



Outcome of Treatment of Distal Third Femur Fracture by Locking Compression Plate MIPPO Technique

KEYWORDS

Distal Femur, LCP, MIPPO.

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ABSTRACT Background: To study the outcome of management of distal femur Fractures by distal femur LCP by MIPPO.

Mateials and method: A Prospective study of 30 (thirty) adult patients with distal third femur fractures (33-A/B) underwent MIPPO with distal femoral locking compression plate in the department of orthopaedics, Tripura medical college Agartala,between July 2013 and December 2015. Variables of each patient's were recorded and analysed Age, sex, fracture type , mode of injury, limb involvement, associated injuries, timing and duration of operation, duration of hospital stay in days, follow up in months, complications and final outcomes.

Result: Road traffic accidents accounted for majority of fractures (70%) and fall from height accounted for the remaining (30%). The right femur was involved in eighteen (18) patients (60%) and left femur in twelve (12) patients (40%). Clinical union was seen at 12.65 ± 3.78 weeks (10-30 weeks) in all cases. Radiologically bridging callus was seen at 12th post operative week and complete radiological union was at a mean time of 25.73 ± 5.13 weeks (20 - 40 weeks). The final result, twenty six (26) patients had excellent outcome (86.66%) and three (3) patients had good outcome (13.33%) and one (1) failure (3.3%).

Conclusions: Fractures of the shaft of femur is a catastrophic event with an age and gender-related bimodal distribution and occur most frequently in young men after high-energy trauma and in elderly women after a low-energy fall. The most common causes of such severe trauma are road traffic accidents (RTA), falls from height and gunshot injuries. The incidence is on the rise because of increasing vehicular accidents and rapid urbanization. MIPPO avoids direct exposure of the fracture site. The distal femoral LCP do not require pre-contouring (together with self-drilling and self-tapping screws) are the best adjunct to go with the MIPO technique

Introduction

Fractures of the shaft of femur is a catastrophic event with an age and gender-related bimodal distribution and occur most frequently in young men after high-energy trauma and in elderly women after a low-energy fall.^{1,2} The most common causes of such severe trauma are road traffic accidents (RTA), falls from height and gunshot injuries. The incidence is on the rise because of increasing vehicular accidents and rapid urbanization.

Several method of treatment of distal third fracture is now available; the choice of a particular method being determined by the type, location, degree of comminution, age of the patient, surgeon's expertise and the availability of implants and instruments. Among the operative managements, locking compression plate gives one of the best clinical results especially in highly comminuted, osteoporotic and complex intra-articular distal femoral fractures where intramedullary fixation can't be applied due to very short distal fragment^{3,4,5,6}

Distal femur fractures occur at approximately one-tenth the rate of proximal femur fractures and make up 6% of all femur fractures. Most high-energy distal femur fractures occur in males between 15 and 50 years, while most low-en-

ergy fractures occur in osteoporotic women >50 years. The most common high-energy mechanism of injury is a traffic accident (53%) and the most common low-energy mechanism is a fall at home (33%).⁷

There are several methods of management for the treatment of femoral shaft fractures.Regardless of the method chosen, the basic principle of fracture management is restoration of alignment, rotation and length; preservation of the blood supply to aid union and prevent infection and rehabilitation of the affected extremity and thereby the patient. Currently, closed management as definitive treatment for femoral shaft fractures is largely limited to young children and in instances in which devices for internal fixation are unavailable or in patients with significant medical co-morbidities that make femoral stabilization impossible. Femoral plating is a reliable method of treatment which can be done rapidly without the need for special instruments. Plating does not damage the endosteal blood supply like in intramedullary nailing. It gives an accurate reduction of comminuted fracture and allows early motion and good function.

