



COMPARATIVE EVALUATION OF FUNCTIONAL OUTCOME OF USE OF PROXIMAL FEMORAL NAIL VERSUS DYNAMIC HIP SCREW IN THE MANAGEMENT OF PERTROCHANTERIC FRACTURE.

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ABSTRACT **INTRODUCTION:** Pertrochanteric fractures are becoming increasingly common as our population ages. These fractures typically occur in elderly patients and often result in the end of the patient's functional independence. Conservative methods of treatment for pertrochanteric fractures have shown higher morbidity and complications rates. Rigid internal fixation and early mobilisation has become standard method of treatment for such fracture. A variety of treatment options have evolved like extra medullary implants (Fixed angle plates or D.H.S.) and intramedullary implants (P.F.N) for pertrochanteric fractures. There are numerous literature advocating for both the procedure citing their advantage of one over another. The present study was done with comparative evaluation of functional outcome of use of proximal femoral nail versus dynamic hip screw in the management of pertrochanteric fracture to determine whether there is advantage of one method over other or not.

MATERIAL AND METHOD: This prospective study was conducted in Netaji Subhas Chandra Bose Subharti Medical College from June 2017 to September 2019. Total 60 patients were included in this study in which 30 were included in PFN group "P" and 30 in DHS group "D". Intra-operative parameters like duration of surgery, length of incision, c-arm exposure, blood loss were evaluated and post-operatively patient was followed for minimum of 6 months and evaluation was done by Harris hip score.

RESULTS: PFN group had less blood loss, less length of incision, long duration of surgery, early union and fewer complication as compare to DHS group. Follow up of patients showed that Harris hip score at 24th week in PFN group was better than DHS group.

CONCLUSION : The present study demonstrates PFN group had better function outcome as compare to DHS group.

KEYWORDS :

INTRODUCTION

First descriptions of a trochanteric fracture was given by Sir Astley Cooper, an English surgeon and anatomist, in his treatise from the year 1851 as follows- 'Fracture of the femur through the trochanter major, passes obliquely upwards and outwards from the lower portion of the neck but instead of traversing the neck completely, it penetrates the base of the trochanter major the line of fracture being such as to separate the femur into two fragments, one of which is composed of the head, neck and trochanter major, and the other of the shaft with the remaining portions of the femur'.

Pertrochanteric fractures are becoming increasingly common as our population ages. These fractures typically occur in elderly patients and often result in the end of the patient's functional independence. Before the introduction of suitable fixation devices, the treatment of pertrochanteric fractures was predominantly non-operative. Non-operative treatment resulted in many common problems of prolonged immobilization, decubitus ulcers, urinary tract infection, joint contracture, pneumonia and thromboembolism which contribute to the high mortality rate². Due to various complications and high mortality the conservative approach has now fallen into disrepute¹. With evolution of various treatment options like extra medullary implants (Fixed angle plates or D.H.S.) and intramedullary implants (P.F.N) for pertrochanteric fractures surgical management has become now mainstream management².

The dynamic hip screw (DHS), commonly used in extra-medullary fixation, has been a standard implant in treatment of these fractures since long^{3,4}

The proximal femoral nail (PFN) introduced by the AO/ASIF group in 1998 has become prevalent in treating trochanteric fractures in recent year^{5,6}.

Theoretically intramedullary sliding nail possesses certain advantage.¹

1. The implant itself act as a buttress against translation of the proximal fragment.

2. Intramedullary location of the junction of nail and lag screw makes the implant stronger at resisting the bending forces.
3. The reduced distance between the weight bearing axis and the implant resulting in shorter lever arm in intramedullary implant
4. An intramedullary device bears the bending load which is transferred to the intramedullary nail and is resisted by its contact against the medullary canal.
5. The intramedullary hip screw is a more biological method of fixation.

There were many studies comparing the outcomes of the PFNA and DHS for Pertrochanteric fractures, but there was obvious inconsistency in tency of effects across those studies and the optimal management of Pertrochanteric fractures remained controversial. It has been suggested, without supporting clinical data, that the IMNs (intramedullary nails) are superior for unstable trochanteric fractures, reverse oblique fractures and sub trochanteric fractures. Controversy, therefore, continues regarding the optimum choice of implant for these unstable fractures. The early operative treatment of the pertrochanteric fractures is widely accepted practice and different sliding nail-plate systems are used in the treatment.

