

A prospective comparative study of Proximal Femoral Nailing Anti-rotation (PFNA) and Sliding Hip Screw (SHS) for Per-trochanteric Femur Fracture

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¹ Conception of study

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Abstract

Objectives: To determine the functional outcome, operative risks, rate of union, and complication in Per-trochanteric Fracture fixed with PFNA and SHS.

Material and Methods: The present study has been conducted at Shalamar Medical and Dental College Lahore from January 2018 to December 2018. 40 patients with per-trochanteric femur fracture treated with proximal femoral nailing anti-rotation (PFNA) and Sliding hip screw (SHS) were enrolled in our study. 20 patients were treated by PFNA and 20 patients by SHS. Timing of surgery, mobilization status, hospital stay, infection, weight-bearing status, radiological union, complications both technical and implant-related, amount of blood loss (ml), C ARM Exposures, and Harris hip score at the end of 6 months were recorded.

Results: Union was better in the PFNA group (95%) as compared to the SHS group (85%). Complication rate, hospital stay, surgery timing, and requirement of revision surgery were more in the SHS group. The functional outcome was better in the PFNA group as compared to the SHS group.

Conclusion: From our study, we concluded that PFNA is a better alternative than SHS in terms of higher union rates, low complication rates, and better functional outcomes.

Keywords: Per-trochanteric fractures, PFNA, SHS.

Introduction

Per trochanteric fractures are becoming increasingly common as our population ages.^{1,2} These fractures usually occur in fragile patients with mostly other comorbidities.³ 90% of per-trochanteric fractures in elderly results from simple fall or trivial injury.^{4,5} Per-trochanteric fractures in the young population are usually because of high energy trauma.^{6,7} Effective treatment methods that provide a high rate of union and low rate of complications are important [8, 9]. For rigid fixation and early mobilization method of treatment commonly used implants for the fixation of per trochanteric fracture are SHS (extramedullary) and PFNA (intramedullary).^{10,11,12}

There is still controversy regarding the best implant for Per-trochanteric fracture. Keeping in view we present this study to compare results of PFNA and SHS in per-trochanteric femur fractures.^{13,14}

Material & Methods

Our study was conducted in the department of trauma and orthopaedic Shalamar Medical and Dental College Lahore from Jan to Dec 2018. Permission was granted by the institutional ethical review board. We enrolled 40 patients of Per-trochanteric fracture, 20 patients out of 40 were treated with PFNA, 20 with SHS. Inclusion criteria in our study were all the patients aged 18 years and above, closed per trochanteric fracture, and patient with extension into the subtrochanteric region. Patients with low subtrochanteric, open fractures, pathological fractures, and fractures in skeletally immature patients were excluded from the study.

All the patients admitted with Per-trochanteric fractures were assessed clinically and hemodynamically stabilized. X rays of the pelvis (AP view) and full femur (AP and lateral) were taken. The fractured limb was splinted with skin traction. Fractures were classified with Boyd and Griffin classification. Routine investigations were done and pre-op anesthesia fitness was obtained with patients with multiple co-morbidities. All surgeries were performed on a traction table, in a supine position using fluoroscopic guidance. All fractures were aimed to reduce closely. At our setup, due to cost management, we used a Chinese version implant. Postoperative AP and lateral x-rays were assessed for adequacy of reduction and screw position in the head of the femur. All the patients were reviewed in OPD at 2weeks, 6weeks, 12weeks, and at 6 months with check

x rays as shown in Figure 1. In patients with stable Per-trochanteric fracture, either treated with PFNA or SHS bed to chair mobilization was done very next day, and toe touch weight-bearing with the help of foldable walkers was started after 48 hours. Patients with unstable per-trochanteric femur fractures either treated with PFNA or SHS, a bed to chair mobilization was done very next day, and toe touch weight-bearing with help of foldable walkers was started after 6 weeks depending on stability and reduction of the fracture. Full weight-bearing was started only after the radiological union. The results in both groups were compared in terms of:

- Timing of surgery
- Amount of blood loss (ml)
- C ARM Exposures
- Mobilization status
- Weight-bearing status
- Hospital stay
- Infection
- Radiological union
- Complications technical and implant-related
- Harris hip score at the end of 6 months

Results

Forty patients were included in the study, out of which 20 underwent PFNA and the other 20 underwent SHS. The mean age of the patients who underwent PFNA was 46.6 years while in the SHS groups mean age was 48.5. The youngest patient in our study was 20 years old while the oldest patient was 90 years old as shown in Table 1.

