

Clinical outcome of distal femur fracture treated by locking condylar buttress plate

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Abstract

Aim: to evaluate the results of fracture lower end of femur, treated by close/open reduction and internal fixation using locking compression plate.

Materials and Methods: In this study 31 patients with closed fracture lower end of femur (32 distal femur fractures) were studied. All the cases were treated at Akash medical college(devanahalli), between 20017 -2021 at our institution and followed for a minimum of 6 months. The method used for fracture fixation was closed or open reduction and internal fixation with locking compression plate.

Results: All 31 cases studied in our series were closed. 20 patients were males and 11 patients were females. The median age was 48.6 years ranging from 18-84 years. In our study average time for union was (14 weeks and max 22 weeks) and 14 patients showed excellent result,14 Patients showed satisfactory outcome, 3 unsatisfactory and 1 patient showed failure (excellent and satisfactory constituted about 87.5%).

Conclusion: Locking compression plate is a good fixation system for distal end femoral particularly intra-articular type. It provides good angular stability by its triangular reconstruction principle. It is of great use in elderly patients with severe osteoporotic bone, however the radiological union was not age related. Closed reduction and plate fixation by MIPO is soft tissue friendly approach in the treatment of fractures around knee preserving the blood supply to bone. Even with open reduction, there is less soft tissue trauma and less post-operative stiffness.

Keywords: Closed reduction, MIPO, Femur fracture

Introduction

In the last few decades, rapid industrialization and the fast pace of life have brought both comforts and catastrophe like road traffic accidents and crippling many young lives. Fracture lower end of femur are often difficult to treat and they are associated with many complications. In the early 1960s, there was a great reluctance towards operative management of these fractures because of high incidence of infection, non-union, malunion, inadequate fixation and lack of proper instruments, implant as well as antibiotics. Then, the traditional management of displaced fracture of distal femur was along the principle of Watson Jones ^[1] & John Charnley ^[2]. This comprised of skeletal traction, manipulation of fracture and external immobilization in the form of casts and cast bracings.

These methods however met with problems like deformity, shortening, prolonged bed rest, knee stiffness, angulation, joint incongruity, malunion, quadriceps wasting, knee instability and post-traumatic osteoarthritis. The trend of open reduction and internal fixation has become evident in the recent years with good results being obtained with the AO blade plate, dynamic condylar screw, intramedullary supracondylar nail & other implant system like locking compression plates. Elderly patients with severe osteoporosis add further to the difficulties in management of fractures around knee which requires restoration of articular congruency for painless free movements of joint. Loss of stable fixation in osteoporotic bones is of great concern in such elderly patients. Locking compression plates with its innumerable advantages is of great use in such circumstances.

Lock compression plates has the advantages of combination of conventional compression plating and locked plating techniques which enhances the plate osteosynthesis. Anatomically precontoured built plates reduce soft tissue problems and acts as internal external fixator.

In addition, a locking compression plate has got distinct advantages of unicortical fixation and least chance of plate back out as the screw gets locked to the plate. Further, Minimal soft tissue injury occurs when closed reduction is done and MIPO technique is used.

The purpose of this study is to evaluate the results of fracture lower end of femur, treated by close/open reduction and internal fixation using locking compression plate.

Materials and Methods

In this study 31 patients with closed fracture lower end of femur (32 distal femur fractures) were studied. All the cases were treated at Akash medical college (devanahalli), between 2017-2021 at our institution and followed for a minimum of 6 months.

Inclusion criteria

- Closed fractures.
- All displaced and undisplaced A and C fractures.
- Other associated fractures.

Exclusion criteria

- Non-ambulatory (ex. Paraplegia, qudrilegia).
- Impacted stable fracture.
- Paediatric age group.
- Purely unicondylar coronal/saggital plane fractures.
- Active infection.
- Grade III C fractures (gustillo-anderson) and open fractures.
- Patients lost in follow-up.
- Patients managed conservatively for other medical reasons.

Methodology

The method used for fracture fixation was open reduction and internal fixation with locking compression plate.

In all the cases, primarily routine investigation like Hb%, total WBC count, differential WBC count, urine routine & microscopic examination, chest X-ray, blood sugar level, bleeding time and clotting time were carried out. Then X-ray examination of the affected femur in AP and Lateral view was carried out. In selected cases, CT scans with 3D reconstruction was done. Fractures were classified with the help of radiographs according to the AO-ASIF classification. The limb to be operated was prepared a day before scheduled surgery. Second

or third generation intravenous cephalosporin was injected 30 minutes prior on the day of surgery. Open reduction and internal fixation of these difficult fractures are justified only if

- 1) The joint surfaces can be restored anatomically.
- 2) Fixation is sufficiently rigid that external immobilization is not required.
- 3) Rigidity of fixation is sufficient to allow early and active motion of the knee joint.
- 4) The skin and soft tissues are satisfactory for a major operation.

Results

In our study of 32 fractures all cases were fresh, 20 patients were males and 11 patients were females. The median age was 48.6 years ranging from 19-84 years. 20 of the fractures were caused by road traffic accidents and 11 were due to slip fall, with equal side incidence.

Of the fractures, 4 were Mullers type A1; 7 was Mullers type A2; 6 were Mullers type A3; 4 were Mullers type C1, 6 were Mullers type C3 and remaining 5 were Mullers type C3. All fractures were closed.

