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Original Research

Comparison of functional outcome of Proximal Femoral Nailing and Dynamic Hip Screw for unstable Intertrochanteric Fractures

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ABSTRACT:
Background: Osteoporosis being an age related disease is showing a yearly growth especially among the elderly population. Osteoporosis causes decrease in the bone mass and strength and therefore increased risk of fractures. Osteoporotic hip fracture is one of the most common and serious fracture and is associated with high morbidity, mortality, and disability rates. Both intramedullary treatment options like Proximal Femoral Nail (PFN) and extramedullary treatment options like Dynamic Hip Screw (DHS) have been used for the treatment. The objective of this study was to compare the functional outcomes of PFN and DHS for treatment of unstable intertrochantric fractures. **Material and Methods**: This prospective study was conducted in the department of Orthopaedics at Adesh Institute of Medical Sciences and Research Bathinda from August 2017 to March 2020. We included 50 patients aged between 42- 89 years with unstable intertrochantric fractures of Type II, Type III and Type IV (Boyd and Griffin classification). Out of these patients, 25 patients were treated with PFN and 25 patients were treated with DHS. All patients were followed at least for a minimum period of 6 months and were evaluated radiologically and clinically by Kyle's Criteria. **Results**: Out of the 50 patients, 23 (46%) were males and 27 (54%) were females. Male to female ratio was 11:14 in PFN group and 12:13 in DHS group. The age of the patients ranged from 42 years to 89 years. Mean age of the patients in the PFN and DHS group was 64.3±14.42 years and 62.5±12.85 years respectively. Average operative time was 54.2 minutes for PFN group and 65.3 minutes for DHS group and the difference was statistically significant ($p<0.05$). Average amount of blood loss during the surgery was150.45±48.216 ml in PFN group and 265.91±78.156 ml in the DHS group and the difference was statistically significant ($p<0.05$). Time for toe touch weight bearing was significantly shorter in the PFN group (15.56±6.15 days) as compared to the DHS group (40.23±11.27 days) ($p<0.05$). Average limb length shortening was 4.46 mm in PFN group and 8.63 mm in DHS group and the difference was statistically significant ($p<0.05$). **Conclusion**: PFN is a better treatment option as compared to DHS for unstable intertrochantric fractures in terms of reduced duration of surgery, blood loss, early weight bearing and mobilization. Functional outcome was found to be better in PFN group as compared to the DHS group.
Keywords: Proximal Femoral nail, Dynamic Hip Screw, unstable intertrochantric fractures, Kyle's Criteria, outcome

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INTRODUCTION

Osteoporosis is a major health problem especially in elderly populations and is associated with fragility fractures at the hip, spine, and wrist. Hip fracture increases the rate of both morbidity and mortality in the elderly (1). In 1990, 26% of all hip fractures that occurred in Asia were intertrochanteric fractures whereas this figure is estimated to rise to 37% in 2025 and 45% in 2050(2). Intertrochanteric fracture of the

femur is more common in elderly patients with osteoporosis and surgical treatment to fix the fracture has been the most widely accepted method to achieve good reduction and early mobilization (3). Intertrochanteric fractures were more commonly seen in patients with severe osteoporosis whereas femoral neck fractures predominated in those who did not have osteoporosis (4). Fixation of such unstable fracture is always a big challenge for surgeons. Some major disadvantages of the extra medullary implants like DHS lead to the invention of the intra medullary implants for treatment of unstable fractures. A major complication of DHS is lag screw cutting out of the head. Due to lack of lateral cortical support in osteoporotic bone, the excessive femoral head can collapse if there is excessive medial displacement of the femoral shaft in the unstable fractures (5). To overcome the drawbacks of extramedullary implants used for treatment of unstable fractures, intramedullary nails were developed. The main principle of trochanteric entry nail fixation is based on a sliding screw in femoral head fragment attached to an intramedullary nail. The major advantage of the nail over a DHS includes a semi closed procedure and a shorter lever arm that gives greater stability and allows rapid rehabilitation (6). The gamma nail was associated with serious implant related complications such as iatrogenic femoral shaft fractures during nail insertion and therefore other intramedullary fixation devices were introduced. The proximal femoral nail was developed with a redesigned tip that decreases resistance during insertion and reduces bone stress significantly thereby decreasing the chances of fractures of the femoral shaft during intra and post-operatively. It also incorporates two proximal screws to improve the rotational stability of the proximal fracture fragment (7). In patients who underwent short proximal femoral nailing for stable and unstable intertrochanteric fractures, it was concluded that short proximal femoral nail is superior implant in terms of operating time, surgical exposure, blood loss and complications especially for patients with relatively small femora(8). Many studies have shown the superior stability of intertrochanteric fractures treated with PFN (9,10) but other studies have shown higher complication rates with PFN (11).

