Original Article

Comparison between Outcomes of Conventional Dynamic Hip Screws and Proximal Femoral Nail (PFN) Fixation of Intertrochanteric Fracture of the Femur

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ABSTRACT

Objective: To compare the outcomes of conventional dynamic hip screws and proximal femoral nail fixation of intertrochanteric fracture of the femur.

Study Design: Randomized control trial study

Place and Duration of Study: This study was conducted at the Department of Orthopaedic Surgery, Nishtar Medical University Multan from 1st June 2020 to 31st October 2021.

Materials and Methods: Eighty four patients with unstable intertrochanteric fractures were enrolled. All patients between the ages of 25 and 75, of either gender, were enrolled. All patients with renal disease, pathological fractures, or open fractures were barred from participating. Patients were categorized into two groups. Group-I was allocated for dynamic hip screws and Group-II was given proximal femoral nail. Standard x-rays were taken for measuring initial collapse on zero post-operative day. After 4 weeks partial weight was allowed for patients whereas secondary collapse was measured after 6 weeks.

Results: The patient's mean age in Group-I and Group-II was 43.6±9.54 years, and 50.734±10.31 years respectively. The prevalence of stable, unstable, and reverse oblique fractures was 33%, 55%, and 13% respectively. About 100 and 250 mL average blood loss was observed in PFN and DHS respectively. In PFN, patients were more exposed to intra-operative radiation compared to DHS. The average operating time for PFN and DHS was 40minutes and 65 minutes respectively. Patients who received PFN began ambulation earlier because they had a higher Harris Hip Score in the beginning (at 4 and 12 weeks). In the long run, the functional outcomes of both implants were nearly identical.

Conclusion: The better outcomes were observed in the PFN group. Also, the unstable pattern was common in higher grade osteoporosis among elder patients. When compared to the DHS group, the PFN group has less blood loss and less operating time. Patients in the PFN group began ambulation earlier than those in the DHS group.

Key Words: Dynamic hip screw (DHS); Intertrochanteric fracture; Proximal femoral nail (PFN)

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INTRODUCTION

In extracapsular fractures (intertrochanteric and subtrochanteric fractures), the cortical and compact cancellous bone is the primary focus.

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As a result of its non-homogenous osseous structure and geometry, the proximal femur is prone to fractures because of its complicated stress arrangement.[1] Trochanter femur fractures are common in the aged population, and they are commonly linked to loss in physical health as we get older. Surgery is the therapy of choice to avoid potentially fatal consequences. Morbidity rates are still high, despite advances in surgical care.[2-4] Intertrochanteric fractures can be treated surgically or non-surgically. Patients with non-ambulatory or chronic dementia, terminal diseases with a life expectancy of six weeks or less, unresolved medical comorbidities that preclude surgical treatment, an active infectious disease that is a contraindication to the insertion of a surgical implant and incomplete pertrochanteric fractures diagnosed by MRI should be treated non-operatively.[5-6] Intertrochanteric fractures can be treated with a dynamic hip screw or proximal femoral nail[7-8]. The following are the main benefits of

using an intramedullary device: The implant acts as a counterweight to the proximal fragment's lateral translation. The implant's resistance to binding force is improved due to the nail-lag screw junction's intramedullary position.[9] The implant is closer to the weight-bearing axis because the intramedullary device's lever arm is shorter.[10] Upon contacting, the intramedullary device's transmission of bending loads to the intramedullary nail and medullary canal provides resistance.[11] The intramedullary hip screw is a more natural technique of fixation. A meta-analysis was done in order to examine if PFN or DHS fixation differed significantly in the treatment of trochanteric fractures. Hypothesis: PFN fixation is more efficient than DHS fixation in terms of minimising surgery duration and blood transfusions, along with hospital stay, wound problems, reoperation and death.

MATERIALS AND METHODS

This randomized control trial was carried out in the Department of Orthopaedic Surgery, Nishtar Medical University Multan during the June 2020 to October 2021 and 84 patients with unstable intertrochanteric fractures. All patients' between the ages of 25 and 75, of either gender, were enrolled. Participation in the study was not includedifthey were suffering from renal disease, pathological fractures, or open fractures. Patients were divided into two groups based on their symptoms. Those in Group-I received dynamic hip screws, while those in Group-II received proximal femoral nails. On the zero post-operative day, standard X-rays were taken to determine the extent of first collapse. Patients were permitted to regain some weight after four weeks, and subsequent collapse was measured after six weeks. Between the ages of 25 and 75, this study included individuals with pertrochanteric fractures from both sexes who had pertrochanteric fractures. The inclusion of patients with polytrauma, pathological fractures, and confirmed infection was strictly enforced.

