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ORIGINAL ARTICLE

Comparison of Operative Parameters During Fixation of Intertrochanteric Fractures with Proximal Femoral Nail and Dynamic Hip Screw

KASHIF ALI SHAIKH[1], AWES AHMED[2], KAMRAN BAHADUR KHAN[3], FAHAD NOOR MEMON[4]
[1,2]FCPS Orthopedic Surgeon, Jinnah Postgraduate Medical Centre, Karachi
[3]FCPS Orthopedic Training Complete, Jinnah Postgraduate Medical Center, Karachi
[4]FCPS Orthopaedic Surgeon, Gambat Institute 0f Medical Sciences, Gambat
Corresponding author: Kashif Ali Shaikh, Email:Sendkashif@hotmail.com

ABSTRACT

Objective: The aim of the study was to evaluate the surgical characteristics of the proximal femoral nail and dynamic hip screw stabilisation for intertrochanteric fractures.

Methods: After the ethical approval from the institutional review board, this randomized controlled trial, was conducted at Orthopaedic Department, Jinnah Post Graduate Medical Centre, Karachi, from 29th July 2018 to 28th January 2019 through the non-probability consecutive sampling, 100 participants were recruited for the present study. Radiographs of the pelvis with both hips anteroposterior view and traction-internal rotation view were taken. proximal femoral nail was used in group A while dynamic hip screw was used in group B. At the end of the surgery, time and blood loss were calculated and independent t-test was applied for comparison. Effects were addressed through Stratification. P-value ≤0.05 was taken as significant.

Results: There were 72% male and 28% female patients in group-A and 68% male and 32% female patients in group-B. The mean fracture duration in group-A and group-B was 3.52±1.41days and 3.54±1.45 days respectively. Mean operative time in group-A and group-B was 91.32±8.10 minutes and 73.20±12.52 minutes respectively while mean intraoperative blood loss was 188.34±25.80 ml and 255.44±14.56 ml in group-A and group- B respectively. These differences were found significant.

Conclusion: Group A had a longer mean surgical duration and considerably less mean intra-operative blood loss as compared to group B.

Keywords: Operative Parameters, Intertrochanteric Fractures, Proximal Femoral Nail, Dynamic Hip Screw

INTRODUCTION

Hip fractures are a significant problem for both people and society as a whole because they frequently result in permanent impairment or even death for older patients and incur substantial financial costs (1, 2). The aging of the global population is predicted to increase the incidence aging hip injuries to 2.65 million by 2025 and 6.25 million by 2050 (3). About half of all hip fractures are trochanteric fractures, and the most common cause is a low-energy accident (4). Unlike femoral neck fractures, the trochanteric bone usually keeps an adequate blood supply after fracture, leading to a high union rate (5, 6). Even so, death rates after trochanteric fractures remain between 12 and 41% within the first 6 months (7). Two of the most prevalent methods for stabilising a fractured trochanter are the dynamic hip screw (DHS) and the proximal femoral nail (PFN). DHS, which was developed in the 1970s, could give the fissure both dynamic and passive support. Unfortunately, distal protrusion of the screw and secondary fracture displacement are not unusual problems associated with screw displacement (8). In 1996, the AO/ASIF created the PFN as a less intrusive option for treating unstable trochanteric and subtrochanteric femur fractures by way of an intramedullary implant (9). The proximal femoral nail antirotation (PFNA) device, which utilizes a helically curved sliding column-blade design to avoid rotation-induced cut-outs (10, 11), was first developed in 2003. There are potential benefits to using an intramedullary device rather than an extra-medullary one, such as avoiding the need to use fasteners to secure the plate to the shaft, which can be challenging in osteoporotic bones. Furthermore, in PFN, the hip's center of movement is closer to the point of attachment of the shaft. This causes the femur to bear the weight along a more posterior plane, resulting in a shortened straight arm (12). Different manufacturers now offer PFN devices that vary in length, girth, neck shaft inclination, and amount of cephalic fasteners, rotational control, and even the materials used in their creation (13). Despite the fact that PFN has more potential advantages than DHS, the debate over which is preferable continues to rage, particularly in the context of clinical research. Recent extensive cohort studies by Grnhaug KML et al. (14) revealed that PFN is only recommended for unstable trochanteric and subtrochanteric fractures but not for stable fractures or specific fracture kinds. It was found by Wolf O et al. (15) that in stabilised trochanteric fractures, patients under PFN had a marginally higher chance of mortality up to 30 days afterward compared to DHS. DHS was recommended for stable trochanteric fractures in the most recent study from the American Academy of Orthopaedic Surgeons (AAOS) (16). The aim of the study was to evaluate the surgical characteristics of proximal femoral nail and dynamic hip screw stabilisation for intertrochanteric fractures.