Ten patients had associated injury as a consequence of trauma. Associated injuries included musculo-skeletal and systemic injuries. One patient had pelvic fracture. Two patients had open BB# (ipsilateral). Two patients had ipsilateral distal radius. Two patients had humerus fracture ipsilateral. One patient had middle finger fracture. One patient had open comminuted patella fracture. One patient had refracture. One patient had head injury.

4 out of 32 fractures were treated by closed reduction and remaining 28 by open reduction. All patients were operated within an average 3.88 days. Average time duration of surgery was 130 minutes with shortest duration extra' articular and longest being 200 min.

The size of plate was selected based on the type of fracture.

Of 31 patients, 27 Patients (88%) showed radiological UNION within 17 weeks. One patient went for implant failure. Pt broke the plate following slip and fall in bathroom. Broken plate was removed and treated with revision plating and bone grafting which united over 22 weeks following second procedure.

Average flexion in this study was 105 degree with more than 75% patients having knee range of motion more than 110°.

Average knee extensor lag in this study was 5.5 degrees. In this study, very few patients had significant varus/valgus malalignment. The duration of follow-up ranged from 6 months to 24 months.

Table 1: Age and gender distribution

Age (In years)	No. of cases
18-30	3
31-40	6
41-50	7
51-60	8
>60	7
Gender	
Male	20
Female	11

Table 2: Radiological union

Weeks	No. of cases
<16	2
16-18	25
19-20	3
21-22	2
Non	Nil

Table 3: Functional outcome

Grade	No. of cases
Excellent	15
satisfactory	13
unsatisfactory	3
Poor	1

Discussion

In our study 31 distal femur fractures were treated. Overall final outcome of the surgical management of fracture lower end of femur using locking compression plate was assessed in terms of regaining the lost knee function using NEER'S Score. All 31 cases studied in our series were closed. 20 patients were males and 11 patients were females. The median age was 48.6 years ranging from 18-84 years. 20 of the fractures were caused by road traffic accidents and 11 were due to fall. 16 patients were with fracture on left side and 16 on right side.

Yeap, E.J., and Deepak, A.S.^[3] conducted a retrospective review on eleven patients who were treated for Type A and C distal femoral fractures (based on AO classification) between January 2004 and December 2004. All fractures were fixed with titanium distal femoral locking compression plate. The patient's ages ranged from 15 to 85 with a mean of 44. Clinical assessment was conducted at least 6 months post-operatively using the Schatzker score system. Results showed that four patients had excellent results, four good, two fair and one failure.

Zlowodzki *et al.*^[4] combined these series (n=327) and evaluated the outcomes as part of a systematic literature review. Average nonunion, fixation failure, deep infection, and secondary surgery rates were 5.5%, 4.9%, 2.1% and 16.2% respectively. Some of the technical errors that have been reported for fixation failure have involved waiting too long to bone graft defects, allowing early weight bearing, and placing the plate too anterior on the femoral shaft.

In a study by Muller M *et al.*^[5] Internal fixation using the LISS was performed at an average of 5 days (range: 0-29 days) after the injury. 48 fractures were operated on within the first 24 hours. Revision operations were required for 2 cases of implant breakage. 4 cases of implant loosening and 7 debridments to deal with infections. The study showed clearly that when working with LISS, primary cancellous bone grafting is not necessary.

Vallier *et al.*^[6] concluded that locking plates should only be used when conventional fixed-angle devices cannot be placed. They also noted the significant added cost of locking plates. To decrease the risk of implant failure with locking plates, they recommended accurate fracture reduction and fixation along with judicious bone grafting, protected weight bearing, and modifications of the implant design.

Several biomechanical studies have compared conventional fixed-angle implants and locking plates in supracondylar (AO/OTA A3) fracture models. Marti *et al.*^[7] compared the LISS plate with unicortical locking screws to the dynamic condylar screw and condylar buttress plate in axial loading and cyclic axial loading to failure in a cadaveric 1-cm fracture gap model. The LISS had more reversible and less irreversible deformation when compared to the other two constructs, which they attributed to the titanium composition and the unicortical screws.

In our study average time for union was (14 weeks and max 22 weeks) and 14 patients showed excellent result, 14 Patients showed satisfactory outcome, 3 unsatisfactory and 1 patient showed failure (excellent and satisfactory constituted about 87.5%). Kiran Kumar GN *et al.*^[8] conducted a study from October 2010 to March 2012 found similar results. The mean time to union was 16.8 weeks. There was a case of delayed union in one patient which united on further follow-up at 24 weeks without any intervention.

The ROM at the end of the follow-up period was 120° in 73% of our patients (n = 22). The knee score evaluated at the end of the follow-up period was excellent (85-100) in 84% of the patients and good (70-84) in 16% of the patients. The mean knee score was 87.83. There were four cases of superficial infection (13.33%) which were treated with regular dressings, wound culture and antibiotics.

Conclusion

Locking compression plate is a good fixation system for distal end femoral particularly intra-articular type. It provides good angular stability by its triangular reconstruction principle. It is of great use in elderly patients with severe osteoporotic bone, however the radiological union was not age related. Closed reduction and plate fixation by MIPO is soft tissue friendly approach in the treatment of fractures around knee preserving the blood supply to bone. Even with open reduction, there is less soft tissue trauma and less post-operative stiffness.

Early surgery, closed reduction, at least two screws in each fragment and early post-operative knee mobilization are essential for good union and good knee range of motion. Early weight bearing had a significant effect on radiological union. There was no difference in type of fracture and radiological union.

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