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ORIGINAL ARTICLE

A Comparative Study of DHS and PFN in Intertrochanteric fractures of the Femur

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ABSTRACT:
Objective: To compare functional outcome and complications associated with PFN an intramedullary device with DHS an extramedullary traditional device. **Method:** It is prospective selective comparative study of an intramedullary device (PFN) group compared with extramedullary DHS group. Total 108 patients of PFN group and 100 patients in DHS group were studied. All relevant pre and perioperative information and complications were recorded. Also assessment of functional outcome was made. **Results:** The intramedullary group required lesser operative time (p = <0.05) and associated with lesser blood loss (p= <0.05) than the extra medullary group. The overall complication rate is less in intramedullary PFN group. There were no significant difference in functional outcome between both groups. **Conclusion:** The intramedullary device (PFN) is more useful in the treatment of unstable intertrochanteric fractures as compared to extramedullary device (DHS).
Key Words: Hip Fractures, Proximal Femoral nail (PFN), Dynamic hip screw (DHS), intertrochanteric fractures, Screws.

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INTRODUCTION

Generally, intramedullary fixation and extramedullary fixation are the 2 primary options for treatment of such fractures. The dynamic hip screw (DHS), commonly used in extramedullary fixation, has become a standard implant in treatment of these fractures Proximal femoral nail (PFN) and Gamma nail are 2 commonly used devices in the intramedullary fixation. Previous studies showed that the Gamma nail did not perform as well as DHS because it led to a relatively higher incidence of post-operative femoral shaft fracture**.** Intertrochanteric fractures are commonly seen in elderly patients, mostly due to trivial trauma. Gullber[1] has predicted that the total no. of hip fractures worldwide will reach 2.6 million by 2025. Hagino *et al*[14] reported a lifetime risk of hip fracture for individuals at 50 yrs of age of 5.6% for men and 20.0% for women. Any medical condition associated with bone loss, like diabetes mellitus, hyperparathyroidism, Hyperthyroidism and Cushing's syndrome is associated with rise in the risk for hip fracture. Several fixation devices been developed to overcome difficulties encountered in the treatment of unstable intertrochanteric fractures.
Intramedullary implants (Gamma nail, P.F.N), Extramedullary implants (D.H.S), Arthroplasty (Bipolar hemiarthroplasty or T.H.R). The most commonly used implant is the dynamic hip screw (DHS) with side plate. It is currently considered the gold standard for fixation of IT fractures.
However, mechanical and technical failures continue to occur in as many as 6% to 18% of cases treated by a compression hip screw and side plate. Theoretically intramedullary nail possesses certain advantages.[4,6] An intramedullary device bears the bending load which is transferred to the intramedullary nail and is resisted by its contact against the medullary canal. The intramedullary device is a more biological method of fixation. It is now a debate started on which would be the best implant to fix IT fractures. Was the Sliding hip screw with plate to be replaced with the intramedullary hip screw. Our study was aimed at comparing the proximal femoral nail (PFN) with the old method of dynamic hip screw with side plate (DHS) The total duration of surgery, blood loss, infection rate, wound complications, implant failure, post-operative function was to be compared between both devices.

MATERIAL AND METHODS:

The study was a prospective study involving 208 patients of intertrochanteric fractures treated by operative management at Department of orthopedics, Santosh Medical College Ghaziabad, from May 2013 to March 2015. The patients were divided into

two groups. Out of 208 patients, 108 were treated with Proximal Femoral Nail (P.F.N.) and 100 were treated by Dynamic Hip Screw and all patients were followed up for one year.

Inclusion Criteria

- All patients above 60 years with intertrochanteric fractures were selected.

Exclusion Criteria

- Those who did not walk before the fracture.
- Compound fractures.
- Those who are unfit to surgery due to very high risk factors.
- Patients with pathological fractures due to metastasis, tumors were excluded.
- Those unable to cooperate in postoperative period due to medical conditions.

Selection of Treatment: The decision for the type of operation was based on surgeon's preference and availability of the implant. The overall time from injury to surgery averaged 3.2 days (range: 1-6 days). After all required investigations and physician and anaesthetic consultation patients were posted for surgery under regional anaesthesia.

Patient Positioning: All cases were operated on a standard fracture table. The fracture table is essential to achieve reduction and as it allows free access for the C-arm in both views. Great care is taken in padding the heels in the foot stirrups and the perineal region. The other limb is placed in an attitude of extension and abduction. Patients were given prophylactic dose of third generation cephalosporin and aminolycosides i.v. half an hour before surgery.

Fracture Reduction: A closed reduction was then carried out by applying traction on fracture table and was confirmed in both A.P and Lat. views. If a reduction was not obtained then an open reduction was done especially for the P.F.N

Surgical Steps

Dyanamic Hip Screw With Plate Skin incision: An 8 to 10 cm incision was taken at the base of the greater trochanter and extended distally. The iliotibial band was incised to expose the vastus lateralis which was cut in the line of its fibers to expose the underlying bone.

Guide wire insertion: The guide wire was passed at a point along the lateral cortex just opposite the lesser trochanter. The wire should lie in the dead centre of the head in both A.P and lat. views.