METHODOLOGY

After the ethical approval from the institutional review board, this randomized controlled trail, was conducted at Orthopaedic Department, Jinnah Post Graduate Medical Centre, Karachi, from 29th July 2018 to 28th January 2019 through the non-probability consecutive sampling 100 participants were recruited for the present study. Participants between age 20-60 years of both gender, and intertrochanteric fracture presented within 1 week of fracture were included in the study. Participants with Diabetes, hypertension, chronic renal disease, deranged PT, APTT and INR, pathological fractures, or with a previous operation of the intertrochanteric fracture were excluded from the study. Every participant gave their informed permission. Demographic details (name, age, sex, and contact data) were collected through medical charts. The usual precautions were taken before the operation. For final verification, an anteroposterior hip radiograph and a traction-internal rotation hip radiograph were taken. Under spinal anesthesia and with standard operating procedures, all surgeries were performed on a single, standardized fracture platform. All of these procedures involved the use of a C-arm as well. Participants were assigned to Group A and Group B at random. Group A consisted of 50 patients treated with a proximal femur nail for their intertrochanteric fracture, while Group B consisted of 50 patients treated with a dynamic hip screw. Before making the cut in the epidermis, the usual dose of 1.5g of cefoperazone and sulbactum was injected directly. Time and blood loss were determined at the conclusion of operations using the practical criteria. Data were analyzed using SPSS 21. Age, weight, height, body mass index, fracture length, and results were measured and given as means and standard deviations (operative time and Intraoperative blood loss). The rates and frequencies of each demographic parameters were determined. Both groups' results were evaluated and contrasted. With a cutoff of P ≤0.05, an independent t-test was performed.

RESULTS

Demographic and clinical parameters of the participants in both the study groups were presented in Table 1. Mean± S. D of participant's age in group A and B was 47.88±4.96 and 50.82±7.96 years. In both the study groups males are the dominant majority 72% in group A and 68% in Group B. Mean± S. D of participant's height in group A and B was 1.68 ±0.05 and 1.61±0.08 meters. Mean± S. D of participant's weight in group A and B was 73.98±10.51 and 61.60±14.78 kg. Mean± S. D of participant's BMI in group A and B was 26.14±3.73 and 23.35±4.72 Kg/m^2. Mean± S. D of participant's fracture duration in group A and B was 3.52±1.41 and 3.54±1.45 days. Mean± S. D of participant's operative time in group A and B was 91.32±8.10 and 73.20±12.52 minutes (p=0.000). Mean± S. D of participant's intraoperative blood loss in group A and B was 118.34 ±25.80 and 255.44±14.56 mL (p=0.000). We found significant mean difference of operative time among stratified categories of age, gender, BMI, residence and fracture duration. Detailed results are presented in Table 2. We also found significant mean difference in intraoperative blood loss among study groups for stratified categories of age, gender, BMI, residence and fracture duration. Detailed results are presented in Table 3

Table 1: Demographic and clinical parameters of the participants in both the study groups

Parameters	Group A (Mean± S. D)	Group B (Mean± S. D)
Age (years)	47.88±4.96	50.82±7.96
Gender		
Male	36 (72%)	34 (68%)
Female	14 (28%)	16 (32%)
Height (meters)	1.68 ±0.05	1.61±0.08
Weight (kg)	73.98±10.51	61.60±14.78
BMI (Kg/m^2)	26.14±3.73	23.35±4.72
Fracture Duration (days)	3.52±1.41	3.54±1.45
Residence		
Rural	14 (28%)	18 (36%)
Urban	36 (72%)	32 (64%)
Operative Time (minutes)	91.32±8.10	73.20±12.52
Intraoperative blood loss (mL)	118.34 ±25.80	255.44±14.56

Table 2: Operative time among study groups for stratified categories

Parameters	Study Groups	Mean±SD		P-Value
		Mean	SD	
Gender				
Male	Group A	72.25	12.16	0.000*
	Group B	91.91	8.67	
Female	Group A	75.64	13.54	0.002*
	Group B	90.06	6.80	
Age				
≤50 years	Group A	72.31	13.02	0.000
	Group B	90.57	7.74	
>50 years	Group A	75.26	11.42	0.000
	Group B	92.12	8.56	
BMI				
Non Obese (<30 kg/m^2)	Group A	73.70	12.55	0.000*
	Group B	91.40	8.09	
Obese (≥30 kg/m^2)	Group A	69.50	12.75	0.013*
	Group B	90.60	9.09	
Fracture Duration				
≤ 3 Days	Group A	77.40	12.82	0.000*
	Group B	91.54	8.16	
>3 Days	Group A	69.89	11.43	0.000*
	Group B	91.11	8.19	
Residence				
RURAL	Group A	72.57	13.48	0.000*
	Group B	94.38	7.85	
URBAN	Group A	73.44	12.31	0.000*
	Group B	89.59	7.83	

Table 3: Intraoperative blood losses among study groups for stratified categories

