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Surgical management of fracture of distal end of femur in adults by minimal invasive percutaneous plate osteosynthesis (MIPPO) with locking condylar plate

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Abstract

Need for the Study: Fractures of distal femur represent 4-6% of all femoral fractures, the traditional concept of internal fixation which requires an extended approach to the fracture fragments is presently being challenged by a more biological, traumatic approach with careful handling of soft tissue envelope and without bone grafting. The ultimate aim in treating these fractures in adult population is to achieve rapid bony union and allow early mobilization. The main Aim of study is to evaluate the results of Minimally invasive percutaneous plate osteosynthesis with locking condylar plate of distal femoral fracture in adults. Patients with Distal end femur fracture satisfying the inclusion criteria. The proposed study is a hospital based prospective study centered in orthopedic department, Mamata General Hospital, Khammam. The follow up would be for two year with evaluation at 2 weeks, 1 month, 3 months 12 months, and 24 months.

Results: In our study 100 distal femoral fractures were treated. All cases were fresh, 78 patients were males and 22 patients were females. The median age was 47 years ranging from 20-70 years. 65 of the fractures were caused by road traffic accidents and 25 were due to fall, 10 were due to assault. 60 patients were with fracture on right side and 40 on left side. Using Neers scoring system excellent is 65 %,good is 20%,fair is 10% and poor is 5%. Range of motion of knee & Hip was excellent to very good. Gait and weight bearing after complete union was satisfactory

Conclusion: Closed reduction and internal fixation of fracture lower end of femur using locking compression plate by minimally invasive plate osteosynthesis is one of the best modalities of treatment especially in intraarticular fractures where the maintenance of articular congruity is crucial. Fixation with locking condylar plate showed more effectiveness in severely osteoporotic bones, shorter post-operative stay, faster recovery, earlier union rates and excellent functional outcome compared to alternative procedures in other studies.

Keywords: Supracondylar femur fracture, locking condylar plate, closed reduction internal fixation, intra articular fractures, Neers scoring system.

1. Introduction

In the early 1960s, there was a great reluctance towards operative management of these fractures because of high incidence of infection, non-union^[17], mal-union, inadequate fixation and lack of proper instruments, implant as well as antibiotics. Then, the traditional management of displaced supracondylar fracture of femur was along the principle of Watson Jones & John Charnle. 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^[14]. Locking compression plates with its innumerable advantage is of great use in such circumstances^[1, 4]. Locking compression plate has the advantage of combination of conventional compression plating and locked plating techniques which enhances the plate osteosynthesis^[1, 2, 4]. Anatomically precontoured built reduces soft tissue problems and acts as internal external fixator^[2, 12]. 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^[3, 7]. Further, Minimal soft tissue injury occurs when closed reduction is done and MIPPO technique is used^[12, 17]. The purpose of this study is to evaluate the results of fracture lower end of femur treated by minimal invasive percutaneous plate osteosynthesis using locking compression plate.

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Methodology: In this study 100 patients with closed fracture of distal femur were studied. All the cases were treated at Mamata General Hospital KhammamTelangana state, between June 2010 & June 2014 under the Department of orthopaedics Mamata Medical College were included in our study. The method used for fracture fixation was minimally invasive percutaneous plate osteosynthesis (MIPPO) with locking compression plate. The duration of follow up ranged from 3months to 24 months

Inclusion Criteria

1. Those patients who are above the age of 18yrs, male and female with unstable, communited or intraarticular fractures of distal end femur.
2. Patients willing for treatment and given informed written consent

Exclusion Criteria

1. Patient aged below 18 years
2. Compound fractures associated with vascular injuries.
3. Patient not willing for treatment.
4. Fractures more than 3 months old

Results: In our study 100 distal femoral fractures were treated. All cases were fresh, 78 patients were males and 22 patients were females. The median age was 47 years ranging from 20-70 years. 65 of the fractures were caused by road traffic accidents and 25 were due to fall, 10 were due to assault. 60

patients were with fracture on right side and 40 on left side. Of the 100 'lower end of Femur' fractures,(TABLE NO:1) 5 were Mullers type A1; 25 was Mullers type A2 ; 20 were Mullers type A3; 10 was Mullers type C1 20 were type C2 and remaining 20 were Mullers type C3. All fractures were closed.2 patients had associated injuries. Of them, 1 patient had comminuted fracture of patella on same side and 1 had ipsilateral ulna fracture. All patients were treated with closed reduction and internal fixation. All patients were operated within 8 days. Average time duration of surgery was 100 minutes with shortest duration being 75 min and longest being 150 min. The size of plate was selected based on the type of fracture. 6 and 8 holed plates were used more commonly for lower end of femur.