Domestic fall (Slip-in Washroom) was the main cause of injury which comprises 25 patients while in 15 patients fracture was due to road traffic accident (RTA) as shown in Table 2.

We have 14 patients with Boyd and Griffin type 3 followed by 11 patients with type 2 and 9 patients with type 4 fractures in Table 3.

13 patients in the PFNA group have fractures on the right side while 7 patients had fractures on the left side. In the SHS group, 11 patients had right-sided fractures while 9 patients had a fracture on the left side. Blood loss was seen more in the patient with the SHS group as compared to the PFNA group but the c arm exposure (Radiation) was less in the SHS group as compared to the PFNA group. Duration of hospital stay, surgery timing was more in patients with SHS group as shown in Table 4.

All the patients were assessed for a radiological union at 6 weeks and 6 months postoperatively. Among the

patients of the PFNA group, in 17 patients complete union occurred in 10-14 weeks period while 2 patients, union occurred in 14-18 weeks. In the SHS group, 15 patients had a union in 10-14 weeks, and 2 patients had a union in 14-18 weeks. There were 4(10%) non-unions. 1(5%) in the PFNA group and 3(15%) in the SHS group as shown in Table 5.

All the patients with non-union underwent subsequent bone grafting and were healed subsequently except one patient of SHS group who refused for further surgery and was lost the follow-up. One patient in the SHS group had superficial skin infection which was controlled with daily dressing and antibiotics and was later healed at 18 weeks.

In the PFNA group, one patient had intraoperative Greater Trochanter (GT) splitting which was further observed radiographically and was healed subsequently. In SHS group 2 patients had varus collapse and screw cut out requiring revision surgery. Complication rate and subsequent revision surgery were more in the SHS group but were not statistically significant (Table 6).

The mean Harris Hip score in the PFNA group was 84.45 and in SHS group was 83.25. In the PFNA group, 8 patients had excellent scores, 11 patients had a good score and 1 patient had a fair result. In SHS group 4 patients had excellent results, 12 patients had a good score, 3 patients had a fair result and 1 patient had poor result (Table 7).

Table 1: Age distribution among both groups

| Age(Years) | No. of patients in PFNA group | No. of patients in SHS group |
|------------|-------------------------------|------------------------------|
| 20-30 | 2(10%) | 1(5%) |
| 30-40 | 3(15%) | 3(15%) |
| 40-50 | 1(5%) | 2(10%) |
| 50 -60 | 5(25%) | 4(20%) |
| 60-70 | 4(20%) | 5(25%) |
| 70-80 | 4(20%) | 3(15%) |
| 80-90 | 1(5%) | 2(10%) |
| Total | 20 | 20 |

Table 2: Gender distribution and Mode of injury

| | | PFNA | SHS | Total |
|-----------------|------------|------|-----|-------|
| No. of Patients | 40 | 20 | 20 | 40 |
| Male | | 10 | 12 | 22 |
| Female | | 10 | 08 | 18 |
| Mode of Injury | (H/o fall) | 12 | 13 | 25 |
| | RTA | 8 | 7 | 15 |

Table 3: Type of fractures according to Boyd and Griffin classification

| Fracture type | Method of fixation | Method of fixation | Total |
|---------------|--------------------|--------------------|----------|
| Type 1 | PFNA | SHS | |
| | 2(10%) | 4(20%) | 6(15%) |
| Type 2 | 4(20%) | 7(35%) | 11(27.5) |
| Type 3 | 6(30%) | 8(40%) | 14(35%) |
| Type 4 | 8(40%) | 1(5%) | 9(22.5%) |
| Total | 20 | 20 | 40 |

