

# To Evaluate the Outcomes of Proximal Femur Locking Compression Plate in Peritrochanteric Femur Fractures

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## Abstract

**Background:** Peritrochanteric fractures consume major part of orthopaedic injuries with high morbidity and mortality affecting almost all age groups. These fractures are difficult to treat specially the unstable types and unstable fractures unite with difficulty of reduction of fracture and there are high chances of malunion and nonunion. For the last 15 to 20 years different modifications of both the extramedullary and intramedullary devices have been done.

**Aim and Objective:** The treatment goal is to achieve anatomic reduction with a stable fracture fixation to allow early functional rehabilitation. There are limited studies on proximal femur locking compression plates in peritrochanteric fractures and the aim of present study was to evaluate its outcomes.

**Material and Method:** The study was conducted on patients having peritrochanteric fractures fulfilling inclusion and exclusion criteria in SGRD Hospital attached to SGRDUHS Vallah, Amritsar from April 2021 to July 2022. Proximal femur locking compression plating was done and its clinical, functional and radiological outcomes were evaluated.

**Results:** The mean neck shaft angle in our study at 6 months was 124.37. The mean of HHS in our study at 1 month, 3 months and 6 months was 35.17, 64.10 and 81.83 respectively with 20% excellent, 46.7% good, 23.3% fair and 10% poor results and P value was found to be <0.001 (significant). In our study Mean RUSH score at 1 month, 3 months and 6 months was 15.50, 21.23 and 23.87 respectively and p value was found to be <0.001 (highly significant) In our study, 25 (83.3%) out of 30 cases showed union. Mean time for union in our study was 16.8 weeks.

**Conclusion:** Our study concluded that despite the advances in surgical techniques and fixation devices, certain groups of proximal femur fractures continue to be a treatment challenge. Few of the disadvantages associated with PF LCP are relatively difficult operative technique and mechanical hardware failure with varus collapse

**Keywords:** Peritrochanteric Femur Fractures; Proximal femoral Locking Compression plate

## Introduction

The femur is surrounded by plenty of soft tissue envelopes and is usually fractured due to high-energy trauma in the young and trivial trauma in the old. Without suitable precautions, the fracture undergoes malunion leading to varus and external rotation deformity at the fracture site with shortening and limitation of hip movements. <sup>[1]</sup>

Peritrochanteric fractures are 'extracapsular' fractures that include Intertrochanteric and Subtrochanteric fractures occurring in the metaphyseal region between the two trochanters and proximal shaft of the femur and consisting of 50% of all hip fractures which are caused either by a fall directly onto the greater trochanter or by an indirect twisting injury and the crack runs up between the lesser and greater trochanter and the proximal fragment tends to displace in varus and flexion. <sup>[2]</sup> Weight-bearing stress is unequally distributed throughout this area. Koch described that weight bearing force of 1200 pounds per square inch in the

femur (200-pound man) which is more in medial cortex than in lateral cortex. So, medial comminution influences stability of fracture fragments and treatment outcomes.<sup>[3, 4]</sup>

According to Hagino *et al.*, individuals after 50 years of age have higher risk of these fractures and incidence is 5.6% for men and 20% for women. High energy trauma in young population result in increasing incidence of peritrochanteric fractures with increase in road traffic accidents.<sup>[5]</sup>

The fragility of these fractures occurs in population with risk factors include being female, age older than 60, having a history of falls, osteoporosis, having low bone density and low muscle mass. Every year in U.S. more than 280,000 hip fractures occur and this incidence will be expected to double by after 30 years. It has been established that these fractures, except where patient is medically unfit for surgery, are best managed surgically as morbidity and mortality associated with non-operative management is very high.<sup>[6, 7, 8]</sup>

