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Assessment of the Proximal Femoral Nailing and Dynamic Hip Screws in Inter-trochanteric Fractures

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ABSTRACT

An intertrochanteric fracture is one of three types of proximal femur fractures, occurring in the proximal part of the femur. The other two types are subtrochanteric fractures, which occur below the trochanters, and proximal (or cephalad) fractures of the femoral neck. **Objective:** To assess the differences in hospital stay, blood loss, and operative time between proximal femoral nailing and dynamic hip screws in the management of intertrochanteric fractures of the femur. **Methods:** Quasi-experimental study was conducted in Unit II of the Orthopedic Surgery department at Jinnah Hospital Lahore. It included eighty patients whose demographic profiles (name, age, gender, and BMI) were collected. Using a non-probability consecutive sampling technique, patients were divided into two groups: Group A underwent Dynamic Hip Screw (DHS) surgery, while Group B received Proximal Femoral Nailing (PFN) surgery. Data on operative time, blood loss, and hospital stay were analyzed using SPSS version 21.0, with outcomes compared via independent sample t-test at $p < 0.05$ significance. **Results:** Regarding hospital stay, blood loss, and operating time, DHS and PFN differed significantly. Compared to the DHS group, the PFN group's operating time, blood loss, and length of hospital stay were much lower. **Conclusions:** This study has demonstrated that PFN is a far superior option to DHS for treating femur intertrochanteric fractures. Going forward, suggested PFN rather than DHS for femur fractures of this kind.

INTRODUCTION

An intertrochanteric fracture is one of three types of proximal femur fractures, occurring in the upper portion of the femur. The two other forms of proximal femur fractures are subtrochanteric fractures, which occur distal to or below the trochanters, and proximal or cephalad fractures of the femoral neck [1]. While it's usual to refer to all three types of fractures as just proximal femur fractures, it's crucial to understand the differences between them as each has unique anatomy, prognosis, and management. Literature from the early 1800s showed that intertrochanteric proximal femur fractures were malunited in varus and often healed, resulting in deformity and reduced function related to limp and weak hip abductor muscles. However, because of coexisting medical conditions and extended incumbency that hindered union, nonoperative treatment of intertrochanteric fractures yielded notable, intolerable morbidity and death. Regardless of the mortality, conservative treatment was ruled unsuitable due to these serious issues [2]. Consequently, decreasing the degree of malunion and potential nonunion of these fractures, as well as the mortality from non-orthopedic comorbid or concurrent medical issues, have been key components of advancement in the treatment of intertrochanteric fractures. Patients can now function better because of these advancements [3]. The elderly population's

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concomitant osteoporosis or osteopenia is the other issue linked to intertrochanteric fractures. Programs to make sure these people are evaluated and, if needed, treated to avoid a second fracture have been developed as a result of this problem's recognition. Given the continuous rise in the older population, it's especially critical to prevent the initial fracture [4]. Simple fracture healing is aided by fracture stability, which is the fracture pattern's capacity to withstand weight-bearing deformation. Furthermore, the various sub-types of intertrochanteric fractures have differing rates of sequelae, including mortality and morbidity, as well as postoperative treatment [5]. Currently, surgery is required to treat intertrochanteric fractures. Even if nonsurgical procedures offer adequate recovery rates, surgical methods have supplanted earlier nonsurgical methods such as prolonged traction in bed, prolonged bed rest, or prolonged immobilization in a full-body cast [6]. The nonsurgical management yielded acceptable healing rates, but the resulting unsatisfactory morbidity and death were a result of bad unions that compromised patient function and numerous non-orthopedic problems linked to extended immobility or inactivity. Among these issues were the following complications [7]. Extended immobilization can lead to various complications, including inactivity-related pneumonia and pulmonary complications, pulmonary embolism due to extremity immobility from deep vein thrombosis, pressure sores from prolonged bed rest, and muscular atrophy with decreased range of motion in the lower extremities. Presently, almost all trochanteric fractures are treated with surgery, which is referred to as open reduction and internal fixation, with a few notable exceptions. Almost any trochanteric fracture can be treated with one of the many internal fixation devices that are available. Every instance requires a precise fit between the right device and the particular kind of fracture. It is also recommended to employ the appropriate surgical method as specified by the device developer. As a result, the ideal device is selected following a careful diagnosis of the trochanteric fracture type. The patient's degree of osteoporosis, activity level, and reasonable expectations for the procedure must all be considered when determining the technique's indications and contraindications [8]. At the very least, technically sound preoperative radiographs of the hip are needed to achieve this match between technique and patient. These radiographs should include a true lateral view (cross-table technique). Sometimes the fracture cannot be well defined to allow for precise operative planning. In these situations, a computed tomography (CT) scan, a frog lateral view, or even a reconstructed CT scan, may be required. If there has been severe shortening, then gentle traction during the radiograph will help characterize the fracture (traction view) [9].

