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## STUDY OF SURGICAL MANAGEMENT OF DISTAL FEMORAL FRACTURES BY DISTAL FEMORAL LOCKING COMPRESSION PLATE OSTEOSYNTHESIS

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**Abstract:** A prospective study of 30 patients with closed distal femur fractures (AO classification A, C) of both sexes & above 18 years of age managed surgically by Distal Femoral Locking Compression Plate with the aim of finding its efficacy in terms of union rate (time to union), time of mobilization, functional results, radiological results & complications over a period of 1 year. Minimum of 6 months & maximum of 16 months follow up was done. Patients were evaluated both clinically as well as radio logically at 6 weeks, 12 weeks, 6 months, 9 months & 12 months. Result of the study showed that the average time to union was 3.83 months. The average range of flexion obtained postoperatively was 111.3°. Two contractures & decreased knee movements, four mal-alignment / mal-union, one implant failure & one infection were the residual complications in our study. Mean Neer's score was 80.20. Excellent results were seen in 15 cases, satisfactory in 11, unsatisfactory in 3 & 1 case of failure was seen. So the results showed that Locking Compression Plate (LCP) system, is a safe & reliable implant for distal femur fractures AO types A & C.

**Keywords:** DFLCP, LCP

### Introduction

Fractures of the distal femur constitute a heterogeneous group of injuries affecting knee. High energy injuries tend to occur in young males, whereas low energy injuries occur commonly in elderly females. These fractures often are unstable and comminuted. They are complex injuries that can be difficult to manage. Distal femoral fractures account for about 4% to 7% of all femoral fracture. These fractures have got wide variety of fracture patterns and they are commonly associated with injuries such as open wounds, patellar fractures and ligament disruption. These serious injuries have the potential to produce significant long-term disability especially when they are associated with extensive articular cartilage damage, marked bone comminution, and severe soft tissue injury. The problems

which are commonly observed in these fractures are

- Adequate exposure of articular surface, particularly of medial femoral condyle and coronal plane fractures are challenging.
- Standard implants used for other types of distal femoral fractures like condylar blade plate and supracondylar nails are not helpful in particular surface reduction and fixation.
- In setting of medial comminution and short distal segment, there is high incidence of loss of fixation and varus collapse.

It is now recognized by most orthopaedic surgeons that distal femoral fractures are best treated with reduction and surgical stabilization. Anatomic reduction of

the articular surface, restoration of limb alignment, and early mobilization have been shown to be effective ways of managing most distal femoral fractures. The treatment of distal femoral fractures has evolved nevertheless, these fractures remain difficult to treat and carry an unpredictable prognosis. The fracture characteristics which make these fractures difficult to treat include, osteoporosis, multiplanar articular injury, high degree of comminution, short distal femoral block in which it is difficult to insert fixation, associated open wounds, internal derangement of knee including ligament and meniscal injuries and possible extensor mechanism injuries. Complications are significant and include infection, knee stiffness, need for bone grafting, non-union and mal-union. In the past two decades there has emerged another injury group coming out of periprosthetic fractures which is not included in our study. This group in addition to the already existing problems of distal femoral fractures brings in the dimension of a prosthesis which might be loose.

Over the years, many different strategies have been used with varying success. The management of distal femoral fractures has seen a paradigm shift from non-operative measures in 1960 to biological fixation and evolution of modern implants as well as specific techniques in current times. Though various treatment options are available for the management of these injuries with their own advantages and disadvantages, experience with use of locking compression plate which combines fixed-angle locking screw technology with the option for conventional screw utilization is still very limited and more study is required to define its place in the management of distal femur fractures. Methods of treatment vary according to type, level of fracture and age of patient and are based on assessment of advantages and disadvantages associated with each. Despite the advances in techniques and the improvements in surgical implants, treatment of distal femoral fractures remains a challenge in many situations.

## Materials

A prospective study of 30 patients with distal femur fractures (AO classification

A,C) who were treated with distal femur locking compression plate (DF-LCP) at Department of Orthopaedics, Victoria hospital & Bowring & lady curzon hospitals, BMCRI, Bangalore. Minimum of 6 months & a maximum of 16 months follow up was done. The functional & radiographic results were recorded according to Neer's criteria.