Before the introduction of suitable fixation devices, treatment of intertrochanteric fractures of femur was non-operative and consisted of prolonged bed rest with traction until fracture healing occurred followed by a lengthy program of ambulation training. In elderly patients, this approach was associated with high complication rates; typical problems like decubitus ulcers, UTI, joint contractures, pneumonia, and thromboembolic complications, resulting in a high mortality rate. In addition, fracture healing was generally accompanied by varus deformity, shortening and external rotation because of the inability of traction to effectively counteract the deforming muscular forces. For these reasons, the treatment of intertrochanteric fracture by reduction and internal fixation has become the standard method of treatment.<sup>[6, 7, 8]</sup>

50% of peritrochanteric fractures are unstable. The results of unstable fractures are less reliable and have a high failure rate of 8 to 25%. One goal of operative treatment is strong stable fixation of the fracture fragments. Unstable peritrochanteric fractures are technically much more challenging than stable fractures, a stable reduction of these type of fractures requires providing medial and posterior cortical contact between the major proximal and distal fragments to resist varus and posterior displacing forces. Implant should be such as to allow early weight bearing and should have low complication rates. Hence, surgeon must understand implant options available and should strive to achieve accurate realignment and proper implant placement.<sup>[9]</sup>

The concept of DHS with trochanteric stabilization plate is to prevent or reduce medial displacement. However if the trochanteric stabilization plate impedes further compression of fracture before the fracture has become stable, the ends may angulate into varus with lag screws cut out, loosening or breaking the plate as result. Even in dealing with intertrochanteric fracture which is proven to be suitable for DHS, failures can exceed 15% when sliding hip screws are used.<sup>[10]</sup>

### **Aim and Objectives**

**Aim:** To evaluate the outcomes of proximal femur locking compression plate in peritrochanteric fractures.

### **Objectives**

1. To Evaluate the Clinical and Functional outcomes of proximal femur locking compression plate in peritrochanteric fractures using Harris Hip Score.
2. To Evaluate the Radiological outcomes of Proximal femur locking compression plate in peritrochanteric fractures using Neck Shaft Angle and RUSH Score.

### **Material and Methods**

This Prospective observational study was done under the guidelines of the ethical committee of the institution. A written, valid, informed consent was taken from all patients participating in this study. A total of thirty-two patients with peritrochanteric femur fractures were included from April, 2021 to July, 2022 in Department of Orthopedics, SGRD Hospital

attached to SGRDUHS Vallah, Amritsar. Patients with peritrochanteric femur fracture had been treated by “Proximal Femur Locking Compression Plate”. All the patients who were brought to casualty and outpatient department with peritrochanteric fractures were selected for the study.

After patient with Peritrochanteric femur fracture was admitted to hospital, all necessary clinical details were recorded in performa prepared for surgery. The cases were studied based on gender, age, side of injury, type of fracture according to AO classification and mode of injury and postoperatively patients were evaluated radiologically for bone union using RUSH Score and Neck Shaft Angle and their clinical and functional outcomes were assessed by Harris Hip Score during follow ups.

### Inclusion Criteria

- Patient admitted with unstable intertrochanteric or subtrochanteric fractures.
- Patients with Fractures of proximal end of femur combined with ipsilateral shaft fracture.
- Revision surgeries like PFN failure.

### Exclusion Criteria

- Patients with Proximal fragment intracapsular fractures
- Patients with stable trochanteric fractures
- Compound fractures
- Infections, unsuitable skin condition like blebs, burns, and bedsores.

Data from the present study was systematically collected, compiled in Microsoft Excel and statistically analysed using statistical package of social sciences (SPSS) version 26 to draw relevant conclusions. The observations were tabulated in the form of numbers and percentages. Categorical data was analysed using Chi-square test or Fischer’s exact test as appropriate. Level of significance was determined as  $p \leq 0.05$  as significant and  $p \leq 0.001$  as highly significant.