METHODS

A quasi-experimental study was conducted at Unit II of the Orthopedic Surgery Department at Jinnah Hospital in Lahore over six months, following the approval of the study synopsis. A total of eighty patients were included, with the sample size calculated based on a 95% confidence level and 80% power of the test, using the mean operative times of 59.16 ± 16.92 minutes for Proximal Femoral Nailing (PFN) and 87.35 ± 21.29 minutes for Dynamic Hip Screw (DHS) in intertrochanteric femur fractures [4]. Informed consent was obtained from all participants, and demographic profiles (name, age, gender, and BMI) were collected. Using a non-probability consecutive sampling technique, patients were divided into two groups: Group A underwent DHS surgery, while Group B received PFN surgery. The study included patients aged 20 to 70 years of either gender who presented with a femoral intertrochanteric fracture within 7 days of injury. Exclusion criteria included osteoporosis, osteoarthritis, osteomalacia, and a positive rheumatoid arthritis factor (RA > 14 IU/ml), as well as patients with comminuted fractures, multiple fractures, or open fractures showing signs of infection and debris (e.g., pus discharge) during clinical examination. All surgeries were performed under general anesthesia by a single surgical team to ensure that patients were completely unconscious and pain-free, allowing for optimal muscle relaxation and access to the surgical site. Following anesthesia, the skin was incised, and the operative time was recorded. Total blood loss was measured during the surgery, and once the skin was closed, the final operative time was noted. Patients were then transferred to post-surgical wards, where they were monitored until discharge, and the total hospital stay was documented according to operational definitions. Data were entered and analyzed using SPSS version 21.0. Quantitative variables such as age, BMI, operative time, blood loss, and hospital stay were presented as mean and standard deviation, while qualitative variables like gender and anatomical side were reported as frequency and percentage. Outcomes between the two groups were compared using an independent sample t-test, with a significance level set at $p < 0.05$. After surgery, patients were monitored in post-surgical wards until discharge, and the total hospital stay was recorded.

RESULTS

The findings of the study indicated that for patients under 50 years old, the average operating time was 55.71 ± 3.28 minutes in the PFN group and 74.54 ± 7.75 minutes in the DHS group. For patients over 50 years old, the average operating time was 53.11 ± 2.80 minutes in the PFN group and 79.29 ± 7.33 minutes in the DHS group. For patients under 50 years old, the mean blood loss was 247.16 ± 32.44 ml in the PFN group and 445.08 ± 28.67 ml in the DHS group. For patients over 50 years old, the mean blood loss was

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247.33 ± 34.14 ml in the PFN group and 444.50 ± 38.78 ml in the DHS group. The mean hospital stays for patients under 50 years old were 8.71 ± 2.65 days in the PFN group and 10.69 ± 2.09 days in the DHS group. For patients over 50 years old, the mean hospital stays were 8.78 ± 3.07 days in the PFN group and 10.14 ± 1.75 days in the DHS group. Except for the hospital stay for patients over 50, or p-value <0.05, there was a statistically significant difference seen between the study groups for operative time, blood loss, and hospital stays stratified by age (Table 1).

Table 1: Comparison Between Study Groups Categorized by Age, In Terms of Operative Time, Blood Loss, And Hospital Stay

Study Group	Age (Years)	Study Groups (Mean ± SD)		p-Value
		PFN	DHS	
Operative Time	≤50	55.71 ± 3.28	74.54 ± 7.75	0.001*
	>50	53.11 ± 2.80	79.29 ± 7.33	0.001*
Blood Loss	≤50	247.16 ± 32.44	445.08 ± 28.67	0.001*
	>50	247.33 ± 34.14	444.50 ± 38.78	0.001*
Hospital Stays	≤50	8.71 ± 2.65	10.69 ± 2.09	0.003*
	>50	8.78 ± 3.07	10.14 ± 1.75	0.250

The study's findings revealed that, for male patients, the average operating time was 54.86 ± 3.48 minutes in the PFN group and 76.12 ± 8.61 minutes in the DHS group; for female patients, the average operating time was 55.44 ± 3.22 minutes in the PFN group and 76.33 ± 6.67 minutes in the DHS group. For male patients, the average blood loss was 246.45 ± 36.49 ml in the PFN group and 442.92 ± 29.53 ml in the DHS group. For female patients, the average blood loss was 248.11 ± 27.54 ml in the PFN group and 448.13 ± 26.92 ml in the DHS group. For male patients, the average hospital stays were 8.95 ± 2.72 days in the PFN group and 10.52 ± 1.89 days in the DHS group. For female patients, the average hospital stays were 8.44 ± 2.75 days in the PFN group and 10.47 ± 2.17 days in the DHS group. With operating time, blood loss, and hospital stays stratified by gender, a statistically significant difference (p-value < 0.05) was seen between the study groups (Table 2).

