For the PFNA2 group, 70.8 % (n=16) were stable and 29.2% (n= 7) were mostly unstable intertrochanteric fractures.

Radiological outcome evaluation has revealed that 70.8% union in the PFNA2 group at 3 months and 97.9 % union at 6 months, 91.3% union at around 9 months among the DHS group as tabulated in table - 1. In case of unstable fractures out of the 16 cases treated with DHS, fracture site union could not be established in 6 cases even after 6 months in contrary to only one case that didn't unite in the PFNA2 group.

Functional outcome of the patients was evaluated with *Harris* hip score (HHS) for both groups have been compared at 3, 6, 9 months and the details are given in table - 2. A higher average HHS is evidently seen (p value < 0.05, Mann Whitney U test) across the months to follow-up.

The functional outcome when classified using HHS was 66.6% (good), 6.7 (fair) and 26.7% (poor) for DHS group whereas 15.3% (excellent), 77% (good), 12.5% (fair) for PFNA2 group. In case of unstable fractures DHS group had 57.1% (fair) and 43% (poor) results out of 7 patients. When compared to this PFNA2 group had 77 (good) and 10% (fair) results out of 10 patients as tabulated in table - 3.

Table 1: Radiological outcome evaluation

	Type of implant	United	Not united	P – value
3 months	DHS	6 (27.1%)	16 (72.9%)	0.001
	PFNA2	16 (70.8%)	7 (29.2%)	
6 months	DHS	16 (72.9%)	6 (27.1)	<0.01
	PFNA2	22 (97.9%)	1 (2.1%)	
9 months	DHS	18 (81.9%)	4 (18.1)	<0.01
	PFNA2	21 (91.3%)	2 (8.7%)	

Table 2: HHS at 3, 6 and 9 months

	Groups	N	Mean	SD	P – value
3 months	DHS	22	36.23	5.082	<0.01
	PFNA2	23	46.35	4.833	
6 months	DHS	22	53.69	5.841	<0.01
	PFNA2	23	67.71	4.972	
9 months	DHS	22	71.52	6.943	<0.01
	PFNA2	23	81.12	5.006	

Table 3: Outcomes with methods of fixation

	DHS		PFNA2	
	Stable	Unstable	Stable	Unstable
Excellent	0	0	2	0
Good	10	0	10	9
Fair	1	4	1	1
Poor	4	3	0	0
Total	15	7	13	10

Discussion

Over the past 3 decades, the reported incidence of colorectal intertrochanteric fractures is one of the common fractures particularly in the old age group individuals globally. The various treatment options for the effective management of these fractures have greatly evolved a lot in the recent years. DHS has been recommended as the gold standard in the treatment of intertrochanteric fractures for over a long period of time. After the launch of cephalomedullary nails has given many orthopaedic surgeons newer options in the management of these fractures particularly reported with the unstable conditions. Various types of cephalomedullary nails have been brought to market with few added advantages with the latest one being PFNA2. In the given study, a valuable attempt has been made in order to compare the radiological, functional and clinical outcomes in patients who were subjected to surgical treatment with DHS and PFNA2.

All the study participants who were included in the study were ranged between 46 to 81 years with mean age of 69.27 years in case of DHS and a mean age of 58.72 for PFNA2. Majority of the patients were females in both the DHS group (58.5%) and the PFNA2 group (53.8%). The major mechanism of injury was reported to be domestic fall in elderly (78%) and lesser common causes were road traffic accident and fall from height.

The current study reveals a significant difference in the number of fractures that were united when compared at 3 months (P value=0.001), 6 months (<0.01) as well as in 9 months (<0.01), suggesting that union is significantly earlier in PFNA2 nailing than in dynamic hip screw fixation. This result was reported to be in contrast to the study conducted by *Venkaresh* et al in which there was no significant difference in the time to reunion among the two groups in which the comparison was between DHS and PFN as against PFNA2 which was the effective choice of implant in the proposed study. Another plausible reason that could be attributed to the higher mean age of patients in the DHS group. The overall functional outcome of patients affected with intertrochanteric fractures who were treated by PFNA2 is significantly better than those treated by DHS fixation. The average *Harris* hip score compared at the end of 3 months, 6 months and 9 months conducted by *Ujjal Bhakat* et al as enlisted in table 4 reveals comparable results.⁹

Harris has given the proposed scoring criteria for the classification of functional outcome which was observed that there was 66.6% (good), 6.7 (fair) and 26.7% (poor) for DHS group whereas 15.3% (excellent), 77% (good), 12.5% (fair) for PFNA2 group. In case of unstable

fractures DHS group had 57.1% (fair) and 43% (poor) results out of 7 patients. When compared to this PFNA2 group had 77 (good) and 10% (fair) results out of 10 patients as tabulated in table - 3. In a study conducted by *Mohammed Faisal* and *Prithviraj* revealed an excellent outcome of 66%, good outcome of 28%, fair outcome of 6% for PFNA2 and excellent outcome of 36%, good outcome of 54%, fair outcome of 8%, poor outcome of 2% for DHS.¹⁰

Functional outcome could effectively be influenced by the type of fractures. The current study had also compared the functional outcome among stable and unstable fractures in the two groups that had been followed in the study. Among the 22 cases of proximal femoral nailing 7 were unstable intertrochanteric fractures. Among the 15 intertrochanteric fractures 66.7% (10) good and 6.7% (1) fair outcomes were observed. 7 patients were having unstable fractures in the DHS group (n=22), of which 57.1% (4) fair and 43% (3) poor outcomes. This suggests that for unstable fractures PFNA2 is a far better implant than DHS. Similar findings were also observed in a study done by *Karnam et al.*⁸

Conclusion

To conclude, PFNA2 fairly showed a better functional outcome when compared to DHS. Although, DHS gives good functional outcome in stable fractures it is not so fair in the case of unstable fractures. The radiological union is also faster with proximal femoral nailing. Therefore, based on this study, PFNA2 could be the better fixation device when compared to DHS particularly in those unstable fractures.

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