### Results

A total of 32 patients with peritrochanteric femur fractures were enrolled in the study. In our study, the mean age of the patients in our study was 51.12 years with the youngest patients being 18 years old and the oldest one 85 years old. In our study, 20(62.5%) were males and 12(37.5%) were females. The mode of injury was Fall on hip from standing height in 19 patients (59.375%) and road traffic accident was responsible for fracture among the remaining 13 patients (40.625%). Out of total 32 cases involved, 18 were of right side and 14 were of left side. There were 22 cases of type A3 of AO classification and ten cases of A2 type. Out of 32 cases, 2 were expired due to medical illness and remaining thirty cases were followed up regularly for a period of 6 months. (Table 1)

**Table 1**

Age(Years)	Number	Percent
<30 Years	3	10.00
31-50 Years	12	40.00
51-70 Years	8	26.67
>70 Years	7	23.33
Sex		
Female	12	40.0
Male	18	60.0
Side		

Left	14	46.7
Right	16	53.3
<b>Mode of Injury</b>		
Fall	17	56.7
RSA	13	43.3
<b>AO Classification</b>		
AO 2.2	1	3.3
AO 2.3	8	26.7
AO 3.1	2	6.7
AO 3.2	5	16.7
AO 3.3	14	46.7

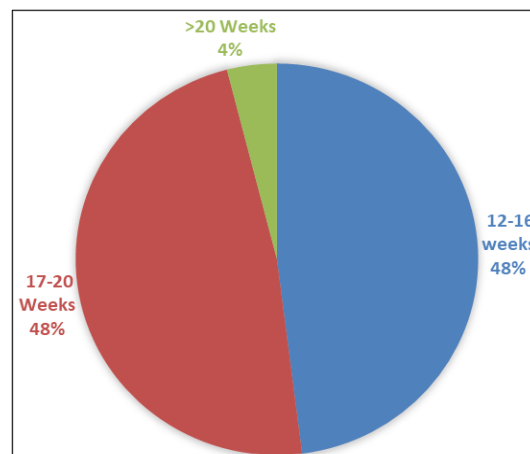
In our study, out of 30 patients, 23 patients had no complications and 5 patients had varus collapse that progressed to nonunion and 2 out of these 5 cases resulted in implant failure due to screw breakage in one and plate pull out in other. The reason for implant failure was that both the patients started weight bearing early against the advice. Patients were advised for implant removal and revision surgery along with bone grafting but patients refused. Limb length discrepancy seen in 6 patients in the form of shortening with minimum shortening of 0.5cm and maximum shortening of 2 cm. There was one case of superficial infection which was cured by oral antibiotic therapy and regular dressing changes and infection healed completely. (Table 2)

**Table 2**

Complications	Number	Percent
Nonunion with varus angulation	5	16.7
Shortening	6	20.0
Superficial infection	1	3.3
Implant failure	2	6.7
No Complication	23	76.6

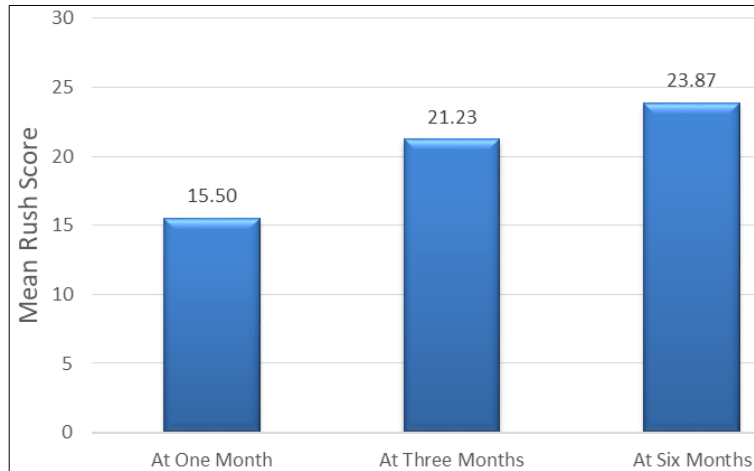
Radiological union was said to be achieved on the evidence of obliteration of fracture lines and trabecular continuity between two fragments on anteroposterior and lateral x rays in three cortices and fracture healing was assessed using RUSH SCORE (Radiological Union Score for Hip).

