

## STUDY OF SURGICAL MANAGEMENT OF DISTAL FEMUR FRACTURE USING LOCKING COMPRESSION PLATE

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Received : 31/07/2024  
Received in revised form : 03/10/2024  
Accepted : 17/10/2024

**Keywords:**

Locking Compression plate; Locked internal fixators; Femoral Fractures; Implants.

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DOI: 10.47009/jamp.2024.6.5.136

Source of Support: Nil,  
Conflict of Interest: None declared

*Int J Acad Med Pharm*  
2024; 6 (5); 718-721



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### Abstract

**Background:** Fractures of Distal Femur are common due to increased road traffic accidents and fall from height because of increased construction activities. These fractures are quite disabling. These fractures necessitate early stabilization of fractures. Internal fixation with locking compression plate (LCP) has shown to give one of the best results in terms of recovery, fracture union and clinical outcome. The study intends to determine union rates with locking compression plates and clinical outcome associated with treatment modality. **Materials and Methods:** 46 cases of distal femur fractures treated with locking compression plate (LCP) from December 2021 to June 2022 at a single centre. They were admitted and examined according to protocol clinically and radiologically. All patients were followed up for a duration of 6 months and outcome assessed with Neers score. **Result:** All fractures healed with an average duration of 16 weeks which is similar duration with other studies. We had two cases of varus collapse one was due to early weight bearing in one case and other case was due to gross comminution. Average Neer's Knee score was 76. **Conclusion:** The LCP condylar plate is the treatment of choice in the management of comminuted distal femoral fractures especially Type A fractures were reported with higher Neer scores. LCP also prevents compression of periosteal vessels. It may not completely solve the age-old problems associated with any fracture like non-union and malunion, but is a valuable technique in management of these fractures. But however, in type C fractures the outcome is poorer.

## INTRODUCTION

The fast urban growth, land development, faster transport and others. led to a manifold increase in road traffic accidents and construction injuries (fall from height) therefore crippling many young lives. Older patients especially women sustain fractures due to osteoporosis.

Many studies have proved this bimodal distribution of supra condylar fractures of femur. Fractures of distal femur are complex injuries producing long term disability. They account for 6% of all femur fractures and 31% if hip fractures are excluded. Nearly 50% of distal femur intra articular fractures are open fractures.<sup>[1-3]</sup> Until the 1960's there was a great reluctance towards operative management of fracture due to high incidence of infection, non-union, mal-union. Watson Jones and John Charnley advocated in that era traditional management by skeletal traction, manipulation of fracture, external

immobilization, and cast and cast bracing. These met with problem like deformity shortening, prolonged bed rest, knee stiffness, angulation, malunion, quadriceps wasting, and knee instability and post traumatic complications.<sup>[4,5]</sup>

The trend of open reduction and internal fixation has become evident in the recent years with good results being obtained with AO Blade plate, Dynamic Condylar Screw, Intra Medullary Supracondylar nail and Locking Compression Plate. Elderly patients and Osteoporosis add to difficulty in articular fractures. Loss of stable fixation is of great concern, so locking compression plate use has an advantage in these patients.<sup>[6]</sup> Locking Compression Plate has the advantage of combination of Compression Plating, Locked Plating and Bridge Plating. This reduces soft tissue damage and periosteal vessels are preserved. Therefore, it acts like a closed external fixator.<sup>[7]</sup>

## MATERIALS AND METHODS

In this study 46 patients with supracondylar fracture were enrolled and followed up for six months in a single centre. All the fractures in this series were post-traumatic, pathological fracture were excluded along with supracondylar fractures in children. Supracondylar fractures treated conservatively or fixed with other fixation systems like AO blade plate and condylar buttress plate were not included. All patients included for study were clinically and radiological examination was completed along with basic blood examination. All wounds were managed as per standard protocol and primary immobilized once confirmed with no other complications.

Surgical procedure <sup>[3,8]</sup>

Under appropriate anaesthesia, we used the standard lateral approach to distal femur, with patient in supine position and a sand bag was kept below the operating knee and one below the ipsilateral hip. Skin and subcutaneous tissue were cut, superior geniculate artery was identified and ligated care was taken not to incise the lateral meniscus at the lateral joint margin. The vastus lateralis muscle carefully elevated from intermuscular septum and retracted anteriorly and medially. Osteotomy of tibial tubercle & lifting along with patellar tendon, caused anterior exposure to the condyles of femur. In certain cases, modified approach by Starr et al, an anterolateral skin incision was made and lateral parapatellar arthrotomy with elevation of vastus allowed better visualization of the condyles. After reducing and temporarily securing the articular fragments with pointed reduction forceps and/or K wires. If a posterior Hoffa fragment was present, it was reduced and provisionally stabilized with K wire inserted from anterior to posterior. Securing the condyles with 6.5 mm cancellous screws. A condylar plate guide or plate itself was held laterally on the condyle to select an area, where screws would not interfere with plate

placement. Placing a K wire across the femoral condyle, at the level of the knee, to indicate the joint axis and place a second K wire across the patello-femoral joint on the trochlear surface. Using anatomic landmarks and C – arm imaging, mounting the plate on the intact / reconstructed condyle without attempting to reduce the proximal portion of the fracture. Checking whether the guide wire inserted in through the central hole is parallel to both distal femoral joint axis and patello femoral joint.