Parameters	Study Groups	Mean±SD		P-Value
		Mean	SD	
Gender				
Male	Group A	187.94	24.57	0.000*
	Group B	254.02	14.10	
Female	Group A	189.35	29.70	0.000*
	Group B	258.43	15.51	
Age				
≤50 years	Group A	188.51	24.73	0.000
	Group B	258.34	14.55	
>50 years	Group A	187.93	29.07	0.000
	Group B	252.29	14.19	
BMI				
Non Obese (<30 kg/m^2)	Group A	189.13	25.97	0.000*
	Group B	255.64	14.65	
Obese (≥30 kg/m^2)	Group A	182.52	26.05	0.000*
	Group B	253.60	15.14	
Fracture Duration				
≤ 3 Days	Group A	193.90	26.54	0.000*
	Group B	253.87	13.78	
>3 Days	Group A	183.96	24.80	0.000*
	Group B	256.88	15.37	
Residence				
RURAL	Group A	179.50	26.11	0.000*
	Group B	253.35	16.39	
URBAN	Group A	191.77	25.21	0.000*
	Group B	256.53	13.57	

DISCUSSION

A person who has suffered an intertrochanteric fracture has a break in the upper part of the femur that occurs between the two trochanters and may or may not extend into the upper femoral shaft. Age is well-known to increase the risk of intertrochanteric fractures. A two-to-sevenfold increase in the chance for hip fractures is linked with the presence of any disease that causes bone loss, such as diabetes mellitus, hyperparathyroidism, hyperthyroidism, or Cushing's syndrome. They have the greatest subsequent mortality rate of all medically treated fractures, are the most common form of fracture to necessitate surgery, and have become a major drain on healthcare funding for their high expense of treatment (17). Intertrochanteric fracture rates also change greatly from one nation to the next. The number of hip injuries is expected to rise to 4.5 million by 2050 from the current 2.6 million, as reported by Gulberg et al. (18). In 1990, Asia accounted for 26% of all hip injuries; by 2025 and 2050, that number could reach 37% and 45%, respectively (19, 20). Intertrochanteric fractures can be treated in a number of ways, both surgically and non-surgically. In the early 19th century, when surgical procedure was not developed enough to do secure fixing, the non-operative approach was the therapy of preference (17). Trochanteric femur fractures are a medical emergency in the aged and require internal stabilisation and early movement. Everyone agrees that this is the best strategy for minimising the health risks associated with bed rest. The functional outcomes of internal fixation are comparable to those of conventional therapy, thanks to the elimination of malunion. Choice therapy is still debated. The dynamic hip screw (DHS) was a game-changer in the treatment of broken hips. In contrast to PFN, the stability of a fracture through the lateral wall of the femur from plates fixed with screws, which are not well anchored in an osteoporotic bone, was achieved with DHS implants. PFN implants have a biomechanical benefit over DHS implants (21). Most senior female injuries in one research were the result of non-traumatic falls within the house (21). Low-energy injuries, such as a straightforward fall with osteoporotic bone, is a frequent cause of Intertrochanteric fractures, which are particularly common in the aged, according to research by Cummings SR et al. (22) One research found that while the average operating time for PFN and DHS was comparable, the DHS group experienced significantly higher blood loss (21). The results of PFN and DHS stabilisation of unstable proximal femur fractures in 70 patients were examined by Khan IA et al. (23) Although PFN group had substantially lower blood loss, the length of the operation was

comparable between the two groups, according to one research (PFN- 200mls, DHS: 375 mls). PFN had a shorter mean operating time of 49.38.8 seconds compared to DHS (70.811.06) in one research. The benefits of PFN are not limited to a reduction in blood loss. The PFN cohort began partial weight bearing sooner than the DHS cohort. After radiographic union was confirmed, only then did patients begin carrying their full weight (21). An 80-patient research by Muzzafar N. et al. showed that the DHS group needed more time in surgery and was linked to more blood loss than the PFN group. Despite the fact that they only examined the long-term effect, they still discovered no statistically meaningful differences in functional outcomes. First and third months post-operation showed improved functional outcomes for the PFN group, but six and twelve months later, the two groups fared similarly (24). The research by Ranjeetesh K et al. of (25) patients revealed that PFN is better accepted by elderly patients with osteoporotic bone and offers advantages in terms of surgical time and radiation dose compared to DHS. Patients who were given PFN began walking sooner because their Harris hip scores were higher right away (at 1 and 3 months). Long-term functionality was nearly identical between the two implants (26). In their meta-analysis of 1348 fractures, Huang X et al. discovered that PFN fixation is just as successful as DHS fixation across all metrics studied (27). In their meta-analysis of 600 fractures, Parker et al. found that both devices generated similar outcomes, though the intramedullary nail tended to lead to a faster recovery to normal function (28). The PFN group had substantially less surgical time, perioperative blood loss, and duration of cut than the DHS group, according to a meta-analysis by Zhang K et al. that included six trials and 669 fractures. There were no statistically significant variations in the rates of surgical illness, lag screw cut-out, or reoperation between the two groups (29). Because this was a single-hospital research with a relatively small sample size performed in a metropolitan setting, its findings may not apply to more broadly applicable groups.

CONCLUSION

The research showed that, when comparing the two groups, group A had a significantly longer mean operative duration and had a considerably lower mean intra operative blood loss as compared to group B. The variations were also statistically significant when controlling for age, body mass index, and time since the injury occurred.

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