Intertrochanteric Femur Fractures: A Comparison of the Proximal Femoral Nail and the Dynamic Hip Screw

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Abstract

Objective: Determination and comparison of the radiological as well as the functional outcomes of Proximal Femoral Nail (PFN) and Dynamic Hip Screw (DHS) in the treatment of intertrochanteric fractures (ITF) of the femur **Study design:** A randomized controlled trial **Place and Duration:** This study was conducted in Ghulam Muhammad Mahar Medical College Sukkur from February 2022 to February 2023. **Methodology:** According to the inclusion criteria, the patients added to the study had stable intertrochanteric fractures and they were divided into two groups. One group was treated using PNS and called group A. The other group was treated by DHS and called group B. After the treatment course was completed, the patients were reviewed functionally and radiologically. The assessment was done for functional outcomes by Harris Hip Score (HHS). The grading was done in such a way that a <70 score was considered poor, a 70-80 score was considered fair, 81-90 was considered good and a 91-100 score was considered to be excellent. The comparison of both treatments was done three months after the treatment, then on the sixth and twelfth months. **Results:** The study was done on 110 patients, out of which 62 (56.36%) were male and 48 (43.63%) were female. The patients were randomly split into Group A and Group B. Group A and B had 55 patients each. The mean age of the patients in group A (PFN) was 58.64±6.35 years and in group B (DHS) was 58.96±5.96 years. The number of male patients in group A was 35 (63.63%) and in group B was 27 (49%). The number of female patients in Group A was 20 (36.36%) and in Group B was 28 (50.9%). The mean time of reunion of the bone seen radiologically in group A was 13.6±6 weeks and in group B was 13.3±4 weeks. In group A, the mean HHS score in the third month was 35.65±3.55 (poor) and it was 53.79±4.65 (poor) in group B ($p < 0.05$). In the sixth month of the treatment, it was 82.75±4.64 (good) in group A and 88.65±4.86 (good) in group B ($p < 0.05$). After one year of the treatment, the HHS score of the patients in group A was 92.87± 2.97 (excellent) and in group B was 93.18±2.19 (excellent) ($p<0.05$). **Conclusion:** The outcomes of PFN and DHS-treated patients for intertrochanteric femur fractures are similar. The outcomes were not excellent in the beginning, however, the reunion on radiology and HHS scores were excellent after one year of the treatment.

Keywords: Dynamic hip screw, Intertrochanteric fracture, femur fracture, proximal femoral nail, Reunion of bone, Harris hip Score, radiographs

1. Introduction

Hip fracture is common in elderly individuals, especially in patients with osteoporosis. It is a disease of great concern and also a significant health issue on a global level [1]. These fractures have been categorized according to the location of the fracture such as intertrochanteric, sub-trochanteric, and

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femoral neck fracture [2]. Prompt surgical intervention is needed to treat the patients. The approach chosen for the correction of the fracture is determined by the location of the fracture, the age of the patient, and the general health of the patient [3]. More than half of hip fractures in elderly patients are ITFs [4]. The main motive for the treatment of ITFs is early mobilization and minimum complications [5]. Even though DHS is used more commonly in the treatment of ITFs, the use of PFN has recently increased due to its wide benefits [6]. PFNis also more favoured due to more stability in its design [7]. The failure of PFN installation in the literature is mostly because of technical errors [8].

The objective of the current study is to distinguish between the functional as well as radiological outcomes of PFN and DHS in the treatment of ITFs of the femur.

2. Methodology

The present study is a randomized controlled trial including a total of 110 patients. All the patients have been taken from the outpatient department and emergency department of the hospital with ITFs. As per the inclusion criteria of the study, the patients included in the study had sustained the fractures within one week of presentation to the hospital. According to the exclusion criteria of the study, the patients with open fractures, previous surgery of hip fracture, segmented fractures, polytrauma, and fractures due to certain pathology, were excluded from the study. A complete history of all the patients was taken followed by physical examinations and baseline investigations. Written consent was taken from all the patients considered in the study after explaining the details regarding the study methodology and course of treatment. The patients were split randomly into two groups having 55 patients in each group. The patients in the group A were treated with PFN and the patients in the group B were treated with DHS.

All the procedures were done under general and spinal anesthesia. The surgical team that performed all the procedures, be that for PFN or DHS, was the same. The team followed the standard protocols for both techniques. The reduction done for the fractures was a close reduction. An incision of the lateral surface is made distal to the greater trochanter for exposing the entry point of DHS. For the application of DHS, size lag screw, cortical screws, and hole side plate with 135° angle was used. The position of the lag screw was maintained in the posteroinferior location in the femur neck.

