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RESEARCH ARTICLE
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A COMPARISON OF AO DYNAMIC CONDYLAR SCREWS (DCS) VS PROXIMAL FEMORAL NAIL ANTIROTATION (PFNA) FOR THE TREATMENT OF UNSTABLE PERITROCHANTERIC FEMORAL FRACTURES, A RETROSPECTIVE STUDY

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Abstract
Purpose: The purpose of this study was to compare the outcomes of intramedullary fixation versus plate-screw fixation for unstable peritrochanteric femoral fracture patients over the age of 60.
Methods: A retrospective analysis of patients who had unstable peritrochanteric femoral fractures and were treated with a 95° fixed-angle screw plate (DCS) or an intramedullary nailing device (PFNA) is presented in this article. The study covered 73 fractures, 41 of whom were operated with the PFNA system and 32 with the DCS. The treatment groups were compared over the period of atleast 1 year, considering all demographic and trauma parameters.
Results: At the 1-year follow-up, no significant differences in age, gender, side of injury, mechanism of trauma, associated comorbidities, AO fracture classification, mortality at one year, functional score or fracture reduction quality were seen between the two groups. The PFNA group had a shorter surgical time (80.46±12.74 mins) than the DCS group (93.94±13.89mins.). In the DCS group, as more exposure and surgical time was required, resulting in more blood loss, length of hospital stay and late weight bearing than in the PFNA group. The PFNA group's in term of postoperative functional outcomes were found to be much better than the DCS group's.
Conclusions: PFNA is a more suitable choice for the treatment of unstable peritrochanteric fracture because of some advantages such as minimal exposure, less surgical time, blood loss, hospital stay, weight bearing and better postoperative functional results.

INTRODUCTION
Hip fractures have been on the rise in many regions of the world due to an ageing population (1). A large increase in proximal femur fractures is projected in the future due to demographic changes (2) Peritrochanteric fractures commonly known as extracapsular hip fractures, are further divided into

two types: stable or unstable patterns depending on the presence of comminution, loss of posteromedial buttress, reverse oblique fracture parttern or peritrochanteric fracture with subtrochanteric extension (3). These unstable fractures (AO/ASIF classification: 31-A2 and 31-A3) can be difficult to treat because of fracture pattern and poor quality of bone in older patients (4).

The appropriate treatment for unstable peritrochanteric fractures is still up for debate (5). many implants have been developed to aid fracture stabilisation, obtain early ambulation, and lower the risk of complications (6), (7). Intramedullary and extramedullary implants are the two types of implants available(4).

In the treatment of peritrochanteric fractures, the dynamic hip screw (DHS) or sliding hip screw (SHS) has been the standard implant (1). But DCS screw is cannulated, an extramedullary fixation implant developed by the AO/ASIF group from the 95 fixed-angle plate, is considerably easier to install in that area(1, 8).When compared to intramedullary implants, however, it has a biomechanical disadvantage due to the greater distance between the weight bearing axis and the implants(1).

The proximal femoral nail Antirotation (PFNA) device, one of the third-generation intramedullary implants , was developed by the AO/ASIF group in 2004. Biomechanical testing has shown that PFNA blade compresses cancellous bone and promotes angular and rotational stability and prevents varus collapse. In comparison to other widely utilized screw systems, also reveales much stronger cutoff resistance in osteoporotic bone(4, 9, 10). Additionally, PFNA allows for early mobilization and weight bearing on the afflicted limb (11). The goal of this retrospective study is to compare the results of the DCS and the PFNA in the treatment of patients over 60 who had unstable peritrochanteric fractures.

Patients and methods

This retrospective study included patients with unstable peritrochanteric fractures operated at Nishtar hospital Multan between January 2019 and December 2021. The inclusion criteria were radiologically diagnosed unstable peritrochanteric fractures (31-A2 and A3 for AO/ASIF classification), age older than 60 years old, and an American Society of Anesthesiologists (ASA) score of 1–4.

The exclusion criteria were pathologic fractures, poor ambulation before the trauma, polytrauma, and severe concomitant medical conditions (ASA 5), the patients who underwent surgery 10 days after admission. The patients were divided into two groups based on type of implant used. Intramedullary fixation with the PFNA system was implemented in Group A. This group was composed of 41 patients with peritrochanteric fractures (AO Classification: 31-A2 in 17 and 31-A3 in 24). Group B underwent extramedullary fixation with the DCS system. This group consisted of 32 patients with peritrochanteric fractures (AO Classification: 31-A2 in 12 and 31-A3 in 20).