Out of 25 union cases, 12 cases showed union at 12-16 weeks, 12 cases showed union at 16-20 weeks and 1 case showed union at 20-24 weeks. Hence, the duration of union in our cases varied from 12-24 weeks with mean as 16.8 weeks.(Fig 1)



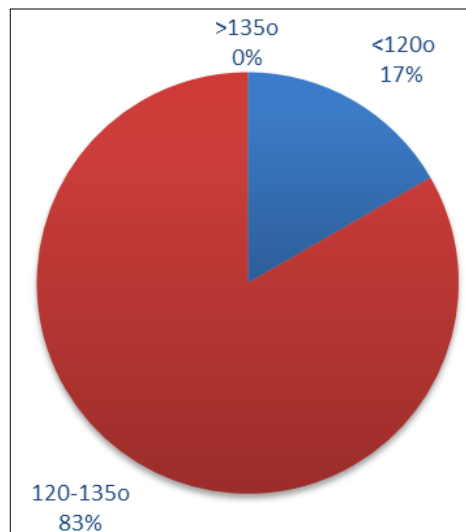
**Fig 1:** Time of Union (in week)

Mean RUSH Score at 1 month, 3 months and 6 month was 15.50, 21.23 and 23.8 respectively and on comparing the RUSH Score between 1 and 3 months, mean difference was found to be -5.733 and p value was found to be <0.001 (highly significant).



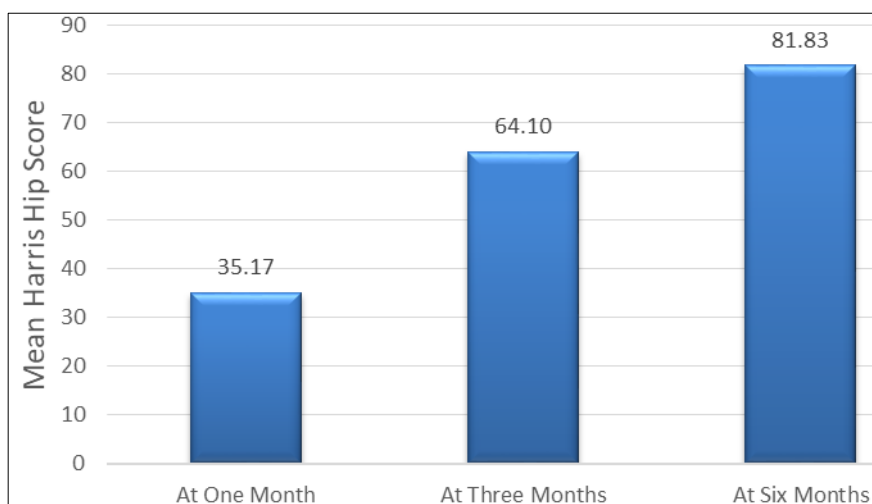
**Fig 2:** Mean RUSH Score at Different Follow ups

Neck shaft angle at 6 months was found to be 124.37°. Out of 30 cases, 5 cases had Neck shaft angle of <math><120^\circ</math> and in remaining all 25 cases, Neck Shaft angle was found to be between 120-135°. None of the case had Neck Shaft angle of <math>>135^\circ</math>. (Fig 3)



**Fig 3:** Neck Shaft Angle at Six Months

Mean Harris Hip Score at 1 month, 3 months and 6 months was 35.17, 64.10 and 81.83 respectively. On comparing Harris Hip Score at different intervals (between 1 month and 3 months and between 1 month and 6 months) P value was found to be <math><0.001</math> which is highly significant. (Fig 4)



**Fig 4:** Mean Harris Hip Score at Different Follow ups

### Discussion

Our major group of patients belonged to 31-50 years (40%) age group with mean age 52.37 years ranging from 18-85 years. Our study results are comparable with other studies like Shah MD *et al* <sup>[11]</sup>. (55.3±17.9), Lingayat MB *et al* <sup>[12]</sup>. (59.04±18.45) and Nath GR *et al* <sup>[13]</sup>. (56.8).