This study was performed to analyze comparative Evaluation of functional outcome use of Proximal Femoral Nail versus Dynamic Hip Screw in the management of pertrochanteric fractures.

MATERIAL AND METHOD

We conducted hospital based prospective study in Netaji Subhas Chandra Bose Subharti Medical College from June 2017 to September 2019. Total 60 patients were included in our study in which 30 were included in PFN group "P" and 30 in DHS group "D".

CRITERIA FOR INCLUSION AND EXCLUSION

INCLUSION CRITERIA

1. Adult patients above the age of 18 years with Pertrochanteric fractures (Boyd and Griffin TypeI, II, III, IV)

EXCLUSION CRITERIA

1. Fractures associated with poly trauma
2. Pre-existing femoral deformity preventing hip screw osteosynthesis or intra-medullary nailing
3. Patients with pathological fractures
4. Patients with Open trochanteric fractures.
5. Comorbidities that preclude surgical treatment

PRE-OPERATIVE PREPARATION

The cases selected were investigated for pre anesthetic fitness and X-ray (AP view of both hip and lateral view of involved hip) and clinical records were maintained. Intravenous prophylactic antibiotic was given an hour before surgery.

AFTER TREATMENT:

Postoperatively, for both groups same antibiotics protocol was followed. Analgesics were given as per patient's requirement. Blood transfusion was given depending on the requirement. Sutures removed on 14th postoperative day.

Patients were encouraged to sit in the bed after 24 hours after surgery. Quadriceps drill exercises and knee mobilization was started in immediate post operative period.

In unstable Boyd and Griffin (type II, III, IV) fracture patterns weight bearing was delayed 3-4 weeks and in rest of the patients were encouraged for partial weight bearing with walker support depending on the pain tolerability.

FOLLOW UP:

Patients were followed up at an interval of 6 weeks, 12 weeks and 24 weeks. At every visit patient was assessed clinically with Harris Hip scoring system.

X-ray both hip with both thigh AP view and involved hip and thigh lateral view was done to assess fracture union and implant bone interaction.

FUNCTIONAL RESULTS:

Assessed based following hip scoring system adopted.

RESULT AND OBSERVATION

In our study during a period from June 2017 to September 2019 a total number of 60 patients were included as per inclusion criteria and underwent surgical fixation.

The results of study was analyzed and observation of this study are as follow:-

1. Age: In PFN group 16(53.3%) patient were between 61-80 years age group followed by 11(36.7%) patients were between 41-60 years age group and 3(10.0%) patient were between 21-40 years age group and in DHS group 12(40.0%) patients were in age group between 41-60 years age group and 11(36.7%) patients were between 61-80 year age group.

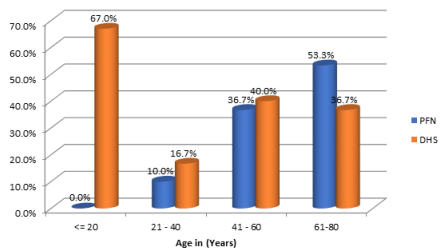


Table:-1 Age distributions of studied patients

2. Gender: In this study the PFN group had 20(66.6%) patients that were male and 10(33.4%) patients were female while in DHS group 12 (40%) patient were male while 18(60%) patients were female.
3. Mode of Injury: In this study 27(90.0%) patients of PFN group and 28(93.3%) patients of DHS group sustained fracture due to low energy trauma while 3(10.0%) patients of PFN group and 2(6.7%) patients of DHS group had sustained fracture due to high energy trauma.
4. Side of fracture: In this study 14 patients of PFN and DHS group were right sided while 16 patients of PFN and DHS group were

right sided

5. Type Of Fracture: PFN group had 25(83.3%) patient in type II Boyd & Griffin classification, 4(13.3%) patients in type-2 Boyd & Griffin and 1 patient in Boyd & Griffin. DHS group had 23(76.7%) patients in type-2 Boyd & Griffin and 7 patients belongs to type 1 Boyd & Griffin classification.