**Aim:** To study the efficacy, technical requirements, functional results, radiological results, pitfalls, complications & out comes as well as to study union rate & time of mobilization.

**Inclusion Criteria:** Patients of age 18 yrs & above of both sexes who have sustained closed distal femur fractures of (AO/OTA) classification types - (A1, A2, A3, C1, C2, C3)

**Exclusion Criteria:** Patients who are less than 18 yrs of age & have sustained compound fractures of distal femur, closed distal femur fractures (AO/OTA) - B1, B2, B3 types, pathological fractures, pregnant patients, patients who had sustained periprosthetic fractures, patients who were unfit for surgery & who didn't give consent for surgery were excluded from the study.

## Method of Data Collection

Proper history of the incident followed by clinical examination was done followed by radiological (standard antero-posterior & lateral plain x-rays) & routine base line investigation were done. CT scan was done in selected cases to establish the nature of fracture, comminution & any intercondylar extension. After getting all pre-operative evaluation & fitness for surgery patient were operated with distal femoral locking compression plate (DFLCP). Patients were treated with antibiotics, analgesics & anti-inflammatory medications pre & post operatively.

**Post-operative evaluation:** Patients were evaluated post-operatively by clinical & radiological assessment. Patients were assessed for wound healing complications like gaping, discharge, time for union, weight bearing, and ambulation. Quadriceps exercises & hamstring exercises were started on 1<sup>st</sup> post-op day (depending on fracture fixation, stability & configuration) followed

by active & active assisted range of motion exercises of the knee.

**Follow up:** During follow up, functional outcome was assessed using Neer's Criteria & radiological assessment done by X-ray. Functional assessment was done initially on

weekly basis followed by 6 weeks, 12 weeks, 6 months, 9 months & 12 months as shown in figure 1. X-rays were also taken at 6 weeks, 12 weeks, 6 months, 9 months & 12 months to see for the fracture union in progress.



**Figure 1 – X-ray & clinical photos of patient treated with DFLCP**

## Results

Result of the study showed that the average time to union was 3.83 months (15.36 weeks) with a range of 2 - 8 months (8 -32 weeks) & standard deviation being 1.482. The average range of flexion obtained postoperatively was 111.3° with a range of 70° - 150°. Two contractures & decreased knee movements, four mal-alignment/ mal-

union, one implant failure & one infection were the residual complications in our study. Follow up of our cases included from a minimum of 6 months to a maximum of 16 months. Mean Neer's score was 80.20 & standard deviation was 9.084. Excellent results were seen in 15 cases, satisfactory in 11, unsatisfactory in 3 & 1 case of failure was seen.

**Table 1: Functional outcome of surgical procedure**

1	Average time to union	3.83 months (range 2 - 8m)
2	The Average range of flexion	111.3 degrees (range 70° - 150°)
3	Contracture & decreased knee movements	2
4	Mal-alignment/Mal-union	4
5	Implant failure	1
6	Infection	1

**Table 2: Neer's score of the patients after surgery**

Type of Fracture	Total no. Of Cases	Excellent Neer's Score	Satisfactory Neer's Score	Unsatisfactory Neer's Score	Failure Neer's Score
A1	2	1	0	0	1
A2	3	1	2	0	0
A3	5	3	2	0	0
C1	8	4	4	0	0
C2	7	2	4	1	0
C3	5	3	0	2	0

## Discussion

The Locking Compression Plate (LCP) system offers a number of advantages in fracture fixation combining angular stability through the use of locking screws with traditional fixation techniques. However, the system is complex, requiring careful attention to biomechanical principles & good surgical technique. The 'angular stability' provided by LCP at the plate-screw interface, allows extra-periosteal fixation of the plate to the bone. By preserving periosteal blood supply to the bone it addresses the importance of the biological factors involved in fracture healing. LCP is a single beam construct, where the strength of its fixation is equal to the sum of all screw-bone interfaces rather than a single screw's axial

Stiffness & pullout resistance as in unlocked plates.

## Conclusion

We conclude that DF-LCP, the "internal fixator" is a safe & reliable implant for distal femur fractures AO types A & C although careful preoperative planning & case selection are important factors which determine the final outcome. It may substitute a conventional plate & screw system (compression method) in treatment of complex distal femoral fractures especially in osteoporotic bone. Further randomised controlled studies are required in different situations to know the usefulness of this implant.

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