Males in our study was found to be more affected than females as males were found to be working outdoor, involved in manual labour, farming, working at heights, driving etc making them more susceptible to injury. Other similar studies showing Male predominance were In our study the common mode of injury being trivial fall accounting for 57% of the cases. This was like that quoted by Krishna V *et al* <sup>[14]</sup>. And Shah MD *et al* <sup>[11]</sup>. as 77% and 50% respectively of cases sustained fracture by mechanical fall. This contrasts with Hossain MM *et al* <sup>[15]</sup>. states high velocity trauma due to RTA as the main cause of these fractures.

The fracture pattern most encountered in our study being 31A3-3 which is in contrast to Lingayat MB *et al*. <sup>[12]</sup> who found it to be 31 A2-2.

The mean neck shaft angle in our study at 6 months was 124.37, Whereas Shah MD *et al*. <sup>[11]</sup> and Krishna V *et al*. <sup>[14]</sup> reported post-reduction neck shaft angle of 125.9 and 126.1 respectively. Acc to Hossain MM *et al*., <sup>[15]</sup> mean neck shaft angle of healthy and injured side were measured as 134.32±0.94 and 133.58±1.07 respectively and P value > 0.05(no significant difference).

In our study, 25 (83.3%) out of 30 cases showed union. Mean time for union in our study was 16.8 weeks which is in contrast to Krishna V *et al*. <sup>[14]</sup> series with 12.5±2 weeks of union time which was less compared to our study. Other studies where union time was analysed and similar to our study were: The clinical and functional status was obtained using Harris Hip Score. The mean of HHS in our study at 1 month, 3 months and 6 months was 35.17, 64.10 and 81.83 respectively with 20% excellent, 46.7% good, 23.3% fair and 10% poor results and P value was found to be <0.001(significant).

The results obtained were slightly lower in comparison to Hossain MM *et al*., <sup>[15]</sup> Hu *et al*., <sup>[16]</sup> Krishna V *et al*. <sup>[14]</sup> series which reported a mean Harris Hip Score of (92.05±7.85), 86.5 and 84.26 respectively.

The functional outcomes of our study population were comparatively better than those reported by Shah MD *et al*. <sup>[11]</sup> (80.2) and Lingayat MB *et al*. <sup>[12]</sup> (78.6±7.63)

Due to the advantage of cost effectiveness X-rays have always been the first choice of imaging. But the use of X-rays to evaluate fracture union has always been a problem of low consistency. To address this problem, Bhandari's RUSH score showed moderate consistency in assessment of fracture healing after surgery.

In our study Mean RUSH score at 1 month, 3months and 6 months was 15.50, 21.23 and 23.87 respectively and p value was found to be <0.001(highly significant) this is similar to study by Frank T *et al*. <sup>[17]</sup> the mean 6 months RUSH score was 24.3±3.4. The overall fracture healing impression consistency was substantial (ICC=0.79)

## Conclusion

Our study concluded that despite the advances in surgical techniques and fixation devices, certain groups of proximal femur fractures continue to be a treatment challenge. Proximal femoral LCP is a good method for proximal femur fractures as it provides the surgeon with flexibility to achieve angular stability or axial compression with plate to bone apposition. Few of the disadvantages associated with PF LCP are relatively difficult operative technique and mechanical hardware failure with varus collapse. The use of PFLCP in peritrochanteric femur fractures was associated with satisfactory outcome in most of the treated patients with union in 83.3% cases. In light of these observations, we conclude that despite few unfavourable results and complications, Proximal femoral Locking Compression plate is a satisfactory method of treatment in peritrochanteric femur fractures especially with severe comminution. It requires closed monitoring during pre-operative, intra-operative and post-operative period to avoid complications which can be managed.

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