Following the completion of all required lab tests and receipt of a fitness certificate from the anaesthesiologist, the patients were ready for surgery. Patients were randomised to one of two groups based on a random draw. Patients in Group 1 had DHS fracture fixation, whereas those in Group II received PFN fracture treatment, according to the study. A thorough explanation of both procedures was provided to the patients. Prior to executing the procedure, written informed permission was obtained from the patient. In the initial postoperative period, patients were cared for and then discharged as soon as they were deemed to be stable. Patients were evaluated for infection (diagnosed clinically when any two of the following signs appeared within four weeks of the operation: redness around the wound, serosanguinous discharge, and fever >100F) and union (defined as the absence of pain or tenderness and the ability to walk without assistance at three months post-operatively) both clinically and radiologically (defined as solid bridging callus connecting the fracture fragments on both sides on both AP and lateral views at three months postoperatively). SPSS-25 was used to enter and evaluate the information. For the purpose of comparing the frequency of postoperative infection and fracture union between groups, the Chi-square test was utilised. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Group-I had a mean age of 43.6±9.54 years, whereas Group-II had a mean age of 50.734±10.31 years, according to the data. Approximately 33%, 55% and 13% of the patients had stable, unstable, or reverse oblique fractures. In PFN and DHS, around 100 and 250 mL of average blood loss were reported. Patients in PFN received more intra-operative radiation than those in DHS because of this. PFN and DHS had 40-minute and 65-minute running times, respectively. They were able to walk sooner because they had higher Harris Hip Scores at the commencement of their treatment with PFN (at 4 and 12 weeks). Both implants had essentially comparable long-term functional outcomes. All of the participants' demographic information (Table 1). Demographic information is given in Table 2 after doing a chi-square analysis and independent test. Post-operative union and infection are shown in Table 3 for the study group after 12 weeks.

Table No.1: Demographic details of participants (n=84)

Parameters	No.	%
Age (years)		
25-40	14	16.7
41-60	41	48.8
61-75	29	34.5
Gender		
Male	33	39.3
Female	51	60.7

Table No.2: Demographic details based on Chi-square and independent test

Para-meter	Proximal Femoral Nail (N=42)	Dynamic Hip Screw (N=42)	P-value
Age (years)			
25-40	6 (14.3%)	8 (19.04%)	0.831
41-60	21 (50%)	20 (47.6%)	
61-75	15 (35.7%)	14 (33.3%)	
Gender			
Male	18 (42.9%)	15 (35.7%)	0.421
Female	24 (57.1%)	27 (64.3%)	

Table No.3: Prevalence of post-operative union and infection after 12 weeks

Outcome	Proximal Femoral Nail (N=42)	Dynamic Hip Screw (N=42)	P-value
Union			
Yes	33 (78.6%)	19 (45.2%)	0.002
No	9 (21.4%)	23 (54.8%)	
Infection			
Yes	0 (0%)	13 (31%)	≤0.002
No	42 (100%)	29 (69%)	

DISCUSSION

Hip fractures are the most commonly encountered fractures by orthopaedic surgeons, with a current annual rate of 250,000 in the United States.[12,13] It is expected that hip fractures rate by 2025, will reach 2.6 million globally, and by 2050, it will reach 4.5 million due to increased life expectancy. Gallagher et al[14] demonstrated that the risk of hip fracture doubles every ten years after the age of fifty. The goals of treating pertrochanteric fractures are to restore independence as soon as possible, to treat without complications, and to return patients to their pre-injury level of independence. The dynamic hip screw has always been the standard implant for fracture stabilization in patients with pertrochanteric hip fractures. However, the introduction of PFN has revolutionized pertrochanteric fractures, with proven benefits such as increased stability, decreased operative blood loss, and early mobilization. Recent studies claimed that PFN increased the rate of fracture union while decreasing the risk of infection, but the available evidence was disputed, necessitating the current study.

Many factors influence the trochanteric fractures successful treatment, including the patient's age, fracture treatment time, general health, and treatment adequacy, concurrent medical treatment, and fixation stability.[15,16] DHS placement requires a long exposure, anatomical reduction, and stripping of extensive soft tissue. Furthermore, bone stress riser caused by side plate and screw, increases chance of implant failure.[17]

The ability of PFN devices to tolerate cyclic and static loads is significantly greater than that of DHS implants. Gamma nail use, on the other hand, is associated with several problems, including anterior soreness in the thigh and femoral shaft fractures. [18] Multiple anatomical studies have demonstrated that the superior medial quadrant is the weakest link in the chain. There is a lot of cut-out in the bone, especially in osteoporotic bone. [19]

Increasing the contact surface area of the device with the femoral head cancellous bone is achieved by turning the column screw into a helical blade. As a result, the restricted amount of bone is compressed rather than removed. According to certain research, rotation of the head/neck fragment occurs in all types of head holding devices in these fractures, requiring the use of a head holding device to keep the fragment from rotating until the fracture heals. [20] The presence of helical blades may help to increase the rotational stability of the proximal fragment and reduce femoral head overload. [21]

Finally, the PFN device was found to lower iatrogenic tissue trauma as well as the rate of re-operation. Based on the results of this study, it appears that the PFN device may be used effectively to treat trochanteric fractures and that it may be the best option, particularly in the treatment of unstable trochanteric fractures, because of its low re-operation rate. Based on the results of this study, it appears that the PFN device may be used effectively to treat trochanteric fractures and that it may be the best option, particularly in the treatment of unstable trochanteric fractures, because of its low re-operation rate.

CONCLUSION

The PFN group had much better outcomes than the other groups. Additionally, the unstable pattern was common in patients with greater grade osteoporosis, particularly in the elderly. When compared to the DHS group, the PFN group suffers from less blood loss and requires less time under anaesthesia. It was shown that patients in the PFN group began ambulating earlier than those in the DHS group.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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