Reaming: Once guide pin position was confirmed the reamer was set to within 5mm of the guide wire length and reaming was done, taking care to prevent entry of the guide pin into the pelvis.

Tapping: This step was omitted in severely osteoporotic bone.

Screw insertion: The appropriate size screw was then advanced keeping the principle of tip apex distance.

Plate fixation: Guide wire angle with shaft was confirmed and accordingly angled four hole side plate was then fixed to the lateral cortex.

Tension Band Wiring: In cases with fractures of the greater trochanter which are displaced a T.B.W was used which is passed through the gluteus medius around the barrel of the plate.

Wound closure- The wound was closed in layers over a suction drain.

PROXIMAL FEMORAL NAIL (P.F.N): Skin incision-3 cm skin incision was taken of approx. 2 cm from the greater trochanter tip. Guide wire insertion-A guide wire was passed anteriorly to hold the reduction making sure it was not in the medullary canal. The entry point- was marked with a wire and a cannulated cutter or awl was used to make entry. Reaming and nail insertion-The entry point was gently reamed. Nail was inserted with zig attatched to it. Proximal locking -Two guide wires were passed using the aiming device. Using appropriate drills the hip pin and the neck screw were inserted. Distal locking and wound closure -It is done with the aiming device. 1 or 2 locking screws are used depending on the fracture stability. The wound was closed in layers. No drain was used.

Post-Operative Protocol: Antibiotic prophylaxis - The same combination which was given preoperatively was then repeated for 48 hours. If there was obvious hematoma the antibiotics were continued for two more days. Thromboprophylaxis- Most patients in our study were treated with physical methods such as early mobilization, manual compression of the calf and elastic stockings. Low molecular weight heparins were reserved for patients with high risk for thromboembolism.[4,6]

Wound Care: All drains were removed by 48 hours once the drainage stopped. The wounds were inspected on the 3rd and 7th post operative day. Stitches were removed on the 12th or 13th day if the wound margins were healthy. Wounds showing any suspicious signs of infection were treated after culture sensitivity of wound swab. Blood loss and Blood transfusion. Estimation of blood loss was done in O.T as the amount of blood in suction bottle and no. of mops soaked. In post operative period as the amount in suction drain in D.H.S group while in P.F.N group suction drain was not used. Blood transfusion was given if necessary.

Postoperative Assessment

Table 1: All patients were followed up for a period of one year; the follow up visits were done at:

10 Days	for stich Removal
6weeks	1st visit
3months	2nd visit
6months	3rd visit
12 months	4th visit

Postop implant positioning of hip screw (both AP and lat view)

Assessment done regarding one of these parameters on respective visits-

1. Four post walker partial weight bearing (Toe touch walking)
2. Full weight bear walking,
3. Time to union
4. Walking with support,
5. Shortening
6. Complications

RESULTS AND OBSERVATIONS

The study involved 208 patients of intertrochanteric fractures,. 100 were treated by a dynamic hip screw with plate and 108 were treated by Proximal Femoral Nail. Outcome is as follows.

Age:

Table 1: Age distribution

Age	D.H.S.(100)	P.F.N(108)	Total No. Of Patients
60-65	30(30%)	38 (35%)	66
66-70	28 (28%)	26(24%)	56
71-75	22(22%)	28(26%)	50
76-80	12(12%)	8(7%)	20
81-85	7(7%)	6(5%)	13
>85	1(1%)	2(3%)	3

The study involved patients above 60 years of age. The mean age distribution was 70.9 yrs in DHS group while mean age of PFN group 70.8 yrs. The largest group of patients being from 60 to 65 years.

SIDE: In our study out of 208 patients 121 (58%) patients had intertrochanteric fracture involving right side while 87 (41%) pts had fracture of left side.

Sex Distribution: The study involved 141(67%) males and 67(33%) females. The more complex fracture patterns A-2 types and A-3 types were seen more commonly in females, with fracture patterns A3-2 and A3-3 seen exclusively in females.

FRACTURE PATTERNS: All the fractures were classified as per the A.O. (O.T.A.) classification.

Study group	Sex M/F = (100/108)	Side Rt	Lt	Fracture pattern A1	A2	A3
DHS(100)	M=68(68%)	62	38	58	22	20
PFN(108)	73(67%) 35(33%)	59	49	23	37	48

Functional hip scores: All patients were subjected to the Harris hip score at three months, six months and one yearly follow ups. In the D.H.S group the one month hip score (Avg. 24.4) was less than that of the P.F.N group (Avg. 33.4), $p<0.05$ however this difference disappeared with the two group on the six monthly and yearly follow up with both scores being same. (D.H.S-94.2 and P.F.N-94.6)

Time to union- average time for union is 8 weeks in DHS and in PFN group is 9 weeks. two cases of nonunion were treated with bone grafting.

