Treating lower femur fractures in adult by locking plate

Ali Tawfik Elalfy\textsuperscript{1}, Mohammed Elsadek Atia\textsuperscript{1}, Sameh Mohammed Holail\textsuperscript{1} and Mohammed Moustafa Hamid Ali\textsuperscript{1}

\textsuperscript{1}Orthopedic Surgery Department, Faculty of Medicine, Zagazig University, Egypt

Corresponding Author: Mohammed Moustafa Hamid Ali
E-mail: mohamednasser530@gmail.com

ABSTRACT

Objectives: The aim of the work is evaluation the clinical outcomes and radiological union of distal third femur fractures by using distal femur locking plate in Zagazig university hospitals and Kafr Saad emergency hospital.

Methods: The study included 12 patients referred to The Department of Orthopaedic Surgery in Zagazig University Hospital and Kafr Saad Emergency Hospital who had fractures of the distal femur during the period between 8/2019 and 7/2020 and treated with locking compression plate.

Results: In our study 12 femoral fractures were treated, eight were males and four were females. All cases were fresh, the mean age of cases in our study was 45.6 years. The youngest patient was 20 years old and the oldest patient was 70 years. The causes of fractures were motor vehicle accident in nine patients, two were due to minor fall and a gun shot in one patient. There were no sports or industrial accidents. Out of total 12 cases, five case were extra-articular and rest 7 cases were intra-articular. Most of the cases, 7 out of total 12 (58\%) were type C and 5 cases had type A fracture (42\%). Five out of total 12 cases had open fracture, and rest 7 cases had closed fracture. Open fractures were treated with intravenous antibiotics and tetanus prophylaxis. One case out of total 5 open fractures (20\%), needed initial debridement and temporary stabilization in the form of external fixator before putting the locking plate. Two patients had fracture of ulna and 1 patient had fracture of patella.

Conclusion: To conclude, locking compression plate is an important modality in treatment of distal femur fractures especially when fracture is severely comminuted and in situations of osteoporosis with minimal complications

Key words: Locking plate, Supracondylar femur fractures, osteoporosis, Posterior cruciate ligament.

Introduction:

Distal femur fractures account for less than 1\% of all fractures and about 4-6\% of all femur fractures approximately.\textsuperscript{(1)}

Bimodal age distribution is seen. Peak incidence is present in patients below the age of 40, commonly males, who experience high-energy trauma.\textsuperscript{(1-3)}

Incidence rises again in patients more than 50 years, mainly females, due to osteoporotic bones, with relatively low energy trauma.\textsuperscript{(4-5)}

Frequent trauma mechanism is axial load to femur and less frequently rotational forces result in distal femoral fractures.\textsuperscript{(3-6)}

Distal femur fractures are serious injuries that involve distal 15 cm of femur both supracondylar and intercondylar, whose management is a difficult task to surgeons, as these have an inherent tendency for high morbidity.\textsuperscript{(3)}
Distal femur fractures are not popular as femoral shaft or hip fractures. In the past 30 years, the management of distal femoral fracture has improved from conservative to operative. (7) Except on extreme circumstances, operative management of distal femur fracture is the standard while conservative treatment has fallen out of favor as the result further advances in the technique and implant. (2)

The purpose of surgical treatment is to restore articular congruency, limb alignment and early mobilization. However, impairment can still present in fractures with considerable articular surface involvement, significant bone comminution, and serious soft tissue injury. Locking compression plate is the integration of compression plating, locked plating and bridge plating, causing minimal soft tissue damage and preservation of periosteal vessels. Therefore, it acts like a closed external fixator. (8)

Patients and methods

1. Technical design

Study design: Sample size calculated to be 12 patients taken as comprehensive sample as all adult patients with distal femur fractures admitted during the study period will be included.

Inclusion criteria:
1. Type 33-A, type 33-B, type 33-C according to AO classification.
2. Closed or open distal third femur fractures up to Gustilo - Anderson's classification type I, II and IIIA.
3. All patients were skeletal mature patients (>18 years).
4. Patients with osteoporosis.
5. Patients gave their informed consent for surgery.

