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ORIGINAL ARTICLE

Functional outcome of pertrochanteric fractures undergoing Dynamic Hip Screw versus Proximal Femoral Nail Anti-Rotation Techniques at a Tertiary care hospital of Karachi.

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ABSTRACT… Objective: To find out the functional outcomes as per Harris hip score (HHS) among patients of pertrochanteric fractures undergoing dynamic hip screw (DHS) versus proximal femoral nail anti-rotation (PFNA) at a Tertiary care hospital. **Study Design:** Non-randomized Controlled Trial. **Setting:** Orthopedic Section, Department of Surgery, Agha Khan University Hospital, Karachi, Pakistan. **Period:** 1st August 2023 to 30th January 2023. **Methods:** A total of 40 patients of age 18 and older with confirmed pertrochanteric fractures were non-randomly allocated to ether fixation with DHS or PFNA. Intra-opeative blood loss and duration of surgery were recorded. The functional outcome assessment was assessed using HHS. **Results:** In a total of 40 patients, 31 (77.5%) were female. The mean age was 67.63±15.13 years (ranging between 23 to 89 years). The most common mechanism of fall was tipped over loose carpet, noted in 17 (42.5%) patients. The mean intra-operative blood loss in DHS and PFNA groups were 73.75±20.06 ml, and 72.75±23.14 ml, respectively (p=0.885). The mean duration of surgery were 76.6±14.7 minutes, and 115.1±18.3 minutes in DHS and PFNA groups, respectively (p<0.001). Excellent, good, fair, poor, and failed outcomes were reported in 3 (7.5%), 17 (42.5%), 6 (15.0%), 10 (25.0%), and 4 (10.0%) patients respectively. When both groups were compared for outcomes, no statistically significant differences were observed (p=0.339). The mean HHS in DHS, and PFNA groups were 75.26±11.41, and 73.46±14.57, respectively (p=0.666). **Conclusion:** Functional outcomes as per HHS were relatively similar with DHS and PFNA approaches in patients with pertrochanteric fractures.

Key words: Blood Loss, Dynamic Hip Screw, Harris Hip Score, Pertrochanteric Fractures, Proximal Femoral Nail.

INTRODUCTION

As the geriatric population rises, there has been an increase in the number of pertrochanteric fractures records.[1] The majority of pertrochanteric fractures in the elderly result from a ground-level fall or any inconsequential injury.[2] These patients are presented with a variety of pathologies, poor immunity, and malnutrition.[3] It is advised to have an early surgical intervention to prevent the worsening of the consequences of extended bed rest.[4] The young population presenting with pertrochanteric fractures is due to high-energy trauma.[5,6]

There are various methods of surgical intervention available. The dynamic hip screw (DHS) technique, a commonly-used method, affects postoperative early ambulation for patients due to the instability of the internal fixation and shear stress change, so its treatment effect for elderly patients is limited.[7,8] The proximal femoral nail anti-rotation (PFNA) technique has biomechanical advantages and is currently the preferred mode of treatment in patients presenting with pertrochanteric fractures.[9]

There is a considerable lack of data from our part of the world comparing the outcomes of DHS and PFNA. PFNA is a relatively newer technique with good functional outcomes reported in international literature, but it is not practiced routinely in Pakistan. Therefore, we planned the

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current study to assess the functional outcome of pertrochanteric fractures of the hip undergoing PFNA vs DHS in a tertiary care hospital using the Harris Hip Score (HHS). As both of these procedures can be done in pertrochanteric hip fractures, the results of this study would help orthopedic surgeons in Pakistan better decide which surgical procedure to opt for in such cases. Moreover, the study findings would also be helpful in calculating the operating time, the amount of blood loss, and the level of expertise required to operate on trochanteric fractures of the hip.