Table 3: Average hip scores at serial follow up

Average Harris hip scores at	Dyanamic Hip Screw (D.H.S.)	Proximal (P.F.N)
1 Month	24	33
3 Month	53	58
6 Month	90	90
1 Year	94.2	94.6

Table 4:

Parameter	DHS	PFN	significance
Duration of surgery	min	min	(p value <0.05)
Blood loss intraoperative	233 ml	96 ml	(p value <0.05)
Shortening of limb	7mm	5mm	Not significant
Functional hip scores	94.2	94.6	Not significant

Table 5: Complications

Complications	D.H.S.	P.F.N.
Infection	4	2
Non-union	1	1
Implant related complications	5	2
Medical complications	2	2
Deaths	1	1

DISCUSSION

PFN was introduced for treatment of intertrochanteric fractures. It was designed to overcome implant-related complications and facilitate the surgical treatment of unstable intertrochanteric fractures. PFN uses 2 implant screws for fixation into the femoral head and neck. The larger femoral neck screw is intended to carry most of the load. Peritrochanteric fracture of femur are very common in older age group due to osteoporosis. It is a great deal not only for achieving fracture union but also for restoration of optimal function in shortest possible time with least complications. Operative treatment with internal fixation offers best chances of functional recovery. It has been treatment of choice as advocated by Boyde Anderson (1961) and Zuckermann (1994) and Weise and Schirals (2001). The goal of this study was to compare the functional outcomes of intertrochanteric fractures treated by two different fixation devices, the extramedullary dynamic hip screw and the intramedullary proximal femoral nail. Our study consisted of 208 patients with intertrochanteric fractures out of which 100 treated with DHS and 108 treated with PFN.

Age Group: Our study included patients with age group from 60 -88. Both the groups were age matched with p value. Kyle had reported around eight fold increase in trochanteric fracture in men over 80 and women over 70 years.

Male Female Ratio: In our study there is a male preponderance constituting 67% males and 32% females. Melton *et al* released a study titled " Fifty years trend in hip fracture incidence" and had reported male to female ratio as 1:1.8. In our study we included only patients older than 60 yrs. So all the fractures in patients below 60 years either due to fall from height or RTA may result in such finding. The most common mode of injury emerged as simple fall in elderly individuals, around 80% in DHS group and 70% in PFN group. Cummings *et al* (1994) found similar incidence. RTA and fall from height, both accounted for remaining 20% in DHS and 30% in PFN group. Zuckermann (1998) observed young patients sustained fractures in high velocity trauma in 90% of cases.

Types of Fractures: In our study, A1 was the most common type found in 81 patients (38.9%), followed by A3 which are 68 in number (33.6%). Both types have been found commoner in age group above 60 years. It is imperative here to mention that all the subjects taken in the study group were walking without support prior to injury and had similar walking abilities.

Procedure Time and Blood Loss: DHS has longer operative time of 120 minutes and blood loss of 233ml as compare to PFN which is 90 mins and blood loss of 96ml. A central position of screw was found to be optimal in PFN (Mashollard and Ceunn,1972 Dans *et al*,1990).

Post Operative Evaluation: Toe touch weight bearing in both group were similar in first two post operative. Full weight bearing was allowed within 6 weeks with help of walker in 60 % cases of DHS and 50% cases of PFN group. At the end of 12th week 100% of both the groups were could able to bear full weight with the help of walker. All the patients were ambulant with stick in the opposite hand within 12 weeks in both groups. There was no statistical difference in both groups while walking without support at 12th 16th and 24th week. Pejarinem *et al* in their study found that PFN may increase chances of better post operative walking ability with that of DHS.

Follow Up: 100% follow up was maintained in both the groups for 1st 6 months and around 96% at the end of year

Functional Outcomes: The outcomes in terms of HARRIS HIP SCORE at one month DHS (24.4) lesser than PFN avg. 33.4%. But at one year scores become same irrespective of type of fracture, stable or unstable.

Complication: There were two deep infections in PFN group while four got infected in DHS group those were treated with debridement and antibiotic beads. One nonunion in each group treated with shingling, bone grafting and dyanamisation in PFN group. Varus deformity and screw cut out was observed only in 5 cases of DHS group. Z effect was noticed in 2 cases of PFN group. So overall complications were more in DHS group as compared to PFN group.[2,3] Working on the principl of controlled compression at the fracture site, DHS has achieved a low rate of non union fixation failure.[7,8] A disadvantage with DHS is that it requires a relatively large exposure and excessive soft tissue stripping. Being an extramedullary implant the screwed side plate creates stress risers in the bone that increases the risk of the fracture distal to the implant.[9,19] Whereas PFN being an intramedullary device can withstand higher cyclical and static loading as compared to DHS.[11,12] Another important complication is screw cutout. Commonly seen in osteoporotic bone possibly due to varus deviation and rotation most often seen in comminuted unstable fracture pattern apart from poorly performed procedure The presence of 2nd proximal neck screw in PFN may increase rotational stability of the cervicocephalic fragments. It is indicated in some studies that intramedullary devices help in facilitating early postoperative rehabilitation.

CONCLUSION

In summary, the current available data indicate that PFN may be a better choice than DHS in the treatment of intertrochanteric fractures.Though PFN and DHS have similar outcomes in stable fracture patterns of intertrochanteric fractures in our study we found that PFN has better functional outcomes in unstable fractures.

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