



ORIGINAL RESEARCH PAPER

Orthopaedics

A COMPARATIVE PROSPECTIVE STUDY OF DYNAMIC HIP SCREW AND PROXIMAL FEMORAL NAIL IN TREATMENT OF SUBTROCHANTERIC FRACTURE FEMUR

KEY WORDS:
Subtrochanteric fracture, proximal femoral nailing, dynamic hip screw

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ABSTRACT

Subtrochanteric fractures are relatively rare, accounting for 10 -34% of all hip fractures^{1,2,3}. They may be very difficult to fix, and the risk of failure has been high with loss of the lesser trochanter and the medial buttresses^{3,4}. Various intramedullary and extramedullary devices have been developed in an attempt to address potential complications of device failure, mal- or non-union and deformities. In our prospective case series 29 subtrochanteric fractures were involved. The aim of this study is to assess fracture union and functional outcome in subtrochanteric fracture femur treated with proximal femoral nailing and dynamic hip screw, and also to evaluate advantages, disadvantages and major postoperative complications associated with the proximal femoral nailing and dynamic hip screw. Conclusion: The average functional scores for the PFN group at 6 months was 31.5 (excellent) which was significantly greater than the DHS group 27.1 (good) (p = 0.03). There was no significant difference in time to union in both groups (average 5.7 months for DHS group and 5.2 months for PFN group) (p = 0.26). The intraoperative complication rate for the PFN group was 36% which was significantly higher than the DHS group (0%) (p =0.001). The PFN had a significantly better functional outcome than DHS plating at 6 months. Long term studies may be needed to observe whether the difference persists on further follow ups. The PFN had a significant advantage over the DHS with side plate in subtrochanteric fractures with regards to less blood loss, less requirement for transfusions, better functional scores, less shortening and fewer incidences of postoperative complications. From the study, we consider PFN as better alternative to DHS in the treatment of subtrochanteric fracture femur but is technically difficult procedure and requires more expertise compared to DHS.

INTRODUCTION :

The subtrochanteric area has been defined as the area between the inferior border of the lesser trochanter and the isthmus of the femoral shaft or the inferior border of the lesser trochanter to the junction of the proximal and middle one third of the femur. Subtrochanteric fractures are fractures in which the major portion of the fracture involves this area. Various intramedullary and extramedullary devices have been developed in an attempt to address potential complications of device failure, mal- or non-union and deformities. In unstable per- and sub-trochanteric fractures however, the system has been reported to involve high failure rates^{5,6,7}.

Proximal femoral nail (PFN) & Gamma nail (GN) are more stable under loading with a shorter lever arm, so the distance between the hip joint and the nail is reduced compared with that for a plate, thus diminishing the deforming forces across the implant⁸. Being intramedullary, load transfer is more efficient. Advantage of controlled impaction is maintained. Sliding is limited by intramedullary location so less shortening & deformity. Comparative studies between DHS and GN have shown a higher incidence of complications in the GN group, in particular fracture of the femur below the tip of the implant, collapse of the fracture area and cutting out of the femoral neck lag screw^{9,10} in 8 to 15% of cases. Biomechanically, compared to a laterally fixed side-plate, the PFN decreases the bending force of the hip joint on implants by 25 to 30%. This has advantages especially in elderly patients, in whom the primary treatment goal is immediate full-weight-bearing mobilisation¹¹. PFN has an additional anti-rotational screw (hip pin) placed in the femoral neck to avoid rotation of the cervicocephalic fragments during weight bearing¹².

Sliding hip screw devices have been used with good success in the treatment of subtrochanteric fractures with involvement

of the piriformis fossa. Union rates of 95% and average healing times of 2.5 months have been reported with current implants^{13,14,15,16}. However, recent studies^{17,18} have reported increased incidence of complications especially malunion and implant failure.

The purpose of this study on “A Comparative prospective study of Dynamic Hip Screw and Proximal femoral nail in treatment of subtrochanteric fracture femur” is to assess fracture union and functional outcome and advantages and disadvantages of each method.

AIMS AND OBJECTIVES:

- 1.To assess fracture union and functional outcome in subtrochanteric fracture femur treated with proximal femoral nailing and dynamic hip screw.
- 2.To evaluate the advantages and disadvantages associated with the proximal femoral nailing and dynamic hip screw.
- 3.To evaluate the major postoperative complications associated with each group.