METHODS

This non-randomized controlled trials was performed at the Orthopedic Section, Department of Surgery, Agha Khan University Hospital, Karachi, Pakistan, from 1st August 2023 to 30th January 2023. Prior approval from the ethical review committee was obtained (letter number: 2023-8176-26067, dated: 28th August 2023). A total sample size of 40 was calculated with 20 patients in each group using OpenEpi software for cohort studies, the keeping two-sided confidence level at 95%, the power of the study at 80%, and the ratio of the exposed to the unexposed group at 1:1. The anticipated good to excellent outcomes were taken as 95% in PFNA group versus 45% DHS group.[10] A non-probability consecutive sampling technique was implemented for sample selection. The inclusion criteria were patients of age 18 and older with confirmed pertrochanteric fractures. The exclusion criteria were patients with coagulation disorders, systemic malignant tumors, or malignant tumor cachexia. Patients with contraindications after intra-spinal anesthesia puncture or who used analgesia devices or drugs after the operation were also not considered study participants. All of the study patients were subject to informed and written surgical and anesthesia consent once they were briefed about objective, safety, and data secrecy.

After recording the necessary demographical and clinical information, patients were divided non-randomly into two groups. The unexposed group (fixation with DHS) and the exposed group (fixation with PFNA). The Evans classification system was used to determine fracture stability and the need for a particular fixation, either DHS or PFNA. Patients were placed on the traction table in the supine position. The affected limb was given closed traction under fluoroscopy. A C-arm fluoroscopy was used to guide DHS or PFNA implant placement, and the time was calculated. The quantity of blood loss was also monitored. Post-surgical management involved standard care as per institutional protocols. The patients were asked to follow up monthly for 3-month post-operatively at outpatient clinics, when their final functional outcomes as per HHS were assessed. The functional outcome assessment was made through HHS with scores between 0 and 100 (90-100: excellent, 80-89: good, 70-79: fair, 60-69: poor, and below 60: a failed result), comprising of four categories: i) pain (no pain given 44 points), ii) function (no limp, walks without aid, and can walk more than six blocks given 33 points), iii) functional activities (no disabilities given 14 points), and iv) physical examination (based on range of motion with a maximum score of 90).[11] A specifically pre-designed proforma was used to collect all of the relevant information.

The statistical analysis was carried out employing specific software, “IBM-SPSS Statistics”, version 26.0. The qualitative variables (like gender) were expressed in terms of frequencies and percentages, and were compared between both groups using a chi-square test. While the quantitative variables (e.g., age, blood loss and HHS) were presented by calculating means and standard deviations, they were compared by applying an independent sample t-test. The HHS between both groups at 3-month follow-up were also compared through an independent sample t-test to assess differences in functional outcomes. A p-value <0.05 was considered significant.

RESULTS

In a total of 40 patients, 31 (77.5%) were female. The mean age was 67.63 ± 15.13 years (ranging between 23 to 89 years). The most common mechanism of fall was tipped over loose carpet, noted in 17 (42.5%) patients. Baseline characteristics of patients are shown in table-1 and it was found that no statistically significant

differences were noted among patients of both study groups (p>0.05).

The mean intra-operative blood loss was 73.25±12.95 ml (ranging between 40 to 110 ml). The mean blood loss in DHS and PFNA groups were 73.75±20.06 ml, and 72.75±23.14 ml, respectively (p=0.885). The mean duration of surgery were 76.6±14.7 minutes, and 115.1±18.3 minutes in DHS and PFNA groups, respectively (p<0.001). Excellent, good, fair, poor, and failed outcomes were reported in 3 (7.5%), 17 (42.5%), 6 (15.0%), 10 (25.0%), and 4 (10.0%) patients respectively. When both groups were compared for outcomes, no statistically significant differences were observed (p=0.339) and the details of the comparison are shown in Figure-1. The mean HHS in DHS, and PFNA groups were 75.26±11.41, and 73.46±14.57, respectively (p=0.666).

It was found that mechanism of fall as syncope (p=0.046), and laterality of fracture as left (p=0.030) were having significant association with outcomes. Details about the stratification of outcome with respect to study variables in both study groups are shown in Table-II.

