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A clinical study in distal femur fractures management with locking compression plate without C-arm images

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ABSTRACT

Background: Distal femur fractures pose a surgical challenge to the orthopaedic surgeons. Multiple implants are available but locking compression plate is a good implant to be used in this anatomical location. LCP may reduce the tendency of varus collapse and offers higher stability than other implants. Aim of our study was to review functional outcome, union time and complications in distal femoral fractures treated with distal femoral locking plate without C-arm imaging modality.
Methods: 25 patients with closed or open type grade1 and 2 distal femur fractures managed with open method locking compression plate without C-arm image. Pritchett rating system was used for evaluation of outcome.
Results: All patients in this series united well with an average time of 13 weeks with minimal complications. Functional outcome was excellent in 4 patients, good in 19 patients, fair in 2 patients.
Conclusions: Open reduction and locking compression plate is suitable implant available for fixation of distal femur fractures with minimal complications. Even it can be done without C-arm. Surgical technique and proper anatomical reduction and alignment are the key for good results.

Keywords: Distal femur fractures, Distal femur locking plate, Pritchett rating system

INTRODUCTION

Distal femur fractures has bimodal distribution.[1,2] It occurs in young population following high energy trauma and fall from height and in elderly due to osteoporosis.[3,4] The mechanism of injury is axial loading with valgus, varus or rotational forces.[2] Distal femoral fractures are complex injuries involving supracondylar and inter-condylar area and difficult to manage and associated with high morbidity.

The purpose is to restore limb length, limb alignment, articular congruity and early mobilization. Impairment nevertheless occurs in fractures with intraarticular involvement, significant bone comminution and soft tissues damage. Locking compression plates (LCP) act as internal fixator and reduce the tendency of varus collapse. Also LCP has better results than other plates in osteoporotic fractures.[5,6] The objective of this study is to assess the outcomes of distal femur fractures with locking compression plate in terms of pain relief, residual anatomical deformity, movements, return to function and radiographic parameters.

METHODS

25 patients were taken in this prospective study done at Adesh medical college, Ambala, Haryana between June 2016 to October 2017 and followed for a minimum period of 06 months.

Inclusion criteria

Patients with >18 years of age, all intraarticular or extraarticular fractures within 15 cm from the articular surface, closed or open Gustilo Anderson's type 1, 2.

Exlusion criteria

Patients with Gustilo Anderson's type 3 open fractures, associated tibial plateau fractures, with neurovascular injury, pathological fractures and <18 years of age.

All patients after doing the investigations and medical fitness taken for fracture fixation. This study was done without using c-arm imaging modality. Open reduction and internal fixation was performed for all cases. If condyles are involved, anterolateral approach is used; otherwise lateral approach is used for fixation. K wires are initially used for intercondylar fractures for temporary fixation and then LCP with locking and cortical screws. Hip and knee active and passive movements were started within first week of surgery. All patients were followed up at regular interval i.e., once every month for first 3 months and then after 3 months. Weight bearing was delayed until the callus formation at the fracture site. Physical muscle strengthening therapy was started next day only.

Pritchett rating system was used for functional outcome evaluation of study.[17]

Table 1: The Pritchett rating system for distal femoral fracture.

Result	Criteria
Excellent	Full extension; flexion >110 deg; no deformity or joint congruity.
Good	Full Extension; flexion >90 deg; <5 deg of varus or valgus, loss of length <1.5 cm, minimal pain.
Fair	Flexion of 75-90 deg; varus, valgus or angular deformity of 5-10 deg; mild or moderate pain.
Poor	Flexion <75 deg; varus, valgus or angular deformity >10 deg; articular incongruity; frequent pain requiring analgesics.

RESULTS

In our study, out of 25 patients, 21 were male and 4 were female. The age of the patients varies from 18 years to 65 years with mean age 40 years. 18 patients sustained road traffic accidents while 05 patients had accidental fall and 2 patients fall at home. 19 (76%) patients had closed fractures and 6 (24%) patients with open fracture, out of which 4 were grade 1 and 2 were grade 2. Primary bone grafting was done in 5 (20%) patients due to gap at fracture site after reduction (Table 2-4).

Table 2: Sex distribution of patients.

Sex	No. of patients	%
Male	21	84
Female	4	16

Table 3: Age distribution of patients.

Age group (years)	No. of patients	%
18-40	13	52
41-60	10	40
>60	02	08

Table 4: Mode of injury.

Mode of injury	No. of patients	%
RTA	18	72
Fall from Height	05	20
Fall at Home	02	08

According to the Muller's classification, 5 (20%) fractures were of type A1, 03 (12%) of type A2, 8 (32%) of type A3, 1 (4%) of type C1, 6 (24%) of type C2, 2 (8%) were of type C3 fractures (Table 5).

Table 5: Type of fracture according to AO/OTA classification.

AO type	No. of patients	%
A1	05	20
A2	03	12
A3	08	32
C1	1	4
C2	6	24
C3	2	08

Table 6: Knee flexion at three months after surgery.

Knee flexion (degree)	No. of patients	%
75-90	1	4
91-110	20	80
>110	4	16

Table 7: Complications.