OBJECTIVES

The objective of this study was to compare the functional outcome of two commonly used treatment modalities DHS and PFN for treatment of unstable intertrochantric fractures.

MATERIAL AND METHODS

This was a prospective comparative study conducted in Adesh Institute of Medical Sciences and Research Bathinda from August 2017 to March 2020. We included 50 patients of Type II, Type III and Type IV (Boyd and Griffin classification) unstable intertrochantric fractures. X-rays of the pelvis with hip antero-posterior view and traction-internal rotation was done to confirm the diagnosis. Out of these patients, 25 patients were treated with Proximal Femoral Nail (PFN) and 25 patients were treated with Dynamic Hip Screw (DHS). The research protocol was approved by the Institutional Ethical Committee of our Institute.

Exclusion criteria:- Type I fracture (Boyd and Griffin classification), fracture more than 10 days old, Compound fractures, pathological fractures, any co-morbid condition that may hinder rehabilitation, patients in whom spinal anesthesia could not be given.

Informed Consent was taken from all the patients undergoing surgery. Patients were evaluated pre operatively and medical fitness for surgery was obtained. Pre-operative protocol includes application of skin traction to reduce pain in all cases. All the patients were operated under spinal anesthesia by the same surgeon using C-arm. Intravenous Cefuroxime 1.5 gms was injected intravenously prior to the skin incision and Cefuroxime 1.5 gms twice a day was continued for 3 days post-operatively. Duration of surgery (measured from time of incision to the time of skin closure), type of Intra operative reduction, blood loss and any complications was noted. On 3rd post-operative day, all the drains were removed and static quadriceps, knee and ankle mobilization exercises were started. Wound inspection and surgical dressing was done on 3rd, 5th and 8th day post-operatively and stitches were removed on 14th day post-operatively. Duration of Hospital stay, time to start toe touch weight bearing and limb length shortening was also noted for both the groups. Time taken for radiological union on follow up X-rays was noted at 8 weeks, 16 weeks and 24 weeks. Kyle's criteria were used to evaluate results. All patients were followed up for a period of at least 6 months.

RESULTS

In our study, we included 50 patients of either sex of which 25 were treated with PFN and 25 underwent DHS surgery. Out of the 50 patients, 23 (46%) were males and 27 (54%) were females. Male to female ratio was 11:14 in PFN group and 12:13 in DHS group. The age of the patients ranged from 42 years to 89 years. Mean age of the patients in the PFN and DHS group was 64.3±14.42 years and 62.5±12.85 years respectively. Average operative time was 54.2 minutes for PFN group and 65.3 minutes for DHS group and the difference was statistically significant ($p<0.05$). In the PFN group, 21 patients underwent closed reduction and open reduction was done for 4 patients. In the DHS group, closed reduction was done for 20 patients and open reduction was done for 5 patients. Intra-operative technical complications were observed in 2 patients of

PFN group (1 broken bit in distal locking,1broken guide wire) while only 1 patient of DHS group had the complication of broken bit in putting distal screws. Average amount of blood loss during the surgery was150.45±48.216 ml in PFN group and 265.91±78.156 ml in the DHS group and the difference was statistically significant ($p<0.05$). Time for toe touch weight bearing was significantly shorter in the PFN group (15.56±6.15 days) as compared to the DHS group (40.23±11.27 days) ($p<0.05$). Average time for radiological union was 17.5±2.9 weeks in PFN group and 18.1±3.2 weeks in the DHS group. The difference was not statistically significant ($p=0.67$). There was no difference between the two modalities in terms of fracture union (one case of non-union observed in both groups). Average limb length shortening was 4.46 mm and 8.63 mm in PFN group and DHS group respectively and the difference was statistically significant ($p<0.05$). Mean duration of hospital stay was 8.4±1.24 days for PFN group and 9.1±1.56 for the DHS group. The difference was not statistically significant. **(Table I)**

Functional outcome was assessed at 6 months using Kyle's criteria and was found to be better in patients of PFN group as compared the DHS group **(Table II)**.