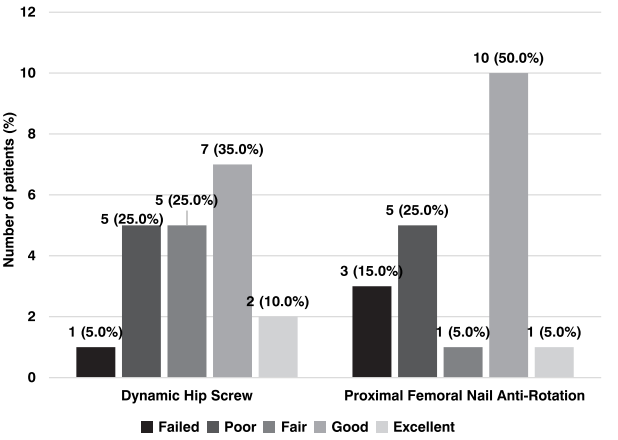

Figure-1. Comparison of outcomes (after 3-months) in study groups (n=40)

DISCUSSION

The management of pertrochanteric fractures in orthopedics is highly dependent on factors such as fracture type and bone quality.[12] DHS has been the preferred treatment until the introduction of PFN in the last few decades. PFN, an intramedullary device, aimed to address issues associated with traditional extra-medullary devices, especially in unstable fractures, such as non-union and malunion.[13,14]

Characteristics		Total (%)	Groups		P-Value
			Dynamic hip Screw (n=20)	PFNA (n=20)	
Age (years)	<60	10 (25.0%)	6 (30.0%)	4 (20.0%)	0.456
	≥60	30 (75.0%)	14 (70.0%)	16 (80.0%)	
Gender	Male	9 (22.5%)	6 (30.0%)	3 (15.0%)	0.256
	Female	31 (77.5%)	14 (70.0%)	17 (85.0%)	
Mechanism of fall	Syncope (blackout)	4 (10.0%)	1 (5.0%)	3 (15.0%)	0.800
	Tripped over loose carpet	17 (42.5%)	8 (40.0%)	9 (45.0%)	
	Sitting on chair	1 (2.5%)	1 (5.0%)	-	
	Tripped from footpath/step	3 (7.5%)	2 (10.0%)	1 (5.0%)	
	Fall from bed	3 (7.5%)	1 (5.0%)	2 (10.0%)	
	Low energy RTA	5 (12.5%)	3 (15.0%)	2 (10.0%)	
	Slipped on wet floor	7 (17.5%)	4 (20.0%)	3 (15.0%)	
Fracture type	Inter-trochanteric	39 (97.5%)	20 (100%)	19 (95.0%)	0.311
	Sub-trochanteric	1 (2.5%)	-	1 (5.0%)	
Laterality of fracture	Left	17 (42.5%)	11 (55.0%)	6 (30.0%)	0.110
	Right	23 (57.5%)	9 (45.0%)	14 (70.0%)	

Table-I. Characteristics of patients of both groups at presentation (N=40)
DHS: Dynamic Hip Screw; PFNA: Proximal Femoral Nail Anti-Rotation

