Management of Pertrochanteric Fractures with Proximal Femoral Nail and Comparison of Results with Dynamic Hip Screw

Gopal Tiwari[1], Fahad Bin Hamid[1], Shalini Sharma[2]

ABSTRACT

Introduction: Proximal Femoral Nail and Dynamic Hip Screw, both are the accepted implants for the internal fixation of Pertrochanteric fractures. Objectives of the research were to compare the results of proximal femoral nail and dynamic hip screw in terms of functional mobility of the patients and the results would also be compared in terms of operating time, peri-operative blood loss, radiological exposure, time to mobilize with frame, wound infection and implant failure.

Material and Methods: A Randomized prospective study was conducted in the outdoor and emergency facilities of department of orthopaedics in a level II hospital. Patients who sustained closed fracture and are beyond 40 years of age were included in the study. Eligible candidates were admitted and randomized to group 'A' or 'B'. Group 'A' patients were managed by Proximal Femoral Nail and group 'B' were managed by Dynamic Hip Screw. Parker and Palmer mobility score before trauma and after 6 month follow-up period was noted.

Results: A total number of 61 patients were randomized to either PFN group (n=25) or DHS group (n=36). Our analysis shows that PFN group patients were significantly more mobile than DHS group patients in terms of P and P score at 6 month follow up (5.8 for PFN Vs 4.19 for DHS, p<0.001). The patients with unstable fracture benefited greatly with PFN by gaining higher P and P score over DHS group (5.46 for PFN Vs 3.50 for DHS, p<0.001).

Conclusion: Proximal femoral nail gives early and greater extent of mobility to the patients.

Keywords: PFN, DHS, P and P Score.

INTRODUCTION

Old, osteoporotic, frail patients are more prone for fractures around trochanter.[1] This population demands early mobilization to prevent the complications of prolonged immobility. Proximal Femoral Nail and Dynamic Hip Screw, both are the accepted implants for the internal fixation of Pertrochanteric fractures. Hip is a principal weight bearing joint and any alteration in the biomechanical property of of the hip largely affects the individual's functional status.

In a developing country like India the problem of lost to follow-up up cases in a usual problem. But in Recent years the development of information technology has helped the people to get connected with mobile phones easily. Palker and Palmer Mobility score has an added advantage to get calculated over telephonic conversation with the patient. It is rationale to state that if underlying fracture behaviour and biomechanics is good, the patient's functional status will be accordingly manifested.

We therefore conducted this study to compare the functional mobility of the Per-trochanteric fracture patients managed with proximal femoral nail and dynamic hip screw.

MATERIAL AND METHODS

This randomized controlled trial was conducted at teaching hospital of north India from Oct- 2013 to Oct-2015. The Study protocol was cleared by institutional ethical committee and informed consent from patient and one of the family members was taken before enrollment. Total numbers of 69 closed Pertrochanteric fractures without sub-trochanteric extension were primarily included in the study of which 8 patients were lost to follow-up. Total number of male patients was 39 and female were 22.The mean age in years of PFN patients was 55.64 years and in the DHS group was 55.81 years. All fractures were classified according to AO/OTA Classification system and labeled as stable or unstable according to the criteria.

Criterion for fracture unstability

1. All Type 31-A3 fractures.
2. Type 31A-2 Fracture with Large posterio-medial fragment

There are total 31 unstable fractures of which 13 are in the PFN and 18 are in DHS group. All patients were ambulant before injury (P and P score 6-8: Table-1) and their pre-operative morbidity was assessed by ASA score (most of the patients belonging to ASA score 2). All patients were treated within 7 days of fracture.

American Society of Anesthesiologists grading (ASA Score)

1. A normal healthy patient
2. A patient with mild systemic disease (that does not limit activity)
3. A patient with severe systemic disease (limits activity, but not incapacitating)
4. A patient with severe systemic disease that is a constant threat to life
5. A moribund patient who is not expected to survive with or without the operation
6. A declared brain-dead patient whose organs are being removed for donor purposes.

   (It is suffixed with **'E'** in the emergency setting.)