MATERIALS AND METHODS:

This is a prospective case series study involving 29 subtrochanteric fractures from April 2019 to July 2021. Of these, 11 were treated with intramedullary proximal femoral nailing (mean age 40 years , range 20 – 65, 10 males and 1 female) and 18 with compression hip screw (mean age 51, range 25-71, 13 males and 5 females;). The routinely used implants in our study were:

1. PFN nail diameter: a 10 mm diameter nail was used in 5 patients and a 11 mm diameter nail in 6 patients. In all patients the central hip screw angle was 135 degrees. Central screw length: An 80 mm hip screw was used in 4 patients and an 85 mm screw in 7 patients. In addition, anti-rotation screws were applied in all cases.

2. Compression hip screw plating

A 135 degree barrel plate was used in all 18 patients of this group.

A 5, 6 and 7 hole plate was used in 6, 8 and 4 patients respectively. An 80 mm hip screw was used in 7 patients, an 85 mm in 8 patients and a 90 mm screw in 3 patients.

A fracture table and an image intensifier were used in all cases. All patients received one dose of 2nd generation cephalosporin intra operatively and 3 days course postoperatively, we followed the operative technique as described in the operative manual. The patients functional status was recorded at the time of admission, 1 monthly, 4 monthly and 6 monthly follow up using the Salvati Wilson scoring.¹⁹

Inclusion Criteria

1. Age 20 years or greater and less than 75 years
2. Subtrochanteric fractures defined as a fracture in which the fracture line traversing the femur was mainly within 5 cm of the femur distal to the lower margin of the lesser trochanter
3. Closed injury

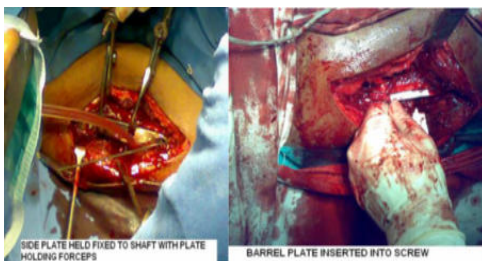
Exclusion Criteria

1. Age less than 20 years or greater than 75
2. Those that do not came for follow up
3. Pathological fracture
4. Open fracture
5. Polytrauma patients
6. Head injury patients
7. Ipsilateral skeletal injuries
8. Severe arthritic hip.

Fig 1. INTRAOPERATIVE PHOTOGRAPHS OF PFN



Fig 2. INTRAOPERATIVE PHOTOGRAPHS OF DHS



STATISTICAL ANALYSIS

For quantitative data i.e. duration, blood loss, Harris hip scores, the "t-test" was used, for the qualitative data the test of difference between two proportions (Chi square test) was used. For data - like implant failure, mal-union, etc. Fisher exact test was used. Applying the Null Hypothesis the observed difference was considered to be significant if the P value was < 0.05.

OBSERVATIONS AND RESULTS

1. AGE DISTRIBUTION: The study involved patients with age distribution from 20 – 71 yrs. The average age was 51 yrs for the DHS group and 40 yrs for PFN group. The comparison was insignificant (p value = 0.71).

Table 1. :Age distribution

AGE (YRS)	DHS	PFN
20 – 35	5	4

35 – 50	2	4
50 – 65	8	2
> 65	3	1

2.SEX DISTRIBUTION: The study involved 23 males and 6 females, Comparison was insignificant (p value = 0.228)

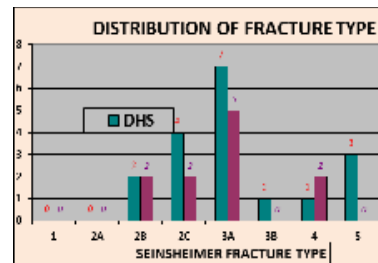
Table 2:Sex distribution.

GROUP	DHS	PFN
MALE	13	10
FEMALE	5	1

3. TYPE OF FRACTURE.

Seinsheimer 20 type 3A was the most common fracture pattern (41%).

The other fracture types 2B, 2C, 3B, 4, 5 constituted 13.8% , 20.7%, 3.4% , 10.3% and 10.3% respectively.