Exclusion criteria:
1. Patients with Gustillo Anderson type IIIB open fracture.
2. Patients with associated tibial plateau fractures.
3. Age of patient less than 18 years of age.
4. Patients managed conservatively.
5. Patient with pathological fracture excluding osteoporosis.
6. Patients absent for follow-up.

Sample size: Assuming that rate of admission of patients with distal femur fracture is 2 cases/month. So, a comprehensive sample of 12 cases will be included in the study.

Demographic data:
Age: The youngest patient in this study was 20 years old and the oldest patient was 70 years old, with an average age of 45.6 years.
Gender: Eight patients were males, while four patients were females.
Affected side: The right femur was affected in five cases (41.7%) and the left femur was affected in seven cases (58.3%).
Fracture type: According to AO classification 5 cases in this study had type A fracture (41.7%) and 7 cases had type C fracture (58.3%).
Mechanism of trauma: Nine patients (91.7%) were injured by motor car accidents, two patients were injured by low energy trauma (by falling) (16.6%), while one patient (8.3%) was injured by gunshot.
Timing: Internal fixation was done within 48 hours from admission for 8 patients and after 5 days for 4 cases.

C. Preoperative management protocol:
- On admission
Careful history taking was done for all patients as follows:
- Personal data: Including name, age, sex, address.
- Comorbidities: DM, hepatic, cardiac, asthmatic, renal, etc.

Clinical examination:
- General examination.
- Local examination.
- Radiological assessment.
- Laboratory investigations.
- Preoperative preparation.

Operative technique:
Anaesthesia:
Spinal anaesthesia was used for all patients.

Patient positioning:
Position the patient supine on a radiolucent table. Place a small bump under the ipsilateral hip to keep the femur in a neutral position rather than in external rotation. Prepare and drape the patient as usual. Place a sterile bump or triangle beneath the knee. place C-arm on the other side of the injured extremity.

Approach (lateral approach):
- Skin incision.
- Division of the iliotibial band.
- Elevation of vastus lateralis.
- Joint capsule arthrotomy for articular surface visualization.
- Provisional Fracture Fixation.
- LCP insertion.
- Intraoperative Assessment of Fracture Reduction.
- Wound closure.

Postoperative Care:
- Intra-venous antibiotics were continued for 24 hours in closed fractures and 48 hours in case of open fractures. Oral antibiotic was given for one week.
- Anti-inflammatory and anti-oedematous medications were continued until pain and oedema subsided.
- Suction drain was removed at 72 hours in all the patients and first wound inspection was done on 3rd post-operative day and sutures were removed at the 14th postoperative day according to the wound condition.

Postoperative follow up:
- Hospitalization from three to five days postoperatively.
- Range of motion exercises were started 3 days after surgery in case of stable fixation and gentle hip and ankle mobilization was encouraged.
- Active quadriceps and hamstring exercises also can begin at this time.
- Continuous passive motion – when started in 1st week has following advantages:
  - Improves early range of motion of knee.
  - Decreases incidence of deep vein thrombosis and pulmonary embolus.
  - Faster pain relief ad shorter stay at hospital.
  - Continuous passive motion reverses collagen loss, improves cartilage nourishment, prevents joint stiffness.
All patients were strongly advised to report immediately about chest pain, excessive swelling of the affected leg, redness or discharge from the wound for the first four weeks after discharge.

**Radiological assessment:**
- Plain X-ray films were done postoperatively in A-P and lateral views for assessment of progress of bone healing and possible complications as frontal or sagittal plane deformity.
- Complete radiographic union was defined as continuity of both cortices in two radiographic planes.
- Scanogram was performed for all cases to assess limb length discrepancy.

**Result:**
In our study 12 femoral fractures were treated, eight were males and four were females. All cases were fresh, the mean age of cases in our study was 45.6 years. The youngest patient was 20 years old and the oldest patient was 70 years. The causes of fractures were motor vehicle accident in nine patients, two were due to minor fall and a gun shot in one patient. There were no sports or industrial accidents. Out of total 12 cases, five case were extra-articular and rest 7 cases were intra-articular. Most of the cases, 7 out of total 12 (58%) were type C and 5 cases had type A fracture (42%). Five out of total 12 cases had open fracture, and rest 7 cases had closed fracture. Open fractures were treated with intravenous antibiotics and tetanus prophylaxis. One case out of total 5 open fractures (20%), needed initial debridement and temporary stabilization in the form of external fixator before putting the locking plate. Two patients had fracture of ulna and 1 patient had fracture of patella.