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How to cite this article: Gopal Tiwari, Fahad Bin Hamid, Shalini Sharma. Management of pertrochanteric fractures with proximal femoral nail and comparison of results with dynamic hip screw. International Journal of Contemporary Medical Research 2016;3(3):829-832.

After informed consent, patients were allocated a sequential study number and were randomized by computer to be treated either with a PFN or DHS. For each patient both implants was arranged. It was only after closed reduction, prepping and draping of the patient by operating surgeon, final decision for implant was made according to computer randomization. Group '1' received proximal femoral nail and Group '2' received dynamic hip screw.

Operative procedure

Fracture reduction was obtained under image intensifier over fracture table by simple traction and internal or external rotation according to the fracture geometry.. For DHS, a straight lateral incision was used and vastus lateralis reflected. Guide was inserted into the femoral neck and head using the appropriate angle guide. The lag screw was then inserted to within 1 cm of the sub-chondral bone after reaming and tapping. A four hole side-plate was placed over the Lag screw. Then side-plate was impacted and fixed with screws against the lateral cortex of the proximal femur.

PFN was introduced through 1 to 2 cm incision made approximately 2 cm proximal to the tip of the greater trochanter. The entry point over trochanter tip is made and medullary canal was opened. Reaming was done over ball-tipped guide wire with flexible reamer and entry point enlarged with 13 mm reamer to accommodate the proximal part of PFN. Then appropriate size proximal femoral nail assembled with its corresponding Zig attachment was inserted by hand with Rocking motion into the proximal femur. With the help of proximal zig, guide wire was placed into femoral neck and head over 8.5 mm slot within 5mm of inferior calcar and upto 1 cm beneath the sub-chondral bone. After reaming with 8.5mm reamer and tapping the lag screw was placed. Then proximal 6.5 mm lag screw was placed in same manner into femoral neck and head and placed approximately 2 cm below to sub- chondral bone. Position of nail was confirmed on both AP and lateral view. Intra-operative variables were recorded (Table-2).

Post Operative Protocol

Quadriceps strengthening exercises were encouraged from the first post operative day. Stitches were removed on 10 post operative day. Partial weight bearing ambulation using a frame was permitted after seven days. Patients were followed-up after 6 weeks, 3 months and 6 months. At each visit their Parker and Palmer mobility score was recorded. Any complication was noted and recorded in their data sheet. After the first visit they were told for taking partial to full weight bearing as they can tolerate. All patients were told and informed about telephonic conversation for their mobility scoring.

STATISTICAL ANALYSIS

Results were analyzed using software STATA version 11.0. Categorical variables were compared with chi square test and student t test was used for discrete and continuous variables. p value of <0.05 was considered significant.

RESULTS

Of the 61 patients available for follow-up, 25 patients have received PFN and 36 patients were fixed with DHS. The base line characteristics are given in the Table-3.

Primary Outcome: There was significant increase in functional mobility of PFN group in terms of P and P score at 6 month follow-up (5.8 for PFN Vs 4.19 for DHS, p<0.05). The patients with unstable fracture benefited greatly with PFN by gaining higher P and P score over DHS group (5.46 for PFN Vs 3.50 for DHS, p<0.001).

Secondary Outcomes: Mean operating time was greater in PFN group (60 min) as compared to DHS group (45.3 min). Radiation exposure was also greater for PFN group (102.03 no. of C-arm exposures) as compared to DHS group (53.78 exposures). Perioperative blood loss was more in DHS group (159.03 ml) as compared to PFN group (70.52 ml). PFN group patients were mobilized earlier with help of frame (8.84 days) as compared to DHS group patients (14.42 days).

Complications: there is one case of infection in PFN group and 3 cases in DHS group. In terms of implant failure there is one case of screw cut-out in DHS group. All patients in PFN group have intact implants at 6 month follow-up.