For all of the patients, background variables, including hardware use, age, gender, associated comorbidities, and mechanism of trauma, were recorded. Surgery was implemented as soon as the patients' general health conditions were suitable. Surgeons who had performed the PFNA and DCS procedures at least five times performed the operations. All of the patients were administered a preoperative intravenous injection of antibiotic cefuroxime (1 g), and general or spinal anesthesia was used in both groups. All of the fractures in Group A were treated on the operating table in supine position with traction table under the control of C-arm fluoroscopy, and the fractures were reduced and treated with closed reductions. The patients in Group B were treated in a supine position with open methods under the control of C-arm fluoroscopy. Blood loss (ml), number of units of blood transfused intraoperatively and postoperatively,length of hospital stay was recorded in each group. Antibiotic treatments continued for 7 postoperative days.

Rehabilitation in terms of hip range of motion exercises and non weight bearing ambulation was started on first post-operative day. All of the patients were regularly examined physically and radiographically after 6 weeks and at 3, 6, and 12 months after their operations. Postoperative clinical assessments were conducted using the harris hip score scoring system. Radiographs of the operated hip were obtained at each follow-up visit, and the position of the implant and extent of fracture union were noted. partial weight bearing (days), full weight bearing (months), mortality at one year, radiological consolidation months) ,the extent of anatomical reduction was classified as acceptable (5–10 varus/valgus and/or anteversion/retroversion) or poor ([10 varus/valgus and/or anteversion/ retroversion)recorded.

postop complications lateral migration of blade or screw, cut out, lateral cortex of femur fracture, peritrochanteric fracture , implant failure, infection, nonunion, and general complications systemic DVT, decubitus ulcer, pneumonia , UTI recorded.

Statistical analyses

Statistical analysis was performed using SPSS version 23. Student’s t tests were used to compare the two groups continuous variables like surgical time, blood loss, length of hospital stay, partial and full weight-bearing time etc.

Chi square test was performed for categorical variables like gender, side of injury, mechanism of injury associated comorbidities, AO fracture classification. A difference was considered to be statistically significant when $p< 0.05$.

Results

In this study, age of the person and duration of injury to surgery, gender, mechanism of injury and In terms of associated comorbidities, mortality at one year, no significant differences were seen between the two groups ($p = 0.92$) (Table 1).

The mean surgical time for patients treated with PFNA was 80.46±12.74 min and was significantly lower than in those treated with DCS, in which the mean time was 93.94±13.89 ($p<0.05$). Fracture reduction was considered good in 57 (33 PFNA, 24 DCS), acceptable in 15(8 PFNA, 7 DCS), and poor in 1 patients (0 PFNA, 1 DCS) on postoperative radiographs. There were no significant differences between the quality of reduction for both implants and fracture types ($p = 0.49$) (Table 2).

Length of hospital stay , partial weight bearing , full weight bearing and radiological consolidation time was significantly shorter for PFNA as compare to DCS group ($p <0.05$).

Harris hip score was considered excellent in 11(6 PFNA, 5 DCS), good in 49(28 PFNA, 21 DCS), and fair in 12 (6 PFNA, 6 DCS) and poor in 1 patient with no significant differences for both implants and fracture types ($p = 0.80$) (Table 3).

The orthopedic and general postoperative complications are listed in Table 4 and 5. No significant differences were seen between the two groups in terms of orthopedic or general complications ($p = 0.71$ and $p = 0.43$, respectively).

Table-1	PFNA (GROUP A; N = 41)	DCS (GROUP B; N = 32)	P VALUES
GENDER: MALE/FEMALE	23/18	20/12	0.58
SIDE: RIGHT/LEFT	26/15	22/10	0.63
MECHANISM OF INJURY			
SIMPLE FALL AT HOME TRAFFIC ACCIDENT	14 27	10 22	0.79
ASSOCIATED COMORBIDITIES HYPERTENSION DIABETES CARDIOVASCULAR DISEASE	11 17 4 1	10 11 2 1	0.92
AO FRACTURE CLASSIFICATION A2 A3	 17 24	 12 20	
SURGICAL TIME (MIN)	80.46±12.74	93.94±13.89	P<0.05
MEAN FOLLOW-UP PERIOD (MONTHS)	13.88±3.018	12.97±1.694	0.13
BLOOD LOSS ML	120.98±27.55	325.00±84.24	P<0.05
BLOOD TRANSFUSED (UNITS)	4	7	.15
LENGRTH OF HOOSPITAL STAY DAYS	4.17±.863	4.66±1.096	.038
PARTIAL WEIGHT-BEARING (days)	8.83±2.35	24.13±4.35	P<0.05
MORTALITY AT 1-YEAR FOLLOW-UP	1	0	.374
CONSOLIDATION TIME (weeks)	17.51±1.39	22.00±5.34	P<0.05

Table-2		FRACTURE REDUCTION QUALITY			TOTAL	P VALUE
		GOOD	ACCEPTABLE	POOR		
HARDWARE USE	PFN	33	8	0	41	
	DCS	24	7	1	32	0.49
TOTAL		57	15	1	73	