According to Virk JS, Garg SK, Gupta P, Jangira V, Singh J. and Rana S, the results were assessed on the basis of a modification of the criteria Neer et al. Cases were categorized into excellent, good, fair or poor based on an analysis of 5 parameters: pain, function, motion, gross anatomy and radiographic appearance. These five parameters were used to analyse the subjective, functional, and anatomical condition of each patient (table 1).

<table>
<thead>
<tr>
<th>CHARACTER</th>
<th>DEFINITION</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>No pain in all range of motion</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Pain, with normal daily activity</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Minimal activity gives pain</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Pain at rest</td>
<td>1</td>
</tr>
<tr>
<td>Movements</td>
<td>Flexion more than 120º</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Full extension, flexion 90º to 120º</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Loss of extension less than 10º: flexion 70º to 90º</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Flexion less than 60º</td>
<td>1</td>
</tr>
<tr>
<td>Function</td>
<td>Full weight bearing, normal gait, no functional impairment</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Limp, no restriction of activity</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Requires walking aid</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Cannot walk</td>
<td>1</td>
</tr>
<tr>
<td>Shortening (cm)</td>
<td>0-0.5</td>
<td>4</td>
</tr>
</tbody>
</table>
RESULT | SCORE
---|---
Excellent | 16-20
Good | 12-16
Fair | 8-12
Failure | 4-8

Eleven (91.7%) patients were commenced to protective full weight bearing when accepted union is presented in follow-up X-ray by the third or fourth month and only one patient delayed full weight bearing to 5 months (table 2).

Table 2: The patients’ data according to full weight bearing.

<table>
<thead>
<tr>
<th>3 months</th>
<th>3 cases</th>
<th>25%</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 months</td>
<td>8 cases</td>
<td>66.7%</td>
</tr>
<tr>
<td>5 months</td>
<td>1 case</td>
<td>8.3%</td>
</tr>
</tbody>
</table>

Six patients had no pain (33%), while three (25%) patients complained of pain with fatigue at the time of their last follow up. They started to feel pain in their knees after walking more than 30 minutes. 3 patients (25%) complained of intermittent pain after heavy exertion. Non of the patients included in this study complained of constant pain at their knees.

According to Age: Patients aged less than 50 years had satisfactory result (7 cases) (58%) more than older patient (5 cases) (42%). This was found to be statistically significant (table 3).

Table 3: Results according to age.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Results</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-30</td>
<td>Excellent</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fair</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>30-40</td>
<td>Excellent</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fair</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
According to Type of Fracture (table 4): We had 5 patients type A fractures, 4 (33%) had excellent results and only one (8.3%) case had good results. Three patients (52%) with type C1 fracture, had excellent results. Also we had two patients (16.6%), with type C2 fracture, one had good results and the other one had fair results. While we had two patients (16.6%) with type C3 fracture, one had good results and the other one had fair results.

**Table 4: Results according to type of fracture.**

<table>
<thead>
<tr>
<th>Type of fracture</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>3</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>%</td>
<td>25%</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>A3</td>
<td>1</td>
<td>1</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>%</td>
<td>8.3%</td>
<td>8.3%</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>1</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>%</td>
<td>33%</td>
<td>8.3%</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>C1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>25%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>--</td>
<td>1</td>
<td>1</td>
<td>--</td>
</tr>
<tr>
<td>%</td>
<td>--</td>
<td>8.3%</td>
<td>8.3%</td>
<td>--</td>
</tr>
<tr>
<td>C3</td>
<td>--</td>
<td>1</td>
<td>1</td>
<td>--</td>
</tr>
<tr>
<td>%</td>
<td>--</td>
<td>8.3%</td>
<td>8.3%</td>
<td>--</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>25%</td>
<td>16.6%</td>
<td>16.6%</td>
<td></td>
</tr>
</tbody>
</table>
Scanogram was performed for all patients six months post-operatively to assess LLD. 7 cases had shortening ranging from 1-2 cm. All the patients had good articular alignment (Table 5).