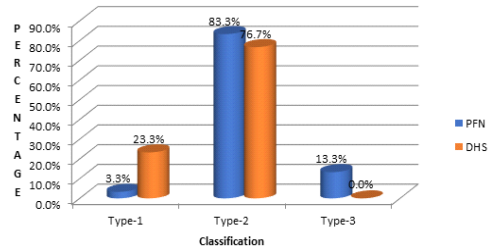


Table-2 Distribution of patient according to Boyd and Griffin classification

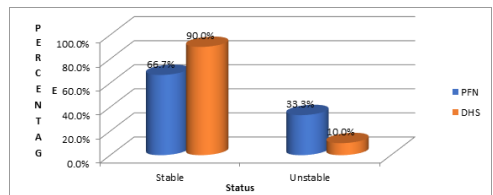


Table No.3 shows the stability status of the studied patients and in group DHS majority of patients were stable 27 (90.0%) while that of PFN group 20 (66.7%) were stable and the association was statistically significant ($P=0.028$)

6. Complications : In DHS group had 2 patient had screw cut out, 2 patient had surgical site infection, 4 patients had valgus malunion and 1 patient had varus effect. In PFN group 1 patients had surgical site infection while 1 patient has valgus malunion and 1 and z-effect.

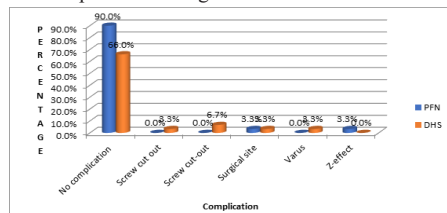


Table No.4 shows the distribution of patients in both the studied group on the basis of complications and PFN group showed no complications in 93.4% patients while 83.4 were having no complications in DHS group and 2 patient in DHS group had screw cutout while 1 patient in PFN group had Z-effect while 4 patient in DHS group had mal-union while 1 patient in PFN group had mal-union this association was insignificant ($p=0.395$)

7. Blood loss: Patients in PFN group had mean blood loss of 123.33 ml while in DHS group had 260.67 ml blood loss.
8. Time for union: PFN group had mean time period of union 11.73 weeks while DHS group had mean time of union 12.33 weeks.

Table No.5 Time period of union in weeks and Blood Loss

Group Statistics	Group	Number	Mean ± SD	P Value
Blood loss (ml)	PFN	30	123.33±36.984	0.001
	DHS	30	260.67±75.655	
Time for union (weeks)	PFN	30	11.73±1.388	0.104

9. In this study 25 of Boyd & Griffin type-II in PFN group and 23 patients of DHS group had union while in Boyd & Griffin type-I 1 patients of PFN group and 7 patients of DHS group had union.

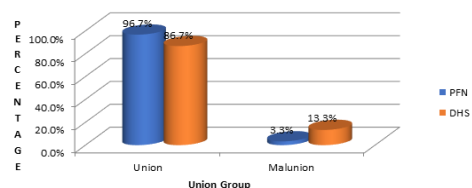


Table No. 6 shows the distribution of patients on the basis of Union Group and the PFN group shows union in 96.7% while that in DHS group union was in 86.7% and the association was significant ($p=0.161$)

10. Harris hip score at 6 weeks in PFN group was 72.10 while in DHS group was 68.17 while at 12 weeks Harris hip score in PFN group was 79.17 while in DHS group was 76.03 while a 24 weeks Harris hip score in PFN group was 89.53 while in DHS group was 81.43

Group Statistics	Group	Number	Mean±S.D	P Value
Harris hip score at 6 th weeks	PFN	30	72.10±5.542	.008
	DHS	30	68.17±5.584	
Harris hip score at 12 th weeks	PFN	30	79.17±4.194	.013
	DHS	30	76.03±5.216	
Harris hip score at 24 th weeks	PFN	30	89.53±3.857	.000
	DHS	30	81.43±4.554	

Table No.7 Shows the follow up of the patients with mean Harris hip score at 6th week in PFN group was 72.10 and DHS group was 68.17 and mean Harris hip score at 12th week in PFN group was 79.17 and DHS group was 76.03 and mean Harris hip score at 24th week in PFN group was 85.53 and DHS group was 81.43.