DISCUSSION

The results of our observational study concluded that PFN is a better treatment option as compared to DHS for unstable intertrochantric fractures in terms of reduced duration of surgery, blood loss, early weight bearing and mobilization. On functional assessment after 6 months, PFN group had a better outcome as compared to the DHS group (Kyle's criteria). The results are consistent with the studies conducted by various other researchers.

A study conducted by Jonnes C et al concluded that PFN is better than DHS in type II intertrochanteric fractures in terms of decreased blood loss, reduced duration of surgery, early weight bearing and mobilization, reduced hospital stay, decreased risk of infection and lesser complications (12). Meta-analysis conducted by Huang X et al concluded that PFN and DHS are equally effective in the treatment of trochanteric fractures. With further modifications of these two types of implants, more high-quality randomized controlled trials and further studies are required to investigate whether these changes can lead to different outcomes (13).

Table I: Comparison of clinical data in both groups

	Parameter	**PFN group (n=25)**	**DHS group (n=25)**
1.	Number of patients	25	25
2.	Gender (Male:Female)	11:14	12:13
3.	Mean age(42- 89 years)	64.3±14.42	62.5±12.85
4.	Average operative time (min)	54.2	65.3
5.	Type of on table reduction (closed:open)	21:4	20:5
6.	Intra operative technical complications	2(1 broken bit in distal locking,1broken guide wire)	1 (broken bit in putting distal screws)
7.	Total amount of blood loss (ml)	150.45±48.216	265.91±78.156
8.	Time for toe touch weight bearing(days)	15.56±6.15	40.23±11.27
9.	Time for radiological union (weeks)	17.5±2.9	18.1±3.2
10.	Number of non unions	1	1
11.	Average Limb length shortening (mm)	4.46	8.63
12.	Duration of hospital stay (days)	8.4±1.24	9.1±1.56

Table II: Comparison of Functional outcome in two groups after 6 months (Kyle's criteria)

	PFN Group (n=25)	**DHS Group** (n=25)
Functional outcome	**Number of patients**	**Number of patients**
Excellent (No or minimum limp, absence of pain, rarely used a cane)	10 (40%)	8 (32%)
Good (mild limp, mild occasional pain, full range of motion, using a cane)	12(48%)	11 (40%)
Fair (moderate limp, moderate pain, limited range of motion, using 2 canes or walker)	3 (12 %)	5(16%)
Poor (wheelchair bound, pain in any position, non-ambulatory)	0 (0%)	1(4%)

Outcome of intertrochanteric fracture also depends on patient related non modifiable variables like bone quality (osteoporosis) and fracture pattern. But surgeon dependent variables like quality of fracture reduction, choice of implant and accurate placement of implant are also important for successful outcome (14). Due to good clinical and anatomical results as well as the low morbidity rate, PFN is of interest in primary surgery for both elder and young patients but to further evaluate the DHS and PFN in the management of unstable trochanteric fractures, larger studies with a longer follow-up duration need to be done. (15).Meta-analysis by Zhang K et al declared that PFN when inserted by means of a minimally invasive procedure, allows the surgeons to minimize soft tissue dissection thereby reducing surgical trauma and blood loss. The results of this meta-analysis also demonstrates that operative time, intra-operative blood loss, and length of incision in the PFN group are significantly less than in the DHS group (16).

However our study had some limitations. Firstly, the number of patients taken for study was less. Secondly, the follow up time period was short. So, the long term complications which may have surfaced after this time could not be assessed. Therefore, it is recommended that a larger study with longer duration should be conducted to validate the results of this study.

CONCLUSION

On the basis of our observational study, it is concluded that PFN is a better treatment option as compared to DHS for unstable intertrochantric fractures in terms of reduced duration of surgery, blood loss, early weight bearing and mobilization. Functional outcome was found to be better in PFN group as compared to the DHS group.

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