DISCUSSION

Dynamic hip screw is an accepted internal fixation device for trochanteric fractures.[5] But the Problems of implant failure like screw cut out; excess collapse at fracture site and chances of varus malunion is a concern with this devise especially in unstable fractures.[6] Up to 50% of failure rate is reported in some studies with this devise.[7] DHS is also associated with significant blood loss[4] which may be a limiting factor in elderly high risk patients. Again it is implanted through a large

	No problem	With aids	With help from another person	Unable to perform
Able to get about the house	3	2	1	0
able to get out of the house	3	2	1	0
Able to go shopping	3	2	1	0

Table-1: Parker and Palmer mobility score (0 to 9)

Operating time	This was calculated from time of skin incision to skin closure.
Peri-operative blood loss	This was calculated by adding the volume of blood on mops and in suction jar then subtracting the volume of normal saline used for washing of wound.
Radiological exposure	Total numbers of shoots taken by C- arm during operative procedure.
Wound infection	Diagnosed when there is persistent discharge from stitch site and showed positive evidence on culture.
Implant failure	If there is screw cut-out or proximal screw migration in PFN.

Table-2: Intra-operative Variables

Variable		PFN Group	DHS Group	p- Value
Mean age (Yrs)		55.64	55.81	>0.5
Patients with Unstable Fracture		13	18	
Side affected (Rt.)		10	23	
Mean time to mobilize with Frame (In days)		8.84	14.42	<0.001
Mean Operating Time(In min.)		60	45.3	<0.001
Mean no. of Radiation Exposure		194.44	92.28	<0.001
Mean Peri-Operative blood loss(In mL)		70.52	154.03	<0.001
P and P Score	Before Trauma	6.64	6.28	>0.1
	At 6 Month Follow-up	5.8	4.19	<0.001
6 Month P and P Score	In Stable Fracture	6.17	5.90	>0.05
	In Unstable Fracture	5.46	3.50	<0.001
Complications (No. Of Patients)	Infection	1	3	
	Implant Failure	0	1	

Table-3: Base line characteristics

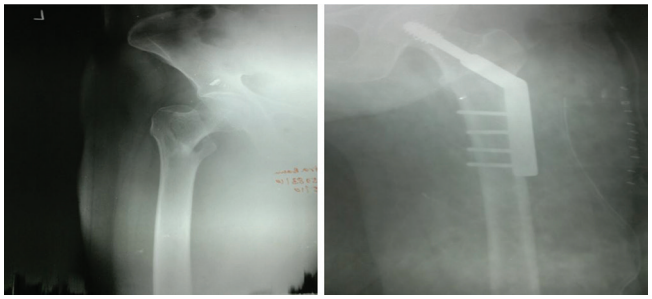

Figure-1: X-ray left hip antero-posterior view, (a) Trochanteric fractures (A1/AO classification) left femur. (b)Postoperative radiograph showing fracture well fixed with dynamic hip screw

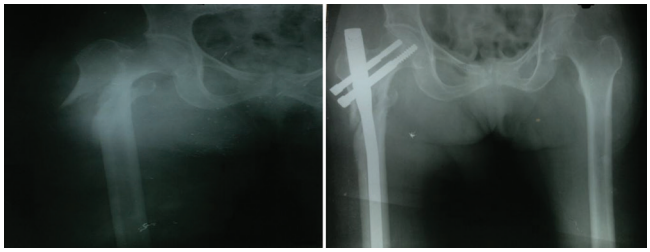

Figure-2: X-ray left hip antero-posterior view, (a) Trochanteric fractures (A3/AO classification) left femur(reverse oblique). (b) Postoperative radiograph showing fracture well fixed with proximal femoral nail

