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Original Research Article

Comparative study of management of intertrochanteric fracture by dynamic hip screw and proximal femoral nailing

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ABSTRACT

Background: The purpose of the present study is to verify the theoretical advantages of the intramedullary device over the dynamic hip screw devices and also whether it actually alters the eventual functional outcome of the patient.
Methods: The study is comparative prospective study in which 40 patients were taken and treated either with dynamic hip screw or proximal femoral nailing. The clinical data will be collected and compared with pre-injury activity and present functional level with modified Harris hip score.
Results: We found that there is no significant difference between Harris hip score in stable fracture (p value=0.222) fixed either with DHS or PFN. But there is statistically significant difference of score in unstable fracture (p value 0.040) treated by DHS and PFN. Functionally, utilizing the Harris hip scoring system, at the final follow-up, our study affirms PFN to be superior to DHS in unstable intertrochanteric fractures while in stable fractures, functional results are same.
Conclusions: PFN is also found better in unstable fractures, because a greater number of patients having excellent Harris hip score. In stable fracture, functional result is same in both groups.

Keywords: Intertrochanteric fracture, Dynamic hip screw, Proximal femoral nail, Harris hip score

INTRODUCTION

Intertrochanteric fracture involves those occurring in region extending from extracapsular basilar neck region to the region along the lesser trochanter proximal to the origin of medullary canal.[1] Intertrochanteric and peritrochanteric are generic term for pertrochanteric fracture. Its incidence has been estimated to be more than 250,000 patients each year in the United States, with the reported mortality ranging from 15 to 20%.[2] Average age incidences of this fracture is 66-76 yrs.[3] Women are more commonly affected as compared to male because of postmenopausal osteoporosis as we found that female to male ratio is 2:1 to 8:1.[3]

According to Cumming, many factors are determining whether a particular fall results in a fracture of the hip like fall is on or near the hip, lack of protective reflex, inadequate muscles and fat around hip to act as shock absorber and poor bone strength.[4] The incidence of hip fracture in aging population is rising in all parts of world, and the number may reach to 5, 12,000 by the year 2040.[5]

METHODS

The study was carried out in the department of orthopaedics, Hindu Rao hospital and North Delhi municipal corporation medical college, New Delhi. The study was done to compare the role and functional outcome of dynamic hip screw and proximal femoral nail in the management of Intertrochanteric fracture of femur.

The study is comparative prospective study in which 40 patients were taken with intertrochanteric fracture and

treated either with dynamic hip screw or proximal femoral nailing. Patients were allocated randomly by sealed envelopes into groups according to computer generated sequence of random number, which were not opened until patient's consents had been taken. Cases were evaluated as regard to functional outcome, fracture healing radiologically and complication if any.

The study includes 20 cases each in DHS and PFN group for a period of 1 year from June 2016 to May 2017.

Inclusion criteria

Patient with intertrochanteric fracture of either sex, age 50 years and above, patient fit for anaesthesia were included.

Exclusion criteria

Patient unfit for surgery, with open/pathological fracture. Admitted for re-operation, patient not willing to be part of study were excluded.

Sample size estimation

Sample size is determined based on the ability to detect the Functional outcome as 'Excellent' between the two groups with reference to previous study.[6]

Formula for sample size is given below:

$$n = \frac{[Z_{1-\frac{\alpha}{2}}\sqrt{2}P(1-P) + Z_{1-\beta}\cdot\sqrt{\{P_1(1-P_1)+P_2(1-P_2)\}}]^2}{(P_1-P_2)^2}$$

Where,
P_1= Anticipated population of patients whose Functional outcome as 'Excellent' in DHS group.
P_2= Anticipated population of patients whose Functional outcome as 'Excellent' in PFN group.

$$P = \frac{P_1 + P_2}{2}$$

When the patients came in casualty of Hindu Rao Hospital, after proper examination they were advised, routine blood investigations, radiological investigation and pre-anaesthetic check-up.

In operation theatre under proper aseptic condition patients in each group were operated and internal fixation done.