Of 100 patients, (TABLE NO: 2) 73 Patients (73%) showed radiological UNION within 18 weeks. No patients had implant failure. Average flexion in this study was 104 degree with more than 50% patients having knee range of motion more than 110°.(TABLE N: 3)Average knee extensor lag in this study was 5.55 degrees. Out of 100 patients, 5 had shortening, 3 patients with shortening of 15 mm and 2 shortening of 10mm. In this study, (TABLE NO: 4) very few patients had significant varus/ valgus malalignment with 5 patients had superficial infection which was treated with debridement and antibiotics. Implant failure 2 patients, Delayed union 2 patient. The duration of follow-up ranged from 3 months to 24 months.

Table 1: Type of Fracture Lower End of Femur

Supracondylar Fracture	No Of Patients	Percent Of Lower End OF FF EMUR FRR Acture
MULLLERS A1	5	5
MULLLERS A2	25	25
MULLLERS A3	20	20
MULLLERS B1	0	0
MULLLERS B2	0	0
MULLLERS B3	0	0
MULLLERS C1	10	10
MULLLERS C2	20	20
MULLLERS C3	20	20

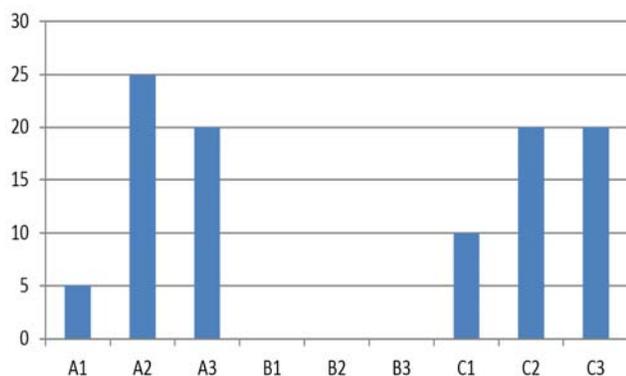


Table 2: Radiological Union

Union (Weeks)	No. of cases	Percentage
<16	NIL	NIL
16 – 18	73	73
19 – 20	25	25
21 – 22	NIL	NIL
DELAYED UNION	2	2
NON UNION	NIL	NIL

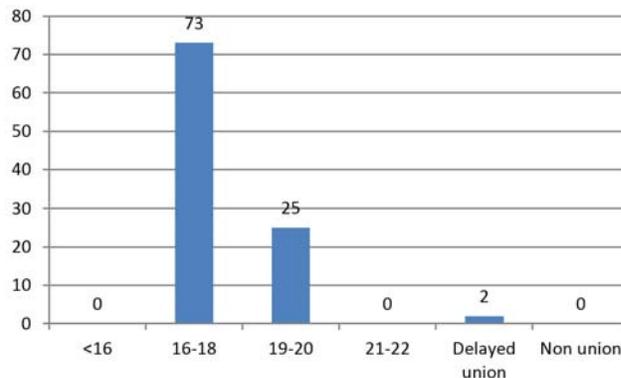


Table 3: Knee Flexion

Knee Flexion (Degrees)	No. of cases	Percentage
< 90	10	10
91 – 109	40	40
110 and MORE	50	50

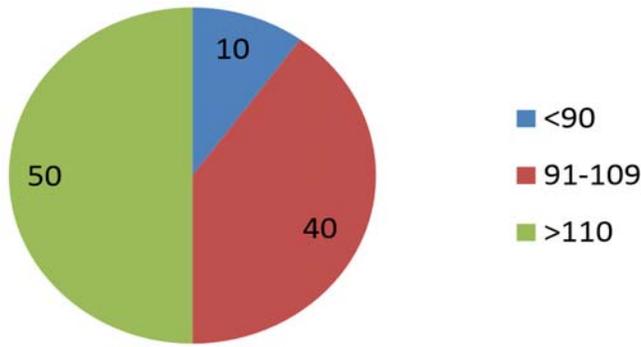
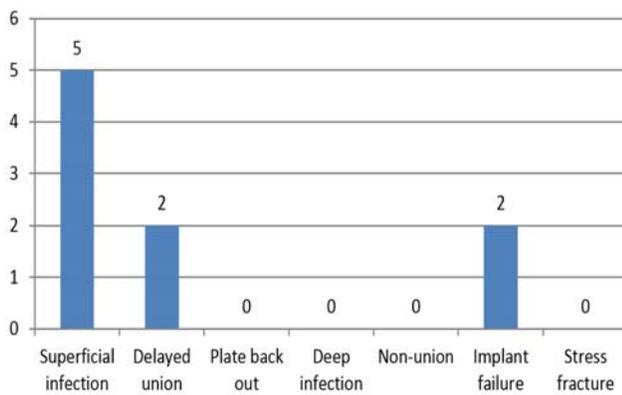


Table 4: Complications

Complications	No. of cases	Percentage
Superficial infection	5	5
Delayed union	2	2
Plate back out	NIL	NIL
Deep infection	NIL	NIL
Non-union	NIL	NIL
Implant failure-- screw/plate breakage	2	2
Stress fracture	NIL	NIL



Discussion [5, 8, 11, 13]

In our study 100 fractures of distal femur 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 100 cases studied in our series were closed. 60 patients were males and 20 patients were females. The median age was 47 years ranging from 20-70 years. 65 of the fractures were caused by road traffic accidents and 25 were due to fall and 10 were due to assault. 60 patients were with fracture on right side and 40 on left side. The results of treatment of distal femoral fractures with the new internal fixator “LCP by MIPPO” arising from clinical studies are presented here. MIPPO technique can be used in the treatment of all supra and intra-articular femoral fractures. The exception is the monocondylar fracture which is more practically treated using only screw osteosynthesis [4, 6, 9, 11].