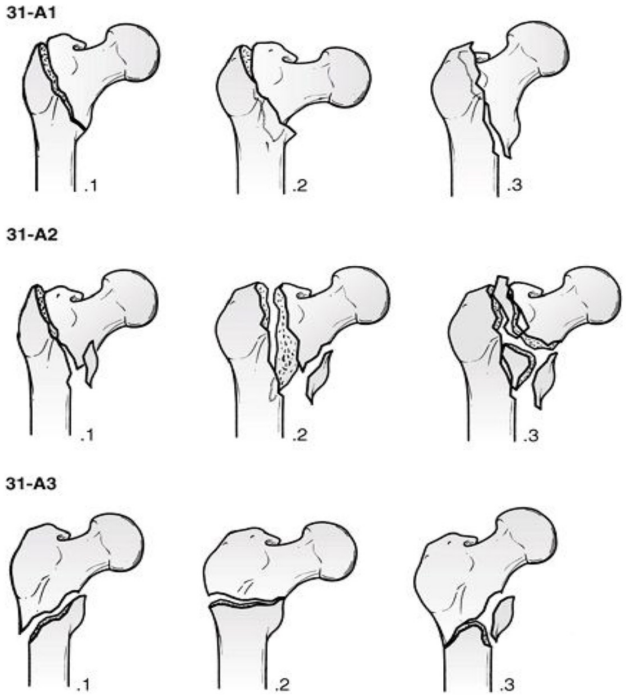

Figure-3: Orthopaedic Trauma Association (OTA) alphanumeric fracture classification, intertrochanteric hip fractures comprise Type 31A. These fractures are divided into three groups, and each group is further divided into subgroups based on obliquity of the fracture line and degree of comminution.Type 31A1. fractures are simple (two-part) fractures, with the typical oblique fracture line extending from the greater trochanter to the medial cortex; the lateral cortex of the greater trochanter remains intact. Type 31A2. fractures are comminuted with a postero-medial fragment; the lateral cortex of the greater trochanter, however, remains intact. Fractures in this group are generally unstable, depending on the size of the medial fragment. Type 31A3. fractures are those in which the fracture line extends across both the medial and lateral cortices; this group includes the reverse obliquity pattern.

incision. Thus the problem of greater soft tissue insult and subsequent infection cannot be underestimated in developing countries like India where malnutrition is not uncommon.

Proximal femoral nail utilizes closed reduction technique and small incision away from fracture site without affecting fracture biology. Thus the chances of union and faster recovery may be anticipated theoretically. Less intra-operative blood loss is the noted advantage due to small incision.[8] Post operatively faster recovery may give the confidence to patients and this can be responsible for their early[9] and greater extent of mobilisation.[10] Some studies support superiority of dynamic hip screw over intra-medullary design.[11,12] But recently evidence-based review of literature showed that neither plate/screw fixation nor intramedullary devices are superior for stable fractures. Unstable fractures theoretically would benefit from intramedullary devices, but insufficient evidence to support recommendation.[13] Unstable fractures can do better with proximal femoral nail when proper reduction and careful surgical technique is used.[14,3] In lieu of inconclusive results, another study comparing DHS and PFN in pertrochanteric fractures has its importance.

Keeping in mind the hip biomechanics and theoretical superiority of intra-medullary design over extra-medullary im-

plants we conducted our study using proximal femoral nail and Dynamic hip screw. With the ease of recording Parker and Palmer mobility score which can be taken by telephonic conversation, this study has an added advantage over others. In our country where follow-up is difficult to maintain, this type of scoring method is quite helpful. For stable fractures both devices can do better but in unstable fractures, results of Proximal femoral nail is enthusiastic over Dynamic hip screw. Since the chance of radiation exposure is high (almost double) in PFN, it should be better avoided in younger population. Less operating time with DHS may gain attraction especially in high risk patients, the other variables like early mobilization, better P and P score, less intra-operative blood loss and decreased chances of implant failure can do wonder for the patients fixed with PFN.

CONCLUSION

We concluded that Proximal femoral nail is an effective intramedullary device for management of unstable pertrochanteric fractures. It provides an early and greater extent of mobility to the patients. Furthermore, there are several limitations to our study. Dual-energy X-ray absorptiometry (DEXA) measurements to quantify bone mineral density (BMD) were not performed. The status of osteoporosis in the two groups will probably be required for definitive assessment. While there are numerous operative devices for treatment of pertrochanteric fractures, none of them are totally free of complications. Therefore, careful surgical technique and optimum reduction is most important.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 28-01-2016; **Published online**: 19-02-2016