Post-operatively injectable antibiotics given for 5 days. Static quadriceps exercise started on 2nd day and active quadriceps and hip flexion exercise started on 5th day. Sutures were removed on 12th post-op day (alternate) and complete suture removal done on 14th post-operative day. Partial weight bearing was started after reviewing clinically and radiologically at about 6 weeks post operatively. Full weight bearing allowed after the confirmation of radiological and clinical union.

Parameters for evaluation

The clinical data will be collected and compared with pre-injury activity and present functional level with modified harris hip score.

Data management and statistical analysis

Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0. Continuous variables are presented as mean±SD, and categorical variables are presented as absolute numbers and percentage. The comparison of normally distributed continuous variables between the groups was performed using Student t test. Nominal categorical data between the groups were compared using chi-square test or Fisher's exact test as appropriate. P-value <0.05 was considered statistically significant.

RESULTS

In this study total 40 cases of intertrochanteric fracture were selected on the basis of inclusion criteria and divided equally in both DHS and PFN group.

Age group

34 out of 40 patients (i.e. 85%) are above 60 yrs. So, majority of cases are seen in elderly populations (Table 1).

Mode of injury

Low energy trauma was common mode of injury as most of the patients had history of trivial fall (Table 2).

Fracture classification

Majority of patients (45%) were of 31-A2.3 type as per AO/AISF classification.

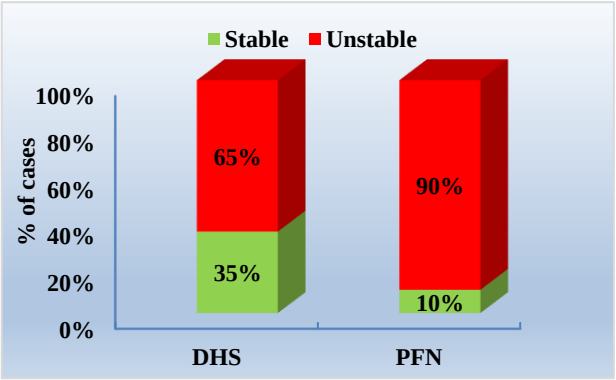

Figure 1: Stability classification.

Stability classifications

Number of stable fractures was (n=9) and unstable was (n=31). In DHS group there was 7 stable and 13 unstable

and in PFN group 2 stable and 18 unstable. Majority of patients were unstable (Figure 1).

Postoperative complication

Surgical site infection (n=1) in DHS group. No any infection in PFN group. In 2 Patients there was implant failure in DHS group (10%) and no implant failure in PFN. Both this failure was in unstable fracture.

Ambulatory status

In DHS group community ambulatory (n=15), home bound (n=4) and bed ridden (n=1) and in PFN group home bound (n=1). As compared to pre-op ambulatory status, 2 more patients got home bound and one patient got bed ridden in DHS group while in PFN group no new case of altered ambulation appeared. Most of the patients in both groups are community mobile post-operatively.

Radiological status

In DHS group delayed union (n=1) and nonunion (n=2) and in PFN group delayed union (n=1) and no case of nonunion.

Functional outcome

Functional outcome is assessed on the basis of harris hip score. In the present study mean of Harris hip score in PFN group was found to be 86.95 ±2.33 which is more than Harris hip score of DHS group (83.11± 2.87). The p value of (<0.001) suggests that the difference of score in between the groups was statistically significant.

Table 1: Age distribution in both the groups.

Age groups(years)	Groups				P value
	DHS		PFN		
	Frequency	%	Frequency	%	
<60	1	5.0	5	25.0	0.726
61-70	10	50.0	8	40.0	
71-80	7	35.0	1	5.0	
>80	2	10.0	6	30.0	
Total	20	100	20	100.0	

Table 2: Mode of injury in both groups.

Injury mode	Groups				P value
	DHS		PFN		
	Frequency	%	Frequency	%	
Fall from height	1	5.0	0	0.0	0.101
Fall from stairs	1	5.0	2	10.0	
Fall in bathroom	1	5.0	5	25.0	
Fall while walking	16	80.0	9	45.0	
Road traffic accident	1	5.0	4	20.0	
Total	20	100	20	100.0	

Table 3: Number of patients as per AO/ASIF fracture classification in both groups.