Variables		Group	Outcome (after 3-months)					P-Value
			Failed	Poor	Fair	Good	Excellent	
Age	<60	DHS	-	1 (100%)	-	3 (50.0%)	2 (100%)	0.290
		PFNA	1 (100%)	-	-	3 (50.0%)	-	
	≥60	DHS	1 (33.3%)	4 (44.4%)	5 (83.3%)	4 (36.4%)	-	0.307
		PFNA	2 (66.7%)	5 (55.6%)	1 (16.7%)	7 (63.6%)	1 (100%)	
Gender	Male	DHS	-	2 (100%)	1 (100%)	3 (60.0%)	-	0.308
		PFNA	-	-	2 (40.0%)	1 (100%)	3 (33.3%)	
	Female	DHS	1 (25.0%)	3 (37.5%)	4 (80.0%)	4 (33.3%)	2 (100%)	0.171
		PFNA	3 (75.0%)	5 (62.5%)	1 (20.0%)	8 (66.7%)	-	
Mechanism of fall	Syncope	DHS	-	-	1 (100%)	-	-	0.046
		PFNA	-	3 (100%)	-	-	-	
	Fall from bed	DHS	-	-	1 (100%)	-	-	0.223
		PFNA	1 (100%)	1 (100%)	-	-	-	
	Low energy RTA	DHS	-	-	-	2 (50.0%)	1 (100%)	0.361
		PFNA	-	-	-	2 (50.0%)	-	
	Slipped on wet floor	DHS	-	2 (100%)	-	1 (100%)	1 (50.0%)	0.175
		PFNA	2 (100%)	-	-	-	1 (50.0%)	
	Tripped over loose carpet	DHS	1 (100%)	2 (66.7%)	2 (66.7%)	3 (30.0%)	-	0.359
		PFNA	-	1 (33.3%)	1 (33.3%)	7 (70.0%)	-	
	Sitting on chair	DHS	-	-	1 (100%)	-	-	
		PFNA	-	-	-	-	-	
	Tripped from footpath	DHS	-	1 (100%)	-	1 (50.0%)	-	0.386
		PFNA	-	-	-	1 (50.0%)	-	
Fracture type	Inter-trochanteric	DHS	1 (25.0%)	5 (50.0%)	5 (83.3%)	7 (43.8%)	2 (66.7%)	0.376
		PFNA	3 (75.0%)	5 (50.0%)	1 (16.7%)	9 (56.3%)	1 (33.3%)	
	Sub-trochanteric	DHS	-	-	-	-	-	
		PFNA	-	-	-	1 (100%)	-	
Laterality of fracture	Left	DHS	-	-	4 (100%)	5 (71.4%)	2 (100%)	0.030
		PFNA	2 (100%)	2 (100%)	-	2 (28.6%)	-	
	Right	DHS	1 (50.0%)	5 (62.5%)	1 (50.0%)	2 (20.0%)	-	0.378
		PFNA	1 (50.0%)	3 (37.5%)	1 (50.0%)	8 (80.0%)	1 (100%)	

Table-II. Stratification of the study variables according to outcomes for both groups (n=40)

DHS: Dynamic Hip Screw; PFNA: Proximal Femoral Nail Anti-Rotation

Our study compared the functional and radiological outcomes of surgically treated pertrochanteric fractures using either PFN or DHS. The mean duration of surgery were 76.6±14.7 minutes, and 115.1±18.3 minutes in DHS and PFNA groups, respectively ($p<0.001$). These findings are very consistent to a study conducted by Shiraz et al from Qatar where the average duration of surgery was 84 and 120 minutes in DHS and PFNA groups, respectively ($p=0.001$).[15] Some authors have also recorded lower mean duration of PFNA procedures.[16] Zou et al from china reported DHS group to consume more time for surgery than PFNA group which is contrary to this study.[17] These discrepancies could be attributed to factors like patient positioning and preparation time, especially when surgeries were performed by senior-level trainees. While some studies suggested PFNA as a quicker procedure, others reported comparable duration or longer times for more complex fractures.[18]

In this study, we found relatively similar functional outcomes after 3-months post-operatively. Xu et al from China reported that blood loss was significantly greater in DHS group but time to mobilization was significantly shorter in the PFNA patients of unstable pertrochanteric fractures.[19] The authors also proposed that PFNA allowed faster recovery than DHS. Shen et al noted that PFNA can benefit peritrochanteric fractures patients with less blood loss and fewer

complications compared with DHS.[20] Some authors have shown that short term functional outcomes favored PFNA in the initial three months, but no significant differences were observed in recovery once union was achieved in six months.[21]

Single center study design with a relatively short follow up duration were some of the inherent limitations of this study. This study was based entirely on a clinical assessment of the operating surgeon, and findings may vary according to the expertise, experience, and acceptability of the per-operative findings of the operating surgeon.

CONCLUSION

Functional outcomes as per HHS were relatively similar with DHS and PFNA approaches in patients with pertrochanteric fractures.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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1	Pervaiz Hashmi	Critical revisions, Drafting, Responsible for data.	
2	Wajahat Alam	Concept and Designing, Proof reading, Critical revisions.