For the application of PFN, a 5cm incision was given proximal to the greater trochanter's tip. This point was used as an entry point for PFN. PFN used was with an angle of 135° and length of 240 mm having distal locking. Lee method was used for the calculation of blood loss and weighing the swabs used during the surgery [9].

The post-operative care of the patients was done according to the standard protocols. Physiotherapists were appointed on the first day after surgery. The patients were encouraged to frequently perform abductor exercises and isometric quadriceps exercises. The patients were instructed to use crutches and walkers on the second day after surgery so that weight-bearing could be avoided. The patients were asked to visit in the second month, third month, sixth month, and one year after the treatment was provided.

The radiological assessment for the union of fractures was done by analyzing the formation of the callus on lateral and anterior-posterior radiographs. The HHS scoring system was used for the functional assessment of the bone reunion. The grading was done in such a way that a score lesser than 70 was considered poor, 70-80 was considered to be fair, 81-90 was good, and 91-100 was excellent [10]. The data were carefully collected and analyzed in IBM SPSS version 26.

3. Results

A total of 110 patients were enrolled in the present study. The patients were added to the study after analyzing them based on exclusion and inclusion criteria. A total of 55 patients were added to each group. The patients in group A were treated with PFN and the patients in group B were treated using DHS. The baseline demographic data of the patients has been shown in Table 1.

Table 1. Baseline and Demographic data (n=110)

Variables	Group A(PFN) (n=55)	Group B (DHS) (n=55)	P-value
Age (in years)	58.64±6.35	58.96±5.96	
Gender			
Male	35 (63.63%)	20 (36.36%)	0.465
Female	27 (49%)	28 (50.9%)	0.573

The patients in group A were given a smaller incision. The duration of the procedure was also smaller in this group. The blood loss during the procedure was lesser compared to group B ($p < 0.05$). The mean time in which the radiological reunion of the bone was seen in group A was 13.6±6 weeks and in group B was 13.3±4 weeks ($p=0.06$). None of the patients represented non-reunion. The mean HHS score in the third month in group A was 35.65±3.55 (poor) and it was 53.79±4.65 (poor) in group B ($p < 0.05$). In the sixth month of the treatment, it was 82.75±4.64 (good) in group A and 88.65±4.86 (good) in group B ($p < 0.05$). After one year of the treatment, the HHS score of the patients in group A was 92.87± 2.97 (excellent) and in group B was 93.18±2.19 (excellent) ($p<0.05$).

Superficial skin infections were seen in 2 (2.63%) patients in group A and 3 (5.45%) patients in group B. These infections resolved without any intervention or antibiotics administration. Not a single mortality was seen in either of the group during the whole duration of the study. The outcomes of the surgery have been shown in Table 2.

Table 2. Surgical outcomes

Variables	Group A(PFN) (n=55)	Group B (DHS) (n=55)	P value
Left	30 (54.54%)	34 (61.81%)	0.374
Right	25 (45.45%)	21 (38.18%)	0.767
Length of incision (cm)	4.83±0.62	7.14±0.83	0.001
Duration of surgery (in minutes)	51.64±5.84	71.69±6.93	0.024
Radiological reunion (in weeks)	13.6±5.3	13.3±4.5	0.061
Intraoperative loss of blood (in ml)	123.84±33.45	225.56±44.63	0.010

4. Discussion

In the present study, a total of 110 patients with intertrochanteric femoral fractures were included and treated with PFN and DHS. These patients were equally and randomly divided into two equal groups. One group was treated with PFN and one was treated using DHS. A comparison of the outcomes of both groups was done to see which technique has better results. A similar study was conducted by Ashraf et al. In their study, they included 60 patients and treated them using both techniques for the sake of comparison. They used radiographs and HHS scoring to analyze the reunion of the bone. They concluded that the outcomes of both techniques were not significantly different. Both techniques are almost equally effective [11]. Their results support the results of the present study.

Memon et al conducted a retrospective study in which they compared the outcomes of DHS and PFN. However, the fractures they studied were unstable per trochanteric femoral fractures. They analyzed the data of 174 patients who had already been treated at the hospital. They concluded that PFN is a better technique in terms of lesser shortening of the limb and there was no cutting of the implant done. Nonetheless, the functional outcomes, infection rate, duration of hospital stay, and functional outcomes of PFN were not significantly different from DHS [12].