Table 5: Distribution according to limb length discrepancy.

<table>
<thead>
<tr>
<th>Limb length discrepancy</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 cm Shortening</td>
<td>1</td>
<td>8.3%</td>
</tr>
<tr>
<td>1.6 cm shortening</td>
<td>2</td>
<td>16.6%</td>
</tr>
<tr>
<td>1.4 cm shortening</td>
<td>2</td>
<td>16.6%</td>
</tr>
<tr>
<td>1.1 cm shortening</td>
<td>1</td>
<td>8.3%</td>
</tr>
<tr>
<td>1 cm shortening</td>
<td>1</td>
<td>8.3%</td>
</tr>
</tbody>
</table>

Table 6: Assessment of Gross Anatomy.

<table>
<thead>
<tr>
<th>Gross anatomy</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickening only</td>
<td>8</td>
<td>66.7%</td>
</tr>
<tr>
<td>Mild varus deformity less than 0.5 °</td>
<td>4</td>
<td>33.3%</td>
</tr>
<tr>
<td>Moderate varus deformity</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Sever varus deformity</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Union but within ability to walk</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Nonunion</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 7: According to Complications.

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial infection</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>Delayed union</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>Plate back out</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Deep infection</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Non-union</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Implant failure - screw plate/ breakage</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Stress fracture</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Deep venous thrombosis</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Period of follow up:

All patients were followed up regularly at 2, 4, 6, 12, 16, 24, 28 and 36 weeks at the outpatient clinic to be evaluated clinically and radiologically.

Discussion

By using LCP positive results were obtained in both old as well as young patients. Time in bed and the complications of the decubitus dorsal position are limited, as locking compression plate provides stability and rigidity that allows rapid union and early weight bearing. (9) As the screws are locked, the plate does not need to be in contact with bone to gain primary stability by the “friction effect”, therefore bone resorption under the plate is limited and peripheral vascularization is preserved (2,3) and converts the whole implant into one single solid angular stable construct. The “combi hole” that presents in the plate provides the dual advantage of applying conventional screws in a compression mode also locking screws in fractures where conventional screw purchase is compromised. The treatment goals are: Early mobilization, rapid fracture union and minimal complication. (9) The LCP that Kregor PJ, Stannard JA, Zlowodzki M and Cole PA., had discussed provides better stabilization of distal femur osteoporotic bone and severely comminuted fractures. (10)

A study conducted by Butt MS, Krikler SJ, Ali MS., showed that mean age group for distal femur fracture was 35 years. (11) Similarly, in the studies conducted by Schuetz M, Müller M, Krettke C, Höntzsch D, Regazzoni P, et al, it was found to be 44 years. (12) Goesling T, Frenk A, Appenzeller A, Garapati R, Marti A, et al., 40.44 years. (13) In our study, the mean age group is 45.6 years which can be attributed to the high incidence of road traffic accident.

In the study conducted by Yeap E, Deepak A., 64 % of patients were males. (14) Similarly in the study conducted by Ricci W, Tornetta III P, Zheng Y, Jones B, Cartner J., 76 % of patients were males. (15) It is comparable to our study in which 33.3% cases were females and 67.3% were males. This can be attributed to the fact that most of the cases in our study were due to road traffic accident.

A study conducted by Isapure WA, Sunil patil, showed that average surgery injury interval was five days. (16) Similarly, in the study conducted by Singh AK, Rastogi A, Singh V, it was seven days (17), Dasaraiah C, Rao AS, Sahini SC., 9.9 days (84), Wiss D WJ, Johnson EE, 6.1 days. (18) They concluded that any delay in surgery injury interval predisposes to unsatisfactory results compared to those cases which were done earlier. This is also comparable to our study in which all the cases were managed within seven days of injury.

A study conducted by Schatzker J, Lambert DC, showed that average duration of surgery was 85 minutes with a range of 40-135 minutes. (19) In the studies by Campbell WC, Canale ST, Beaty JH, average time was 119.2 minutes with a range of 80-180 minutes, and Kulkarni R 129.6 minutes. (20) They concluded that longer duration of surgery is associated with higher incidence of complications such as infections, delayed or non-union and impaired functional outcome. It is comparable to our study in which average duration of surgery was 104.16 minutes and ranged from 80 to 135 minutes.