Graph 1:Distribution of fracture type and method of fixation.

4.DURATION OF SURGERY

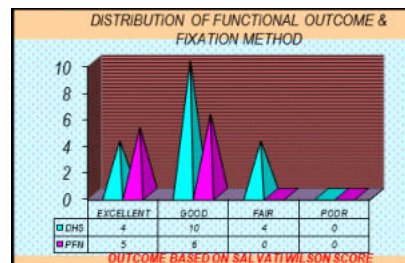
Duration of surgery as calculated from the time of incision to skin closure was counted in each case. The average duration of the two groups was compared and it was noted that the DHS (average time 150 min) required a significantly shorter time as compared to the PFN (average time 196 min). P value 0.001.

5. BLOOD LOSS AND BLOOD TRANSFUSION

The blood loss was estimated from the amount of blood in the suction drain. The average blood loss in the PFN group was 110 ml and in the DHS group was 209 ml. This data was statistically significant (p < 0.001)

6. FUNCTIONAL HIP SCORING

In the DHS group the one month SW score (avg 9.6) was less than that of the PFN group (Avg 12.9) p 0.0001; The difference decreased on the sixth monthly follow up, but the PFN group had a significantly higher score (DHS avg 27.2 and PFN avg 31.55). (p 0.03). At final follow-up of 6 months the PFN group had 45% patients with excellent outcome (5 of 11) and 55 % patients with a good outcome (6 of 11). None had a fair or poor outcome based on Salvati Wilson scores.¹⁹ At 6 months, the DHS group had 22 % patients with excellent outcome (4 of 18), 55% patients with good outcome (10 of 18) and, 22% patients with a fair outcome.

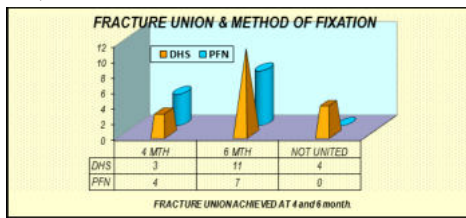


Graph 2.Distribution of functional outcome & fixation methods.

7. FRACTURE UNION

16% in the DHS group achieved union by 3 months (3 of 18), 61 % by 6 months (11 of 18) and 22% patients (4 of 18) had not

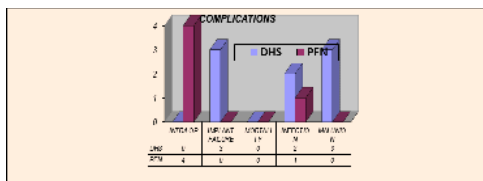
achieved union at 6 months. 36% patients in the PFN group achieved union by 4 months (4 of 11) and 63% patients achieved union by 6 months (7 of 11). There were no ununited fractures in the PFN group at the end of 6 months follow up. Only 77 % of fractures in the DHS group were united at 6 months while 100% of fractures in the PFN group were united by 6 months. The finding was statistically insignificant (p value 0.26)



Graph 3: Fracture union & method of fixation.

8. COMPLICATIONS:

The postoperative complication rate in the DHS group was 44.4 % and in the PFN group was 9.1 % which was statistically insignificant (p < 0.09).



Graph 4: Complications.

CONCLUSION:

1. The PFN had a significantly better functional outcome than DHS plating at 6 months. Long term studies may be needed to observe whether the difference persists on further follow ups.

2. There was no statistically significant difference in subtrochanteric fracture union rate with proximal femoral nailing and DHS plating at 6 months.

3. The PFN had a significant advantage over the DHS with side plate in subtrochanteric fractures with regards to less blood loss, less requirement for transfusions, better functional scores, less shortening and fewer incidences of postoperative complications.

4. The advantages of the DHS plating over proximal femoral nailing was the decreased duration for surgery seen with hip screw plating and less incidence of intraoperative complications.

5. DHS plating is not to be used in specific fracture patterns (Seinsheimer type 3A) considering high rate of implant failure.

6. There was no significant difference in the postoperative complication rates in the two groups.

From the study, we consider PFN as better alternative to DHS in the treatment of subtrochanteric fracture femur but is technically difficult procedure and requires more expertise compared to DHS.

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