ORIGINAL ARTICLE

Treatment and Outcomes of Proximal Femoral Locking Plate Versus Proximal Femoral Nail in Unstable Pert-Trochanteric Fractures (Boyd and Griffin Type III & IV)

MUHAMMAD TAQI[1], MUHAMMAD TASNEEM[2], MUHAMMAD AKHTAR[3], MUMRAIZ S. NAQSHBAND[4], SYED FARAZ SHAH GILLANI[5], MUHAMMAD JAZIB NADEEM[6], RANA DILAWAIZ NADEEM[7], IRFAN AHMAD[8]
[1]*Postgraduate Resident, Department of Orthopaedic Surgery, Mayo Hospital Lahore*
[2]*Senior Registrar, Department of Orthopaedic Surgery King Edward Medical University, Mayo Hospital Lahore*
[3]*Associate Professor, Department of Orthopaedic Surgery King Edward Medical University, Mayo Hospital Lahore*
[4]*Assistant Professor, Department of Orthopaedic Surgery King Edward Medical University, Mayo Hospital Lahore*
[5]*Senior Registrat, Department of Orthopaedic Surgery King Edward Medical University, Mayo Hospital Lahore*
[6]*Clinical Research Assistant, Department of Orthopedic Surgery Mayo Hospital, Lahore*
[7]*Chairman/Professor, Department of Orthopedic Surgery, King Edward Medical University/ Mayo Hospital, Lahore.*
[8]*Senior Registrar, Department of Orthopaedic Surgery Mayo Hospital Lahore*
Correspondence to Dr. Muhammad Taqi, Email: dr.taqi227@gmail.com, Cell: 03016075490

ABSTRACT

Aim: To compare the outcomes between proximal femoral locking plate and proximal femoral nail in unstable per-trochanteric fracture, Boyd & Griffin type III/IV.

Methods: This comparative cross-sectional study done using a non-probability purposive sampling technique at the Department of Orthopedic Surgery, King Edward Medical University/Mayo Hospital, Lahore from January 1st, 2018 to December 30th, 2019. The sample size was 61 cases, aged between 18 to 70 years, with unstable sub-trochanteric, Boyd & Griffin type III and IV fracture were included, and patient with fracture neck of femur, open fracture, pathological fracture, and uncontrolled diabetes mellitus were excluded from the study. The patients were divided into Group-A and Group B.

Results: Out of the total 31 patients in group A, there were 16(51.6%) males and 15(48.4%) females, while amongst 30 patients in group B, there were 17(56.6%) males and 13(43.3%) females. The mean age of the patient in group Awas 55±6.2 years and group B 57.9±6.7 years. There was no superficial and deep infection observed in both groups. There were 2(6.5%) cases of implant failure, in group A and there was no implant failure in group-B. fracture. In group-A, the radiological union was observed in 29(93.5%) patients and group-B, it was observed in 100% of patients. The difference in mean radiological union score (RUST) between the group-A (5.46±62.03 months) and group-B group (6.51±6 1.74 months) were not statistically significant at follow-up of 30 weeks.

Conclusion: Proximal femoral nail is an appropriate option for unstable intertrochanteric fractures of the femur as compared to proximal femoral locking plate in terms of complications and union rates.

Keywords: Inter-trochanteric fracture, Proximal femoral locking plate, Proximal femoral Nail.

INTRODUCTION

Fractures involving the area between greater and lesser trochanter are termed as Intertrochanteric fractures. Intertrochanteric fractures constitute 45% of hip fractures. According to Gulberg et al. prediction, the total number of hip fractures will become 2.6 million by 2025 and 4.5 million in 2050, whereas these statistics could rise to 37% in 2025 and 45% in 2050[1].

Trochanteric fractures are one of the most commonly treated orthopedic injuries, caused as a result of low-energy physical trauma in geriatric patients and high-energy physical trauma in younger patients[2,3]. About half of these injuries lead to unstable fractures[4]. In geriatric patients, these fractures are usually pathological as bones are commonly affected by osteoporosis. In younger patients, it usually occurs as a result of high energy injury in the absence of any disease[5].

All inter-trochanteric fractures have various modes of classification i.e., AO classification, Boyd and Griffin classification, and Evan's classification. Unstable fractures include reverse oblique and comminuted fractures[6,7]. According to Boyd & Griffon Classification, per-trochanteric fractures are classified into four types. Type I fractures show linear cortical breech,while type II fractures are comminuted. Boyd and Griffon type III fratures hace cortical breech extendin to lateral cortex and biplanar fracture is present in type IV. Boyd and Griffon type III & IV are termed as unstable fractures[8]. DHS is the implant of choice for the treatment of stable trochanteric fractures due to its ability to provide secure fixation and controlled impaction[9]. Complications associated with DHS in unstable fractures are osteosynthesis failure, loss of fracture reduction, lag screw cut out or its migration to acetabulum[10].