DISCUSSION

Petrochanter fractures are one of the commonest injuries sustained predominantly in elderly patients due to trivial fall and in younger individuals due to significant trauma. The type of implant used has an important influence on complications of fixation. Sliding devices like the Dynamic Hip Screw (DHS) and Intramedullary devices like the proximal femoral nail (PFN) have their own advantages & disadvantages and various meta-analysis conducted so far have come out with conflicting results regarding superiority of PFN over DHS. The present study "Comparative Evaluation of Functional Outcome of Use of Proximal Femoral Nail versus Dynamic Hip Screw in the Management of Petrochanteric Fractures" is a prospective controlled study including 60 patients with Petrochanteric fractures out of which 30 were treated with DHS and 30 with PFN

The mean age of the PFN group was 60.23±13.01 years while that of DHS group was 57.75±19.07 years and the majority of patients in this study were in age group between 61-80 years (45.0%) followed by age group between 41-60 years (38.3%). This study was comparable with **Shivanna UM et al¹⁰** in which most common age group of study was in the range of 61 – 80, with a mean of 67.13 years and **Zou J et al¹¹** in which the mean age was 65 years in both the PFN group and the DHS group. A similar finding was also found in study of **Ahmed HH et al¹²** which reported the mean age of 63.35 years (±6.9 SD) and **Hussain N. & Kamat S.¹⁶** in which majority of patients were in the age group of 60-80 years with average age in DHS group 69.74 and PFN group 72.3. This implies that mainly the elderly patients are affected by these fractures particularly in their 60s and 70s.

The males were significantly more affected than females in this study where male were (53.3%) and females (46.7%). Similar results was seen in study of **Sinha U and Ishtiaque S¹⁷** which reported 60.0% males and 40.0% females in their study.

In the present study patients were divided on the basis of mode of injury and the majority of patients were of low energy trauma (91.7%) followed by high energy trauma (8.3%). Similar results were reported by **Shivanna UM et al¹⁰** and **Uand Ishtiaque**.

In this study the distribution of patients on the basis of Boyd and Griffin classification was performed and the 80.0% of patients were in type-2 Boyd and Griffin classification with 41.7% in PFN group and 38.3% in DHS group followed by type-1 Boyd and Griffin classification (13.3%) and the association was statistically significant ($P=0.014$).

In DHS group of 23 (76.66%) patients had unstable fracture while that of PFN group had 29 (96.67%) patient with unstable fracture pattern. Similar results were reported by **Ravikumar V and Rashid MP¹³** in which 54.2% patients operated by PFN were unstable fractures and 41.7% patients operated by DHS were unstable fractures and **Naidu KVD¹⁴** which reported 46% fractures were unstable in PFN group and in DHS group 33% fractures were unstable.

In present study the majority of patients were having left side injury

(53.3%) followed by right side (46.7%). **Shivanna UM et al¹⁰** reported injuries to the left hip and right hip are equal. **Sinha Uand Ishtiaque S¹⁷** also reported that left (60.0%) side is more frequently affected than right side (40.0%) similar results were attributed due to support by right hand while falling.

In this study the distribution of patients on the basis of union of fractures, in the PFN group we had union in 96.7% patients while that in DHS group union was 86.7% patients and **Shivanna UM et al¹⁰** reported that union in 80% of the patients in the DHS group while there was union in all patient of PFN group. **Sadowski C et al¹⁵** that seven of the 20 patients who had been treated with the DHS experienced implant failure and/or nonunion, but in comparison to this, only one fracture of 20 treated with PFN had nonunion."

In the present study 1 patient of PFN group had complications in the form of surgical site infection and one had complication of Z-effect whereas 2 patients of the DHS group had complications in the form of surgical site infection and 1 patient had varus angulation. 1 patient in PFN group had valgus malunion and 4 patients in DHS group had varus malunion.

And time of union in DHS group was 12.33 weeks which is more than PFN group (11.33) this can be due to early weight bearing PFN group patient. According to **Shivanna UM et al¹⁰** all the fracture united at a mean of 12 weeks in both DHS which was more or less similar to our study. **Kalaiah K and Koshy JA¹⁸** also reported that complications are very few in PFN group as compared to DHS group. **Shivanna UM et al¹⁰** in their study found three patients (20 per cent) in the DHS group had a malunion whereas there was no malunion reported in the PFN group with all the fractures uniting with less than ten degrees of varus angulation. **Sinha Uand Ishtiaque S¹⁷** reported the contrasting result than the present study as they said that the presence of complications are significantly more in PFN Group (45.0%) compared to DHS Group (10.0%) this difference in results may be attributed to familiarity of the operating surgeon with procedure of surgery.