AO classification	Groups				P value
	DHS		PFN		
	Frequency	%	Frequency	%	
31-A1.2	3	15.0	1	5.0	0.288
31-A1.3	2	10.0	0	0.0	
31-A2.1	2	10.0	1	5.0	
31-A2.2	3	15.0	2	10.0	
31-A2.3	9	45.0	9	45.0	
31-A3.1	0	0.0	3	15.0	
31-A3.2	1	5.0	3	15.0	
31-A3.3	0	0.0	1	5.0	
Total	20	100	20	100	

Table 4: Overall functional outcome as per the Harris hip score (HHS).

Harris hip score	Groups				P value
	DHS		PFN		
	Frequency	%	Frequency	%	
Poor	0	0.0	0	0.0	0.016
Fair	2	10.0	0	0.0	
Good	17	89.5	14	70.0	
Excellent	0	0.0	6	30.0	
Total	19	100.0	20	100.0	

Table 5: Functional outcome in unstable group as per harris hip score.

Harris hip score	Groups				P value
	DHS		PFN		
	Frequency	%	Frequency	%	
Poor	0	0.0	0	0.0	0.040
Fair	2	16.7	0	0.0	
Good	10	83.3	13	72.2	
Excellent	0	0.0	5	26.3	
Total	12	100.0	18	100.0	

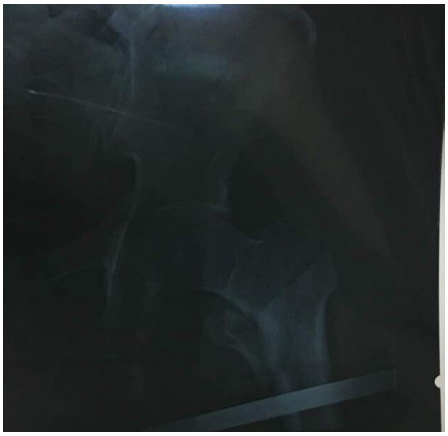

Figure 2: Radiograph of a 64 years old female with AO/OTA type A2.3 fixed with DHS of pre-op.

Figure 3: Radiograph of a 64 years old female with AO/OTA type A2.3 fixed with DHS of immediate post-op.

Figure 4: Radiograph of a 64 years old female with AO/OTA type A2.3 fixed with DHS of X-ray 6 months post-op.

Figure 5: Radiological status of 72 years old female of type AO/OTA A3.3, fixed with PFN of pre-op.

Figure 6: Radiological status of 72 years old female of type AO/OTA A3.3, fixed with PFN of immediate post-op.

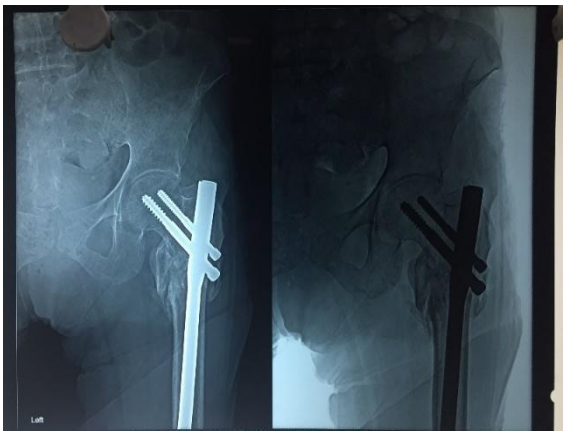

Figure 7: Radiological status of 72 years old female of type AO/OTA A3.3, fixed with PFN of X-ray 6 months post-op.

Harris hip score overall

In PFN group 6 has excellent (90-100) and 14 has good (80-89) score. In DHS group 17 has good (80-89) and 2 has fair (70-79) score. There is statistically significant difference in overall functional outcome HHS in both group as p-value is 0.016 (Table 4).