Proximal femoral nail (PFN) is a commonly used device in the intramedullary fixation. However, both benefits and technical failures of PFN have been reported[11]. PFN is one of the most effective fixation methods used to treat unstable trochanteric fractures[12]. One of the major criticisms of intramedullary systems has been the risk of femoral shaft fractures distal to the implant. The greater trochanter fragment and the lateral trochanteric wall play an important role in stability after implant fixation of unstable intertrochanteric fractures.

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The PFLP was introduced as a new feasible implant for the treatment of complex comminuted and osteoporotic unstable intertrochanteric fractures because it provides proper fixation of the lateral fragments and prevents the lateral migration of proximal fragments hence allows for angular stable plating[13,14]. Although the effects of PFN and PFLP in the treatment of intertrochanteric fractures have been reported, the results and conclusions are not consistent. Therefore, we conducted this comparative study to investigate whether there is a significant difference between PFN and PFLP fixation in the treatment of intertrochanteric fractures in terms of various clinical parameters like bone union and functional outcome using Harris Hip Score. PFN or PFLP, the ideal implant[15].

METHODOLOGY

This comparative cross-sectional study was done using a non-probability purposive sampling technique at the Department of Orthopedic Surgery, King Edward Medical University\Mayo Hospital, Lahore from January 1st, 2018 to December 30th, 2019. The sample size was 61 cases, aged between 18 to 70 years, with unstable sub-trochanteric, Boyd & Griffin type III and IV fracture were included, and patient with fracture neck of femur, open fracture, pathological fracture, and with uncontrolled diabetes mellitus were excluded.

The ethical approval was taken from the hospital ethical review board. The patients were being enrolled in this study after the informed consent and study purpose was explained to them. The patients were divided into Group-A and Group-B. Patients in group-A were treated with Proximal femoral locking plate (PFLCP), and in Group-B patients, were fixed using Dynamic Hip Screw (DHS) **All** patients were followed-up in the out-patient department (OPD) at 6th, 12th, 24th, 36th and 48th weeks postoperatively. We observed infections, implant failure, radiological union, and functional outcomes in two groups. Infections and implant failure were observed clinically, and the union was observed using a Radiological union score (RUST criteria)[16] and functional assessment was done by Harris hip score[17].

Data was entered and analyzed using SPSS version 21.0. Quantitative variables like age, duration of surgery, and blood loss were presented as Mean±Standard deviation (SD). Qualitative variables like gender, side of the limb were presented as frequencies and percentages. A paired T-test was applied to see the union and functional outcome with the age of the patient in two groups, and the P-value was taken less than 0.05 as significant.

SURGICAL TECHNIQUE

Proximal femoral locking plate lateral approach: Aseptic measures were taken with the patient in the supine position, using a straight incision extending from greater trochanter to 5-10 cm distally, according to fracture configuration will be used. The most proximal screw is inserted at an angle of 95°. The second and third screws are inserted at an angle of about 90° in anterior & posterior planes respectively. The fourth screw is inserted at an angle of 120° and the fifth at an angle of 135° which acts as medial buttress screw (preventing varus collapse). The remaining distal screw-holes (5-13 holes) in PF-LCP are fixed to the femoral diaphysis and are like the holes in the classical locking plates. All comminuted fractures with calcar commination were additionally bone grafted. Soft tissue was closed in layers with a negative suction drain in situ.

Proximal femoral nail: Aseptic measures were taken; the patient was in the supine position on a traction table. closed reduction was done and checked under the image intensifier. A 5 cm incision will be made starting from the tip of the greater trochanter extended proximally. Entry portal made at the tip of greater trochanter using the awl after checking under image intensifier and a guidewire will be passed through the trochanter distally, followed by trochanteric reaming over the guidewire. The nail (length: 240-420 mm; size: 9-12 mm; a proximal portion: 15 mm) will be implanted manually. The length and size of the nail will be decided depending upon fracture pattern and individual bone characteristics. The 11.0 cervical screws will be introduced after the position of the guide wires had been confirmed and then assembled on the aiming device on the anteroposterior and lateral views. Depending upon the fracture configuration and stability, the distal static and dynamic holes will be then locked.

RESULTS

Out of the total 31 patients in group A, there were 16(51.6%) males and 15(48.4%) females, while amongst 30 patients in group B, there were 17(56.6%) males and 13(43.3%) females. The mean age of the patient in group Awas 55±6.2 years and group B 57.9±6.7 years. Left side fracture was present in 34(55.7%) patients, and 27(44.3%) had right-sided fracture. Out of the total 61, 36(59.2%) had a fracture due to road traffic accident (RTA), 20(32.8%) fall from a height, and 5(8.1%) had direct trauma. The mean time interval between trauma and surgery was 04±1.27 days. The mean operative time of surgery in the group-A was 96.5±13.7 minutes, and in group-B was 57.69±12.3 minutes (p-value 0.03). A 445±27.3 ml blood was lost in calculated the group-A, and in group-B, blood loss was 230.65±24.5 ml (Table 1).