Table-3		HARRIS HIP SCORE				TOTAL	P VALUE
		EXCELLENT	GOOD	FAIR	POOR		
HARDWARE USE	PFN	6	28	6	1	41	
	DCS	5	21	6	0	32	0.80
TOTAL		11	49	12	1	73	

Table-4		ORTHOPAEDIC COMPLICATION					TOTAL	P VALUE
		LT MIGRATION OF BLADE OR SCREW	CUT OUT	NON UNION	INFECTION	NONE		
HARDWARE USE	PFN	1	1	0	1	38	41	
	DCS	2	1	1	1	27	32	.714
TOTAL		3	2	1	2	65	73	

Table-5		GENERAL COMPLICATION				TOTAL	P value
		SYSTEMIC DVT	PNEUMONIA	UTI	NONE		
HARDWARE USE	PFN	2	0	0	39	41	
	DCS	1	1	1	29	32	.434
TOTAL		3	1	1	68	73	

Discussion

The appropriate and ideal management for unstable peritrochanteric fractures has always been one of orthopaedic surgeons' top concerns around the world.(12) Various devices, including flexible and stiff intramedullary nails, fixed-angle blade plates, dynamic hip screws (DHS), and dynamic condylar screws (DCS), have been documented in the literature as treatments for various forms of unstable peritrochanteric fractures(3). Blade plates, dynamic condylar screws (DCS), and the previously employed intramedullary implants have all been found to be troublesome. Biomechanical studies have revealed that intramedullary implants may be better than plating systems in unstable peritrochanteric fractures(3).

The DCS is an implant currently use in proximal and distal femoral fractures and has been proved to have some technical advantages over the AO condylar blade plate in unstable peritrochsanteric fractures .DCS plates provide the ability for a wide range of rotation of the proximal part of the lag screw, especially in the sagittal plane. The use of DCS, was less expensive and more commonly available in our nation. Important stages in the procedure are the proper placing of the guide wire and the slipping of the plate over the lag screw. The success rate is high If the procedure is performed correctly(13). In patients with good bone stock, the procedure plays an important role (4) But devascularization, which occurs as a result of over-dissection, union delay, nonunion, and infection are the most serious disadvantages (4, 14, 15). The implant's fatigue and weariness should also be considered (4, 16-18).

The PFNA system functions as an internal splint while also bearing a considerable axial load since it provides a minimal bending moment. In addition to this, the PFNA system's helical blade improves bone purchase in the femoral neck–head. Furthermore, by rotating with the nail, the blade inhibits rotation or compaction of the proximal fragment. Because of these considerations, the patient can bear partial weight sooner after surgery (19, 20). Another important advantage of the PFNA technique is that it can be performed with minimal surgical invasion. Cutout of the implant and femoral medialization are two disadvantages of this procedure. This implant can also cause proximal screws or helical blades to migrate laterally(4, 21, 22).

The time to full weight-bearing on the corresponding extremity in the DCS group was substantially longer than in the PFNA group in our study ($p<0.05$). In Sahin et al.(4) study partial weight-bearing (days) was 7.28 ± 3.97 days for PFNA and $22,27 \pm 10.72$ days for DCS respectively while in our study it was 8.83 ± 2.35 days and 24.13 ± 4.35 days respectively ($p<0.05$). Similarly Consolidation time (weeks) in our study for PFNA and DCS was 17.51 ± 1.39 days and 22.00 ± 5.34 days respectively while in Sahin et al. (4) found it to be 15.71 ± 5.49 for PFNA and 22.59 ± 10.21 for DCS.

Lateral cut out/migration was found in 3 patients (1 pateint in PFNA group and 2 patients in DCS group). In a study by Sadowski et al.(23), the rates of cutout were noted as 26.3 and 5 %, respectively. but in our study 1 patient (2.4%) and (3.12%) of each group has that complication and has $p>.05$.

The limitations of this study include retrospective nature and small sample size. Few studies have compared intramedullary fixation to angular stable plates in the treatment of unstable fractures (23) . Sliding hip screw devices have been compared to the PFNA in the treatment of all forms of unstable peritrochanteric fractures in a number of studies (4, 7, 24) . Because it was a retrospective, controlled study, the approach used in our research had limitations.

Conclusion

The successful return to safe and early mobility of older people with unstable peritrochanteric fractures is the major goal of treatment. The radiographic parameters were the same in both groups in our study. Our study shows that for unstable peritrochanteric fractures, in comparison to DCS, PFN offers several advantages of minimal invasive surgery, quicker surgical time, lower blood loss, length of hospital stay, early weight bearing and better postoperative functional parameters.

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