Harris hip score in stable and unstable fracture

There was no statistically significant difference in functional outcome in stable fracture in both groups as p-value was 0.222. Functional outcome in unstable type in DHS group number of patients having fair (70-79) score was 2, good (80-89) score was 10 and none had Excellent score. In PFN group patients having excellent (90-100) score was 5 and good (80-89) score was 13. 26.3% patients had excellent and 72.2% had good score in unstable cases fixed with PFN and 83.3% had good score and none had excellent score fixed with DHS. The results were found to be statistically significant as p=0.0409 (Table 5).

DISCUSSION

In our study, we compared the DHS and PFN for management of intertrochanteric fractures. The study was conducted on 40 patients of either sex and age group was 50 years and above, at Hindu Rao Hospital, between June 2016 to May 2017. The purpose of study was to compare functional outcome of DHS and PFN. In this study Modified Harris Hip Score was used to assess the functional outcome. Fractures were classified on the basis of AO/OTA classifications. Hip fracture is a common injury that occurs predominantly in the elderly. Similar results were obtained by Lustosa et al.[7]

The ratio of women: men range from 2:1 to 8:1 likely because of post-menopausal osteoporosis. Female preponderance is supported by various other western authers.[8] Helfenstein suggested that, by stimulation of osteoclasts due to post-menopausal deficiency of steroid hormones is responsible for greater osteoporosis. In our study most common cause of injury in elderly was low energy trauma (fall while walking and fall in bathroom) (77.5%).

Though there is improvement in conservative treatment, ideal result couldn't be achieved. The basic problems in conservative treatment are not of union but of hypostatic pneumonia, decubitus ulcers, urinary tract infection, disuse osteoporosis, disuse atrophy of muscles, joint contracture and stiffness, malunion and deep vein thrombosis. Operative treatment in the form of internal fixation permits early rehabilitation and offers the best chance of functional recovery, and hence has become the treatment of choice for virtually all fractures in the trochanteric region.

However, according to the study by Saarenpaa et al, Sliding Hip Screws used in the treatment of unstable intertrochanteric fractures have a very high failure rate with a reoperation rate of 8.2% which is unacceptable in the present-day scenario.[9] An intramedullary implant inserted in a minimally invasive manner is better tolerated in the elderly patients.[10] The cephalomedullary nails with a trochanteric entry point have gained popularity in recent years.[11] They have been shown to be biomechanically stronger than extramedullary implants.[12] The Gamma nail is associated with specific complications, among which anterior thigh pain and fracture of femoral shaft are most common. The Proximal femoral nails system (PFN), developed by AO/ASIF, and has some major biomechanical innovations to overcome the previously mentioned limitations of the Gamma nail. Proximal Femoral Nail can be applied with a smaller incision with minimal tissue handling of unstable intertrochanteric fractures.[13,14]

In this study Modified Harris Hip Score was used to assess the functional outcome. In our study patients who had undergone PFN had mean Harris hip score of 86.95 and patient who had undergone DHS had mean score of 83.11 (p-value is less than <0.001) which is statistically

significant. Also Modified Harris hip score is Good (80-89) in 17 patients in DHS group and in PFN group 14 patients Harris hip score is Good (80-89) and 6 are Excellent (90-100), which is statistically significant because p-value is 0.016 (<0.05). On further analysis we found that there is no significant difference between Harris Hip score in stable fracture (p-value=0.222) fixed either with DHS or PFN. But there is statistically significant difference of score in unstable fracture (p-value=0.040) treated by DHS and PFN. Functionally, utilizing the Harris hip scoring system, at the final follow-up, our study affirms PFN to be superior to DHS in unstable intertrochanteric fractures while in stable fractures, functional results are same. This outcome was authenticated by Bhakat *et al* and Mahesh Kumar NB et al who pronounced parallel results implementing similar score.[15,16]

CONCLUSION

In our study we concluded that in short period of follow up the result of PFN in intertrochanteric fracture was seen better than those of DHS with significant numbers of patients having better Harris Hip Score postoperatively. Specifically, PFN is also found better in unstable fractures, because a greater number of patients having excellent Harris hip score. In stable fracture, functional result is same in both groups. In unstable fractures, control of axial telescoping and rotational stability is paramount and an intramedullary device placed in a minimally invasive fashion is endured better in elderly. The quality of the reduction achieved and proper positioning of the implants is important to achieve the best post-operative outcome.

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Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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