There was no superficial and deep infection observed in both groups. There were 02 (6.5%) cases of implant failure, in group A and there was no implant failure in group-B. In group-A, the radiological union was observed in 29(93.5%) patients and group-B, it was observed in 100% of patients. The 02 (6.5%) with implant failure due to early weight-bearing, which observed in group A, were treated with a proximal femoral nail which was followed till union. Time taken for union ranged from 19 to 28 weeks (23.5±4.3 weeks) in group-A, in group-B, it was 15 to 18 weeks, (16.5±4.8 Weeks). The difference in mean radiological union score (RUST) between the group-A (5.46±6 2.03months) and group-B group (6.51±6 1.74months) were not statistically significant (P = 0.059) at follow-up of 30 weeks. In group-A, 12 (41.3%) had excellent, 11 (37.9%) had good, 04 (13.7%) had fair and 02(06.8%) had poor outcomes functional outcome among 29 patients, and in group-B, 14 (46.7%) had excellent, 13 (43.3%) had good and 03 (10%) had fair functional outcome (P=0.06) (table 2).

Table 1: Comparison of proximal femoral locking plate Versus proximal femoral nail.

Variables	Mean age±SD (years)			Fracture Site		Gender		Average time	Average Blood loss	Average Union Time
	40-55	56-70	Mean	Right	Left	Male	Female			
	No. of patients			%age of patients		%age of patients		Minutes	Millimeter	Mean in Weeks
Group A (31)	27	04	55±6	44.4%	55.4%	51.6%	48.4%	96.5	445ml	23.5
Group B (30)	25	05	57.9± 6	46.3%	53.7%	56.6%	43.4%	57.9	230.65	16.5

*Comparing with proximal femoral locking plate (PFLCP) Group, P = 0.05.
Comparing with proximal femoral nail (PFN) Group, P= 0.05

Table 2: Harris score in patients with postoperative follow-up in proximal femoral locking plate Versus proximal femoral nail groups

	Group A (PFLCP) n=29	Group B (PFN) n=30	p-value
Excellent	12	14	
Good	11	13	
Fair	04	03	=0.06
Poor	02	00	
Excellent and good rates	79.3%	93.1%	

2 patients were excluded in group A due to implant failure which were treated later on with PFN.

DISCUSSION

There has been a constant interest in developing new techniques and improving existing ones because of the ever-increasing incidence of intertrochanteric fractures and because it is the most commonly operated fracture. The unstable variety is challenging, Stabilized, and consistent with the conventional PFLCP implant complications that have prompted surgeons to attempt the latest modalities of intramedullary fixation devices. Although PFLCP is one of the standard treatments, there are higher failure rates in unstable fractures that have been reported. PFN was introduced as a new implant that allows early mobility and adequate union as compared to PFLCP. In our study, the mean operative time in the PFLCP group (96.5 min) and that in the PFN group was 57.69 min. The above values were tested statistically and the difference was found to be statistically significant (p-value was 0.0037). Hung et al compared PLFCP, DHS, and PFN, he found the operative time of 59.60±12.40 minutes in PFN and 68.50±12.40 minutes in the PFLCP group[18].

The increased operative time and blood loss with PFLCP maybe because of extensive soft tissue dissection and fracture reduction as described by Little et al[16]. In unstable per-trochanteric fractures, the idea of lateral wall stabilization is a recent and well-accepted theory, which can not be achieved alone with PFLCP. The different suggested methods of the lateral column stabilization fixation are: -

a) Dynamic Hip screw with Plate for Trochanteric Stabilization. b) PFN c) PFLCP (Proximal Femoral Locking Compression Plate)

PFN has the benefit of bypassing the lateral wall and sidewall by lowering the lever arm the gap between the hip joint and the implant. Another advantage of PFN is that it is a device for load sharing and so having an osteoporotic fracture advantage. Our study showed no varus malunion, while Varus malunion occurred in 5% of cases in the study of Gadegone et al[17]. Gadegone et al[18] had 1 case of nonunion out of the 100. Kamboj et al. reported 1 case of nonunion and 2 cases of the delayed union out of the 30 cases in their studies. Guo-Chun Zha et al[19] reported 1 case of nonunion in the 110 patients treated by PFLCP. In our study, we encountered 1 case of nonunion in the PFLCP group and no case in the PFN group. Our study shows 93.1% excellent and good rates in PFN group, while 79.3% appeared in PFLCP group. Suner et al observed Harris hip scores excellent in 11 patients (24.4%), good in 19 patients (42.2%), moderate in nine patients (20%), and poor in six patients (13.3%)[20].

CONCLUSION

This study evaluated the effectiveness of the proximal locking plate and proximal femoral nail in unstable (Boyd & Griffon type II & IV). We found that compared to PFLCP, PFN has the advantage of short surgical time, less blood loss, short duration of fracture union, and low postoperative complications. Thorough knowledge of the concept, features, and procedure of application of PFN is very important. Based on these results, PFNA may be the most effective internal fixation for the treatment of unstable intertrochanteric femoral fractures.

Declaration: We have no conflict of interest to declare. We have no funding source to declare.

The limitations of the study were the small sample size and short follow-up. we would wish to recommend a study with larger sample size and a longer duration of study to have a better evaluation of outcomes.

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