Table 2: Comparison between Study Groups Categorized by Gender, In Terms of Operative Time, Blood Loss, and Hospital Stay

Study Group	Gender	Study Groups (Mean ± SD)		p-Value
		PFN	DHS	
Operative Time	Male	54.86 ± 3.48	76.12 ± 8.61	0.001*
	Female	55.44 ± 3.22	76.33 ± 6.67	0.001*
Blood Loss	Male	246.45 ± 36.49	442.92 ± 29.53	0.001*
	Female	248.11 ± 27.54	448.13 ± 26.92	0.001*
Hospital Stays	Male	8.95 ± 2.72	10.52 ± 1.89	0.003*
	Female	8.44 ± 2.75	10.47 ± 2.17	0.025*

Except for hospital stays with the right anatomical side, or p-value<0.05, the study's results indicated a statistically significant difference between the study groups in terms of operational time, blood loss, and hospital stay stratified by anatomical side (Table 3).

Table 3: Comparison between Study Groups Categorized By Anatomical Side, In Terms Of Operative Time, Blood Loss, and Hospital Stay

Study Group	Anatomical Side	Study Groups (Mean ± SD)		p-Value
		PFN	DHS	
Operative Time	Left	55.77 ± 3.22	77.73 ± 7.97	0.001*
	Right	54.33 ± 3.39	73.36 ± 7.02	0.001*
Blood Loss	Left	252.18 ± 32.83	439.88 ± 27.52	0.001*
	Right	241.11 ± 31.66	454.14 ± 28.48	0.001*
Hospital Stays	Left	8.91 ± 2.84	10.69 ± 2.03	0.015*
	Righ	8.50 ± 2.59	10.14 ± 1.87	0.055

DISCUSSION

The aging of contemporary human populations has led to a notable increase in the occurrence of intertrochanteric fractures. The DHS is now a routine implant used to treat these fractures and is frequently utilized in extramedullary fixation. Two tools that are frequently utilized in intramedullary fixing are PFN and Gamma Nails. Despite reports of PFN and DHS's effects in the treatment of intertrochanteric fractures, the findings and interpretations vary [10]. The PFN group had an average operative time of 55.13 ± 3.34 minutes, while the DHS group had an average of 76.20 ± 7.85 minutes. The PFN group had an average blood loss of 247.20 ± 32.38 ml, while the DHS group had an average of 444.88 ± 28.34 ml. The hospital stay of the PFN group was 8.73 ± 2.71 days, while the DHS group had an average hospital stay of 10.50 ± 1.97 days. In terms of operation time, blood loss, and hospital stay, the PFN group outperformed the DHS group statistically. According to a study by Zhang K *et al.*, PFN may be a more effective treatment for intertrochanteric fractures than DHS. The PFN group's operating time was noticeably shorter [11]. According to Kumar P *et al.*, research, PFN is superior to DHS in type II intertrochanteric fractures in terms of fewer blood losses, shorter surgical times, earlier weight bearing and mobilization, shorter hospital stays, lower infection risks, and fewer sequelae [6]. Patients who received PFN had lower intraoperative blood loss (73ml), shorter surgery times (91min), and were able to mobilize earlier than those who underwent DHS, which had higher intraoperative blood loss (159 ml) and longer surgery times (105 min) [12-14]. According to another study by Shiraz S *et al.*, and Yan M *et al.*, in the case of DHS, the average hospital stay was 12.4 days (8–14 days), whereas in the case of PFN, it was 7.8 days (4–12 days) (P=0.001). The DHS group took an average of 12 weeks to return to their pre-injury walking abilities, while the PFN group took just 8 weeks (P=0.03) [15, 16]. Yu W *et al.*, conducted a further investigation which revealed that, in contrast to the PFN Antirotation device, the DHS device may not be the best implant for stable intertrochanteric femur fractures. The difference remained over time, reaching 6.4% and 13.4% at the most recent follow-up (P<0.05). Postoperative HHS after 12, 15, 18, 21, 24, 36, and 48 months after surgery, as well as during

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the ultimate follow-up, varied statistically. There were no discernible statistical variations in medical problems between the two groups. [17, 18]. Randomized post-operative rehabilitation research by Pajarinen *et al.*, comparing DHS and PFN treatment for peritrochanteric femoral fractures revealed that PFN may enable a quicker recovery of walking ability following surgery than DHS [19]. A randomized trial found that the average operating time for patients treated with PFN was 55 minutes, while the average operating time for patients treated with DHS was 87 minutes. An additional experiment revealed that the average operating time was greater for DHS when compared with PFN. The blood loss was nearly double for DHS than PFN and the duration of hospital stay was also less in PFN [20]. In Type II intertrochanteric femur fractures, PFN is superior to DHS in terms of less blood loss, shorter surgical times, shorter stays in the hospital, lower risk of infection, and other sequelae [21].

CONCLUSIONS

This study has demonstrated that PFN is a far superior option to DHS for the treatment of femur intertrochanteric fractures. Going forward, we shall suggest PFN rather than DHS for femur fractures of this kind.

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Authors Contribution

Conceptualization: MRA
Methodology: NNA, MFS
Formal analysis: SS
Writing, review and editing: MRA, IA, YU, L, SS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

All the authors declare no conflict of interest.

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