Table 4: Final functional outcome in both groups

| | PFNA | SHS |
|---------------------|------------------|----------------|
| Hospital stay | 2.5days | 3.5 days |
| Radiation Exposure | 45+1.2(No. time) | 32+4(No. time) |
| Blood loss | 75ml | 150ml |
| Duration of surgery | 45min | 75min |

Table 5: Final functional outcome in both groups

| Union | PFNA | SHS | Total |
|-----------|---------|---------|---------|
| United | 19(95%) | 17(85%) | 36(90%) |
| Non-union | 01(5%) | 3(15%) | 4(10%) |
| Total | 20 | 20 | 40 |

Table 6: Patient distribution according to complication

| Complications | PFNA | SHS | Total |
|--------------------------------|-------|--------|---------|
| Varus collapse & screw cut out | 0 | 2(10%) | 2(5%) |
| Z Effect | 0 | 0 | 0 |
| GT Splitting | 1(5%) | 0 | 1(2.5%) |
| Infection | | 1(5%) | 1(2.5%) |
| Total | 1(5%) | 3(15%) | 4(10%) |

Table 7: Functional outcome according to HHS

| Groups | No. | Excellent | Good | Fair | Poor |
|--------|-----|-----------|------|------|------|
| PFNA | 20 | 8 | 11 | 1 | 0 |
| SHS | 20 | 4 | 12 | 3 | 1 |

Pre-op X rays immediate post-op 6 Months post-op



Figure 1: Unstable PT fracture fixed with PFNA

Discussion

In the past few decades, the fixation of the Per-trochanteric femur fracture has changed significantly. SHS has been the implant of choice for Per-trochanteric fractures for a long time. But many complications reported for complex and unstable fractures. The PFNA was designed to decrease the implant-related complication of SHS and facilitate the management of complex and unstable Per-trochanteric fractures. Many studies showed PFNA is superior to SHS for unstable Per-trochanteric fractures.

In the current study, we compare the timing of surgery, hospital stay, infection, radiological union, complications technical, and implant-related. The amount of blood loss(ml), C ARM Exposures, and Harris hip score at the end of 6 months between the two groups treated with PFNA and SHS. The mean age of the patient with PFNA was 46.6 years and the mean age of the patient with SHS was 48.5 years. These ages are comparable to the studies done by Kumar et al, Jose et al, and Mundla et al.^{15,16,17} In our study males (twenty-two) were more affected as compared to females (eighteen). This was contrary to the study done by Kumar et al and Mundla et al that had more female predominance. We classified the fracture according to Boyd and griffin.¹⁸ But in many studies, fractures were classified according to universal AO classification. The radiological union was achieved within 14-18 weeks in most of the patients. In the study by Shivanna and Rudrappa

fractures were united at 12 weeks.¹⁹ In our study 3 cases went into non-union in the SHS group, while in the PFNA group there was 1 non-union case. These findings were comparable to the studies done by Goel et al and Sudan M.^{20,21} Screw cut out & varus collapse of fracture was seen in 2 cases of SHS group. Superficial infection was seen only in 1 case of the SHS group. This was probably due to extensive dissection in the SHS group. Although there was no case of deep infection in any of the two groups. Average blood loss was more in the SHS group but not that significant to warrant blood transfusion. These findings are comparable to the studies done by Kumar et al, Saudan et al and Pajarinen et al.^{15,21,22}

The duration of the surgery and hospital stay was more in the SHS group as compared to the PFNA group. These results are comparable to the results shown by Pan et al and Zhao et al.^{23,14} The Harris hip score at 6 months was higher in the PFNA group as compared to the SHS group. These results were comparable to the study done by Gupta et al.²

Conclusion

PFNA is a versatile implant. Fractures treated with PFNA nail have shown easier rehabilitation, less blood loss, less surgical trauma, early mobility, and early rate of fracture union when compared to SHS. From our study, we consider PFNA as a better implant as compared to SHS in the treatment of Per-trochanteric femur fracture but is technically demanding procedure and requires more expertise.

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