A study conducted by Panchal et al., showed that 70% of patients started full weight bearing at 14 weeks. (21) Similarly, Khurseed et al, found it to be 14.32 weeks. (22) In our study it was found to be 15.3 weeks. This can be attributed to the patient factor. The patients were not compliant and started delayed weight bearing for fear of losing the stability.
A study by Krishna et al., showed that average duration of radiological union was 15.36 weeks. (23) Similarly in the study conducted by Malik A et al., showed that 96% of patients achieved radiological union by 20 weeks and 100% achieved union by 24 to 36 weeks of follow up. (24) Panchal et al., showed that 85% patients achieved radiological union by 18 weeks, (25) Weight and Collinge found it to be 13 weeks, (26) Shriharsha et al., found it to be 18.53 weeks, (27) Yeap and Deepak found it to be 18 weeks, (28) Malik I et al., found it to be 13.88 weeks, (29) Malik A et al., found it to be 16 weeks. (29)

In our study mean duration of radiological union was 16.6 weeks in 11 patients and only one patient achieved complete radiological union by 24 weeks. The higher union time compared to some of the study can be attributed to the fact that most of the cases in our study were managed by open reduction and internal fixation.

Normal knee flexion is 140°. In the study conducted by Krishna et al, average range of knee flexion obtained postoperatively was 111.30°. (29) Similarly in studies conducted by Siliski et al, it was found to be 107°, (30) Scutz et al, found it to be 103°, (31) Kregor et al, found it to be 109°, (32) Yeap and Deepak, found it to be 107.7°. (33) Malik I et al, found it to be 107.6°. In our study average knee flexion achieved was 104.2°. Slightly less average knee flexion in some of the patients can be attributed to the fact that some of the patients had comminuted intra-articular fractures and some of the patients were not regular with their physiotherapy and knee range of motion exercises.

A study conducted by Scutz et al, showed that 20% cases had less than 10 degrees of varus misalignment. (31) A study conducted by Scutz et al, showed that 3.2% cases had more than 10 degrees of valgus misalignment. (31) In our study 33.3% of cases had less than 5 degrees of varus misalignment.

A study conducted by Krishna et al., showed that excellent results were seen in 15 cases, good in 11, satisfactory in 3 and 1 case of failure was seen. Similarly in the study conducted by Shriharsha et al, 80% type A and 40% Type C fractures had excellent or good results. (32) They concluded that extra articular (type A) fractures had better outcome than intra articular (type C) fractures. In the study conducted by Yeap and Deepak et al, 4 patients showed excellent results, 4 good, 2 fair and 1 failure. In the study conducted by Panchal et al, 15 patients had excellent, 5 had good, 4 had fair and only 1 patient had failure outcome. (88) Similarly in the study conducted by Shriharsha et al, 82 percent cases had excellent/ good outcome, and in the study conducted by Bohra et al, 77.5 percent patients had excellent outcome. (33) These studies are comparable to our study in which 80% of type A fractures had excellent results and 71.4% of type C fractures had good to excellent outcome.

This coincides with the study of Sher et al., studied twenty patients with distal femur fractures treated by locking compression plate (from March 2010 to May 2014). (34) Nine males and eleven females, the age range from 18 to 85 years with a mean age of 44 ± 3.7. the mechanism of injury was vehicular accident in 8, falls in 11, and one crush injury. All patients were followed up for an average of 12 months (6–18 months). Nineteen patients had fracture healing 3 to 4 months after surgery; 1 case of distal femoral C3 comminuted fracture patient had fracture healing 15 months surgery and received stage II bone grafting and the healing rate of fracture was 95%. The postoperative joint function was graded according to the Kolmert functional criteria: 14 cases excellent, 4 cases good, 1 case fair, and 1 case poor. All knees reached the state of straightening, and the postoperative excellent rate was 90%.
Among them, 8 patients had maximal flexion of more than 120°, 10 patients had flexion between 90° and 120°, and 2 other patients had flexion of 70° and 40°.\(^{(34)}\)