Complications	No. of patients	%
Superficial infection	1	4
Deep infection	0	0
Delayed union	0	0
Non union	0	0
Malunion		
(Varus malalignment 5-10 deg)	2	8
(Varus malalignment up to 5 deg)	5	20
Implant failure	0	0
Shortening up to 1-2 cm	2	8
Shortening up to 1 cm	5	20

In this study, 4 (16%) patients gained significantly better knee flexion >110°; 20 (80%) patients got knee flexion between 91 to 110°. and 1 (4%) patient regained knee flexion up to 90° only (Table 6).

In this observation, only one patient suffered superficial infection which was healed with dressings and antibiotics. All fractures united well. No case of deep infection, non-union or implant failure was reported. 2 cases of varus malalignment (10°) due to severe comminution and 5 cases of mild varus malalignment (up to 5°) reported. These 2 patients also got 1.5 cm shortening because of comminution only while 5 patients got 7 mm of shortening (Table 7).

The Pritchett rating system for evaluation of distal femoral fracture is used.[17] When evaluated for pain, 12 (48%) patients were having no or minimal pain, 10 (40%) patients had intermittent pain due to knee stiffness and 3 (12%) patients had pain with fatigue. Out of 25 patients, 18 had near normal radiographs, 5 had 5° angulation and 2 patients had 10° angulation (Table 8 and 9).

Table 8: Time taken for full weight bearing.

Full weight bearing time (weeks)	No. of patients	%
12-14	14	56
15-16	8	32
17-18	3	12

Table 9: Functional outcome.

Result	No. of patients	%
Excellent	04	16
Good	19	76
Fair	02	08
Poor	0	0

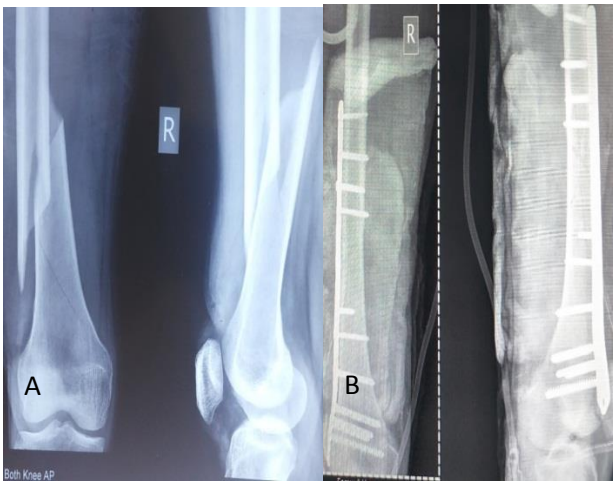

Figure 1: (A) Pre-operative distal femur fracture, (B) post-operative LCP fixation for distal femur fracture.

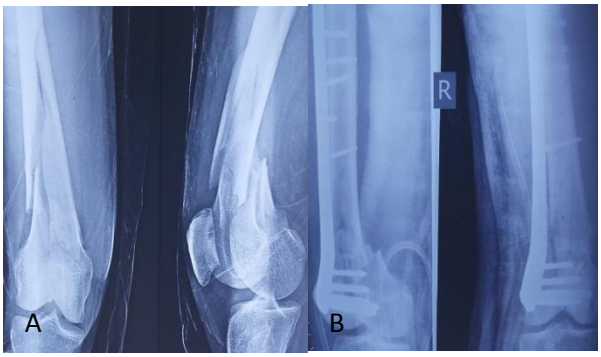

Figure 2: (A) Pre-operative distal femur fracture (comminutted), (B) post-operative LCP fixation.

Pritchett rating system was used for evaluation of outcome.[17] Functional outcome was excellent in 4 (16%) patients, good in 19 (76%) patients, fair in 2 patients (8%) (Table 9, Figure 1 and 2).

DISCUSSION

Distal femur fractures are frequent and often challenging to manage.[7] Conservative management is always associated with poor outcome. Fixation of distal femur fractures with a lateral plate alone has been associated with non-union or malunion with varus collapse and to prevent these problems, dual plating was often used.[8] But it lead to more extensive soft tissue stripping and knee extensor lag. With the advent of locking plates, these problems are addressed and results are encouraging, as it increases the fixation rigidity in osteoporotic fractures and intraarticular/periarticular comminution.[9] The locking condylar plates anatomical design allow to use it as reduction mould, provide multiple points of fixed plate to screw contact, provides greater stability and thereby decreasing the tendency of varus collapse.[10,11] Definite treatment needs restoration of anatomical alignment of distal femur and early knee mobilization for achieving good knee range of movements.

In our study, radiological union was seen at an average of 13 weeks which is comparable to the study of Fankhauser et al, Weight et al, Henderson et al, Schandelmaier et al.[12-15]

60 patients distal femur fractures treated with LCP are evaluated using Pritchett rating system by Reddy et al and 83% patients achieved excellent to good results with 3 % non-union rate.[16]

In Schandelmaier et al series results are 67.7% which are less than 92% satisfactory results in present study.[15]

Kregor et al reported a series with equal distribution of type A and type C distal femur fractures and obtained 100% union rate which is comparable to this series in terms of bony union.[18]

Virk et al obtained 80% excellent to good results in 25 distal femur fracture patients treated with LCP.[19]

CONCLUSION

Open reduction and LCP fixation is an effective method of treating extra-articular/intra-articular with or without comminution and osteoporortic distal femoral fractures with minimal complications. Even it can be done without C-arm image modality. Knee mobilization can be done early. Proper surgical technique is the key to result.

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