In the study of Nadeem et al, they included 60 patients with unstable ITFs of the femur. They treated all the patients using DHS and PFN techniques. They used HHS scoring to assess the functional outcomes of the bone and they did the scoring every 6 weeks for 6 months. The main focus of their study was on the functionality of the bone rather than radiographic reunion. They concluded that PFN was a better technique compared to DHS concerning functional outcomes such as early mobility of the joint and return to normal activity [13].

Another study comparing the functional and radiological outcomes of DHS and PFN-treated fracture of the intertrochanteric region of the femur has been done by Sarfraz et al. They included 80 patients with these fractures and like the present study, they divided the patients into two groups. They treated one group by PFN and the other group by DHS. They did not notice any significant difference in the outcomes of both techniques and concluded that both of the techniques are equally effective [14].

Conclusion: The functional and radiological outcomes of PFN and DHS were similar for a stable ITF of the femur. The outcomes of both techniques are usually poor in the third and sixth months after the surgery. However, the HHS score of DHS is statistically better than PFN. After one year of the surgery, the results are seen to be excellent in the patients treated by both techniques.

5. Funding source

None

6. Conflict of interest

None

References

1. Marks R. Hip fracture epidemiological trends, outcomes, and risk factors, 1970–2009. International journal of general medicine. 2010 Apr 8:1-7.

2. Koval KJ, Zuckerman JD, Koval KJ, Zuckerman JD. Intertrochanteric fractures. Hip Fractures: A Practical Guide to Management. 2000:129-90.

3. Bhandari M, Swiontkowski M. Management of acute hip fracture. New England Journal of Medicine. 2017 Nov 23; 377(21):2053-62.

4. Lindskog DM, Baumgaertner MR. Unstable intertrochanteric hip fractures in the elderly. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 2004 May 1; 12(3):179-90.

5. Kyle RF, Gustilo RB, Premer RF. Analysis of six hundred and twenty-two intertrochanteric hip fractures. Orthopedic Trauma Directions. 2010 Nov; 8(06):25-9.

6. Al-Yassari G, Langstaff RJ, Jones JW, Al-Lami M. The AO/ASIF proximal femoral nail (PFN) for the treatment of unstable trochanteric femoral fracture. Injury. 2002 Jun 1; 33(5):395-9.

7. Toro G, Moretti A, Ambrosio D, Pezzella R, De Cicco A, Landi G, Tammaro N, Florio P, Cecere AB, Braile A, Medici A. Fractures around trochanteric nails: the "Vergilius classification system". Advances in Orthopedics. 2021 Jan 12; 2021:1-9.

8. Lateef SA, Qader WF, Abdulwahab DM, Al Radhwany YA. Proximal Femoral Neck Intramedullary Nailing with a Time Preserving Technique. Annals of the Romanian Society for Cell Biology. 2021 Feb 1:4761-6.
9. Lee MH, Ingvertsen BT, Kirpensteijn J, Jensen AL, Kristensen AT. Quantification of surgical blood loss. Veterinary Surgery. 2006 Jun; 35(4):388-93.
10. Banaszkiewicz PA. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty: an end-result study using a new method of result evaluation. InClassic papers in orthopaedics 2013 Dec 7 (pp. 13-17). London: Springer London.
11. Ashraf RA, Javed A, Asghar K, Amin A, Sheikh SI. Comparison of Dynamic Hip Screw and Proximal Femoral Nail in Intertrochanteric Femur Fractures. Journal of Pakistan Orthopaedic Association. 2021 Aug 4; 33(03):101-6.
12. Memon K, Siddiqui AM, Khan ZA, Zahoor A. Dynamic Hip Screw Fixation Vs. Proximal Femur Nail For Unstable Per-Trochanteric Fractures: A Comparative Analysis Of Outcomes And Complications. Journal of Ayub Medical College, Abbottabad: JAMC. 2021 Jan 1; 33(1):34-8.
13. Nadeem U, Bashir MF, Ahmad S, Ahmad A, Akram R, Javed S, Aziz A. Outcome of proximal femoral nail versus dynamic hip screw fixation in unstable intertrochanteric fractures. Pak J Surg. 2019; 35(2):142-6.
14. Sarfraz M, Ahmad S, Raza MS, Zeb SA, Lakhani S, Khan R. A Comparative Study of Proximal Femoral Nail and Dynamic Hip Screw in the Treatment of Intertrochanteric Fractures of Femur. Pakistan Journal of Medical & Health Sciences. 2022 Jun 17; 16(04):1101-.