In our study, of the 100 ‘lower end of femur’. 5 was Mullers type A1, 25 was Mullers type A2; 20 were of Mullers type A3; 10 were Mullers type C1; 20 were Mullers type C2 and remaining 20 were Mullers type C3. (TABLE NO: 1)

In our study for fixation of fracture lower end femur, Ceftriaxone was administered intravenously before surgery and for 7 days after surgery and converted to oral antibiotics till sutures removal. The average injury surgery interval was

4.25 days. 5 and 6 holed plates were used in 60% of patients. Regarding associated injuries, one patient had comminuted fracture of ipsilateral patella. 1 patients had Ulna fracture on same side. All 100 ‘lower end of femur’ fractures showed clinical and radiological union in average period of 19.9 weeks following surgery.

All 100 fractures were treated by closed reduction and internal fixation. Average time duration of surgery was 100 minutes with shortest duration being 75 min and longest being 150 min. The size of plate was selected based on the type of fracture. 5 and 6 holed plates were used more commonly for lower end of femur. Of 100 patients, 73 Patients (73%) showed radiological UNION within 18 weeks. With 5 patients showed superficial infection which was treated by antibiotic alone. 2 patients had implant failure. 3 patients had shortening of 15 mm and 2 had shortening of 10 mm. (TABLE NO: 4)

Normal knee flexion is 140 degree. Thus, acceptable knee flexion compatible with daily activity would be 110 degree. Average flexion in this study was 104 degree with more than 50% patients having knee range of motion more than 110°. (TABLE NO:3) Average knee extensor lag in this study was 5.50 degrees. Out of 100 patients, in this study, very few patients had significant varus/valgus malalignment. The duration of follow-up ranged from 3 months to 24 months. The average hospital stay for the patients in the present study was 20.3 days.

In our study, outcome in the form of regaining the lost knee function is assessed using NEER’S Score as shown below. In our study on 100 fractures around knee, 65 patients showed excellent result. 20 Patients showed good outcome, 10 patients showed fair outcome. 5 patient showed poor outcome.

Summary and Conclusion

Locking compression plate is a good fixation system for distal end femoral fractures, particularly intra-articular type. The operative-time is lessened with decrease in blood loss. Provides good angular stability by its triangular reconstruction principle. It is of great use in elderly patients with severe osteoporotic bone. Closed reduction and plate fixation by MIPPO 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. Utmost care is required to avoid infection. Non-requirement of bone graft decreases the morbidity associated with donor site. Early surgery, at least two screws in each fragment and early post-operative knee mobilization are essential for good union and good knee range of motion. There is no much difference in individual fracture type healing and weight bearing. Thus, locking compression plate is the optimal tool for many fractures in distal femur. It provides rigid fixation in the region of femur, where a widening canal, thin cortices and frequently poor bone stock make fixation difficult. Surgical exposure for plate placement requires significantly less periosteal stripping and soft tissue exposure than that of other techniques by use of LISS. Orthopaedic surgeons experience with locking compression plating technique will find the locking compression plate a useful technique, but requires attention to prevent complications. To conclude,

Locking Compression Plate is an important armamentarium in treatment of fractures around knee especially when fracture is severely comminuted and in situations of osteoporosis.



Fig 1: Pre OP, Immediate Post OP 6 weeks post OP X Rays of supracondylar fracture femur treated with LCP plating

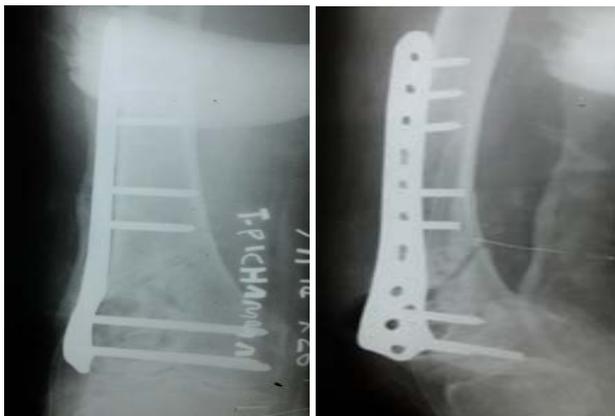


Fig 2: 60 years old female patient of Pre and Post OP X Rays of supracondylar fracture femur treated with LCP plating

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