Measuring the length using measuring device. Inserted screws starting from central hole in the condylar portion and confirming under image control. Once reduction was satisfactory, the plate was loaded in tension using articulated tension device. The plate shaft was fixed with appropriate cortical screws after confirming final reduction of the fractures. Proper postoperative rehabilitation was provided to ensure the attainment and maintenance of satisfactory range of motion, strength and function of the knee joint. The outcome of surgery was assessed by Neers score (9): which is based on clinician-based outcome which includes 6 subscales: Pain (20 points), Function (20 points), Motion (20 points), Work (10 points), Gross anatomy (15 points) and Roentgenogram (15 points).

## RESULTS

46 patients recruited in the study were varying from 19 -65 years among them 26 (56.5%) were male and 20 (43.5%) females respectively. Number of cases with right femur fracture were 30 (65%) and left femur constituting 16 (35%) cases. Based on nature of fracture is mentioned below as shown in [Table 1]. [Table 2] depicts the scoring system of Neers based on 6 subtypes and frequency of cases distributed across them. Neers Overall rating suggested 32.6% excellent recovery followed by 56.5% cases as satisfactory are displayed in [Table 3].

**Table 1: Frequency of cases based on nature of fracture**

Fracture Classification (OTA) Distal	No. of Patients (n=46)
C2	9 (19.5%)
C1	9 (19.5%)
B1	3 (6.5%)
A1	12 (26%)
A2	9 (19.5%)
A3	4 (9%)

**Table 2: Neers scoring system**

Score	Frequency (No of Cases) & (%)					
	Pain	Function	Motion	Work	Gross Anatomy	Roentgenogram
5	5(10.8%)	4(8.7%)		10(21.7%)	29 (63%)	30(65.2%)
4	30 (65.2%)	28(60.8%)	20(43.5%)	28(60.8%)	10 (21.7%)	13(28.2%)
3	11 (24%)	14(30.5)	24(52%)	8(17.5%)	7(15.3%)	3(6.6%)
2	-	-	2(4.5%)	-	-	-
1	-	-	-	-	-	-
0	-	-	-	-	-	-

**Table 3: Neers Score- Overall rating**

Outcome	Rating	No. of Cases
Excellent	Above 85 units	15 (32.6%)
Satisfactory	70-85 units	26 (56.5%)

Unsatisfactory	55-69 units	5 (10.9%)
Failure	Below 55 units	-

## DISCUSSION

The good outcome seen in our study can be attributed to more of Type A fractures, which usually show favourable results. Most of the series above have equal or higher number of Type C fractures. We had only 5% of open fractures, which are much higher in other case series. We also observed that the small sample size can be used only as Level III evidence in evidence-based medicine. We had two cases of varus collapse one was due to early weight bearing in one case and other case was due to gross comminution. One case had an implant failure (Plate breakage) due to early weight bearing. Cases needing hardware revision is comparable to other studies at 13%. Earlier, fixation of these fractures with a lateral plate alone has historically been associated with non-union and /or malunion with varus collapse.<sup>[8,9]</sup>

Prior to advent of locking plates, these problems were addressed with dual plating methods.<sup>[10]</sup> Though this prevented varus collapse, extensive soft tissue stripping and medial incision increased the chance of extensor lag. With the introduction of plates with option of locked screws, the results are encouraging, as it increases the rigidity of fixation in osteoporotic bone and in presence of periarticular or juxta-articular comminution.<sup>[7,11]</sup>

The LCP condylar plates provide multiple points of fixed plate to screws contact, generating greater stability and thereby reducing the tendency of varus collapse.<sup>[11]</sup> Less Invasive Stabilization System plating allows minimally invasive approach by submuscular insertion of plates and thereby preservation of vascularity to the lateral cortex.

In our study, radiological union was seen at an average of 16 weeks which is comparable to study of LCP by Kayali et al that averages 15 weeks. Overall results were excellent in 30 out of 46 cases and were satisfactory in remaining cases except three. The overall average knee score in our study was 76, as opposed to 67.7 by Schandelmaier et al.<sup>[12]</sup> We had 88% good to excellent outcome as per Neer Score in our study, compared to Ketterel et al (90%) and Hann et al (86%).<sup>[13]</sup>

The problems in fixing distal femoral fractures with osteoporosis, extensive comminution and revision surgeries following failed implant can be addressed effectively using locking condylar plate.<sup>[11]</sup> We believe that locking plates represent a valuable advancement in fracture treatment. However, the limitations of this new technology and indications for its use have not been completely elucidated and the long-term results are awaited.

However, the locking plates can fail when physiological loads are outside plate-design parameters. The locked screws can dis-engage from the plate secondary to failure of the screw to seat into the plate properly, as a result of cross – threading or

when insufficient screw torque is used to engage the screw threads into the plate threads.<sup>[13]</sup>

## CONCLUSION

The LCP condylar plate is the treatment of choice in the management of comminuted distal femoral fractures especially Type A fractures where we have found higher Neer scores. LCP also prevents compression of periosteal vessels. It may not completely solve the age-old problems associated with any fracture like non-union and malunion, but is a valuable technique in management of these fractures. But however, in type C fractures the outcome is poorer. But still LCP remains the implant of choice for type C fractures also, though there are complications like knee stiffness and extensor lag were encountered in a few cases, but they show better results than dynamic condylar screw and angle blade plate.

This is ideal to prevent metaphyseal collapse and to maintain limb length in severely comminuted fractures. This technique has a lesser chance of complications like plate or screw breakage, but careful selection of patients and strict adherence to the basic principles of fracture fixation will go a long way in reducing the complications of fracture fixation using locking compression plates. Though this study is only Level III evidence, a larger number of Randomized control trial with higher statistical significance needs to be done to know the efficacy and choice of implants in distal femur fractures.

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