DePuy Synthes Co., Ltd, New Brunswick, CA, USA made retrospective study included 71 distal femoral fractures, in 70 patients, 23 males (32.8%), 47 females (67.2%); mean age, 68.0 years [range, 16–91 years] who were treated with the locking compression plate at a university hospital and related facilities between April 2005 and December 2015. Non-union was diagnosed in 7 of 71 cases. Non-union was diagnosed 2 of 26 (7.7%) cases with a simple fracture and 5 of 45 (11.1%) cases with a comminuted fracture.\(^{(35)}\)

In the study done by G. N. Kiran Kumar et al., 46 consecutive distal femoral fractures treated with distal femoral locking compression plates between 2009 and 2012.\(^{(36)}\) There were 36 men and 10 women with mean age of 35 years (range 20–72). Fractures were categorized according to AO/OTA classification, 10 patients had intra-articular fractures involving both condyles (33C-1), 12 patients had metaphyseal comminution (33C-2), and 24 patients had articular comminution (33C-3). The mean follow-up period was 12.3 months (mean 9–24 months). The mean time for radiological union was 14 weeks (range 8–18 weeks). There were 2 cases of nonunion. One case required autogenous iliac crest bone grafting and the other case required bone grafting along with refixation using longer plate due to breakage of proximal screws with broken proximal screws Fracture went on to unite after 3 months of surgery. At latest follow up 38 patients had good/excellent outcome. 36 patients returned to their preinjury functional level. No cases of infection and rotational or angular deformity more than 5 degrees was noted. 2 patients had limb length discrepancy of <2 cm and no treatment was needed.\(^{(36)}\)

Raghuwanshi Gajendra, Agrawal Sumit S studied 30 patients of Supracondylar femur fracture treated by LCP (from January 2014 to March 2014).\(^{(37)}\) Out of 90 cases 76.70% were male and remaining patients were female. Majority of the cases 55 (70.5%) were injured due to road traffic accident (RTA) followed by 13 (16.66%) cases were of fall at home, 60% of cases were allowed full weight bearing by 12-16 weeks, 30% cases were allowed weight bearing by 17-20 weeks and three (10%) patient which was the case nonunion was allowed weight bearing with knee brace after 24 weeks. In complicated cases three cases (10%) were having superficial infection, non-union occurred in three cases where there was extensive bone loss. Shorting was also observed in 03 (10%) cases. Implant failure not observed in any case. 70% (21) of cases had ROM of 90 degree or more, 20% (6cases) had ROM <70 degree. 60% of cases had excellent results, 30% had fair results, and 10 % had poor result. The case of poor result had non union at distal femur and shortening.\(^{(38-39)}\)

Our study is based on a series of 12 cases, 8 were males and 4 were females, of closed and open fractures of the distal femur treated by open reduction and internal fixation/MIPO using Locking Compression Plates. Male patients dominate the series because of nature of their outdoor activities, and rash driving, 66.7% male and 33.3% female were the cases in this study.

Most of the patients in this study were old patients in the age group 40-70 years. The main cause of injury in this study is attributed to high energy trauma in 9 patients and minor fall in 2 patients presented within 2 hours of injury and only one patient had a gun shot injury. The side distribution in this study showed marginally more number of persons with fractures on the left side than on the right and we could find no specific reason for this data. Patients were followed up until satisfactory bone union for a mean period of 9 months, 12 patients attained bone union in a mean period
of 16 (range, 12–24) weeks. For open fractures the average duration of union increased to 20 to 22 week, thus, making open fractures a risk factor for delayed union in such fractures. Delayed union was observed radiographically in a 70-year-old man and the fracture eventually united at 6 months follow-up. The mean time to full weight bearing was 15.3 (range, 12–20) weeks. The mean range of knee flexion was 104.2º, thus, making it the implant of choice for distal femur fractures across all age groups.

**Conclusion**

In this study 12 patients with supracondylar femur fracture were managed with distal femur Locking Compression Plate with good to excellent outcome. The method of treatment is standard with good exposure of fracture fragments, less operative time and good functional and radiological outcome with good knee joint physiotherapy in postoperative period.

To conclude, locking compression plate is an important modality in treatment of distal femur fractures especially when fracture is severely comminuted and in situations of osteoporosis with minimal complications.

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**References**


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