In this study the blood loss was significantly more in DHS group as compare to PFN group and. Similar result was seen in study of **Naushad Hussain & Sanil Kamat¹⁶** reported that intra-operative blood loss was significantly more in DHS group. Considering the fact that additional surgical exposure can theoretically prolong the operative time and thus more blood loss in DHS group than PFN group. The length of the incision in the DHS group ranged from 14cm to 18cm with a mean of 16cm as compared to a mean incision of 6cm in the PFN group. The smaller incision in the PFN group meant that there was less intraoperative blood loss.

Functional evaluation of studied patient on basis of Harris hip score was done at 6th 12th and 24th week such that at 6th week Harris hip score in PFN group was (72.10) and DHS group was (68.17) which was almost similar and Harris's hip score was also similar at 12th week in PFN group (79.17) and DHS group (76.03) but Harris hip score at 24th weeks in PFN group (89.53) was significantly more than than DHS group (81.43). **Kalaiah K and Koshy JA¹⁸** reported similar results as in our study at 1st month in Proximal Femoral Nail group, mean Harris Hip Score was 46.9±8.1 and in Dynamic Hip Screw group was 36.4±5.6. This difference in mean Harris Hip Score at 1st followup between two groups was statistically significant. At 2nd follow up in Proximal Femoral Nail group, mean Harris Hip Score was 66.7±6.5 and in Dynamic Hip Screw group was 63.4±9.8. At 6th month in Proximal Femoral Nail group, mean Harris Hip Score was 92.1±4.0 and in Dynamic Hip Screw group was 87.5±7.6. Proximal Femoral Nail had higher Harris hip score than in Dynamic Hip Screw group. **Naushad Hussain & Sanil Kamat¹⁶** the functional outcome using Harris hip score was found to be more in PFN group as compared to DHS.

Case-1(DHS)



Pre-op x-ray



Immediate post-op x-ray



Post-op x-ray 12 weeks

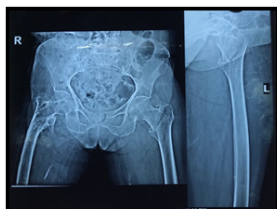


Squatting



FINAL FOLLOW UP SHOWING FULL FUNCTIONAL RECOVERY WITH SURGICAL SCAR MARK OVER RIGHT THIGH

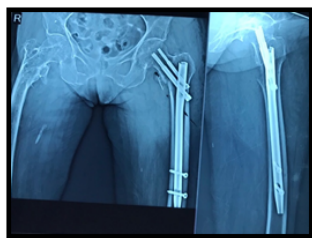
Case-2(PFN)



Pre-op x-ray



Post-op x-ray immediate



24 week Post-op x-ray



FINAL FOLLOW UP SHOWING FULL FUNCTIONAL RECOVERY

CONCLUSION

Pertrochanteric fractures are becoming increasingly common as our population ages. These fractures typically occur in elderly patients and often result in the end of the patient's functional independence. This study was performed to analyze comparative Evaluation of functional outcome use of Proximal Femoral Nail versus Dynamic Hip Screw in the management of pertrochanteric fractures. Following conclusion was drawn from this study

- Union rate was better in PFN group as compared to DHS group in terms of weeks and in more number of patients
- The intraoperative blood loss and the post-operative blood transfusion requirement are significantly higher with the use of Dynamic hip screw.
- The total operative time of surgery is more with the Dynamic Hip screw procedure.
- Harris Hip score at end of 24 weeks for PFN group was better than that of the DHS group hence the functional outcome was found to

be more in PFN group as compared to DHS.

- Complications blood loss, time of union , valgus malunion were more in DHS group compared to PFN group

The PFN group in our study performed much better in view of union rates, complications, blood transfusion & functional outcome based on Harris hip score than the DHS group. Our conclusion from the two study supported the use of PFN for unstable and complex pertrochanteric fracture femur with lesser failure rates, lesser blood loss, less shortening, early union & better functional outcome. However, during implantation of PFN a more precise technical performance is required for better outcomes

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