Material and method

This prospective study was conducted in 30 patients

treated for distal femoral fractures in our institution, department of orthopaedics Tripura medical college from 1 July 2013 to 31 December 2015. Fractures were assessed by antero-posterior and lateral view X-rays of the affected limb with the ipsilateral hip and knee and were classified according to AO classification for distal femurs as seen in the radiological film and AO 33-A/B were only included for the study. Routine Investigations (Blood routine examination, urine routine examination, electrocardiograph, bleeding time, clotting time, chest X-rays, blood sugar-fasting/post prandial, liver function test, and kidney function test and serum electrolytes) were done in all patients. Patients were subjected to skeletal traction by tibial Steinmann pinning under local anesthesia on admission and limb maintained in Thomas splint.

30 (thirty) adult patients with distal third femoral fractures 23 (AO type 33-A) and 7 (AO type 33-B) underwent definitive fracture fixation by MIPPO. A knee roll was used for maintenance of reduction. The plate length, axial and rotational alignment were checked under image intensification. Lateral approach in all patients and followed by tunneling and placing the plate sub vastus and temporary fixing with Kirschner wires followed by final fixation. Minimally invasive techniques were utilized for insertion of proximal screws.

Active and passive movements of the limb was started and continued from immediate post operative day. Skin sutures were removed on the tenth post-operative day and patients were discharged. Patients were followed up every three (3) weeks for the first twelve (12) weeks after surgery, then once a month for the next three (3) months and then every three (3) months for a period of one year. In each visit, Radiological assessment of union and fracture callus quality was done in addition to functional limb assessment by modified Sanders criteria.⁹

Result

Twenty two (22) male and eight (8) female patients (m: f = 2.7:1), ranging in age from 18-55 years the mean age of all patients was 31.4 ± 9 years. Road traffic accidents accounted for majority of fractures (70%) and fall from height accounted for the remaining (30%). The right femur was involved in eighteen (18) patients (60%) and left femur in twelve (12) patients (40%). Clinical union was seen at 12.65 ± 3.78 weeks (10-30 weeks) in all cases. Radiologically bridging callus was seen at 12th post operative week and complete radiological union was at a mean time of 25.73 ± 5.13 weeks (20 - 40 weeks).

Based on the assessment parameters (Modified Sanders criteria) used for the final result, twenty six (26) patients had excellent outcome (86.66%) and three (3) patients had good outcome (13.33%) and one (1) failure (3.3%).



Figure 1 : -Pre operative x ray



Figure 2 :-Post operative x ray

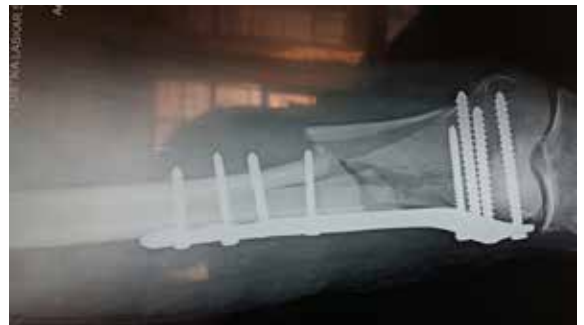


Figure 3: post operative x ray

Table 1: showing mode of injury

Mode of injury	No. of patient	Percentage (%)
RTA	21	70
Fall from height	9	30

Table 2: showing time to union

Time to union	Duration to union (weeks)	Mean duration to union (weeks)
Clinical	10-30	12.65 ±3.75
Radiological	20-36	23.68± 3.17

Table 3: showing final outcome

Outcome	Number of patient	Percentage (%) n= 30
Excellent	26	87(86.67)
Good	3	10(13.33)
Failure	1	3(3.33)

Discussion

Locking compression plate acts as load bearing device, stabilising fracture fragments and ensuring early bony union. Vascular compromise is minimal due to the fact that the plate does not need to be in contact with the bone. The locked plate-screw system produces a rigid screw-bone fixation which prevents malrotation or shortening. Locking compression plating is a safe procedure for complex distal third femoral fractures.

Applying the selection criteria, a total of 30 (thirty) adult patients with distal third femoral fractures 23 (AO type 33-A) and 7 (AO type 33-B) underwent MIPPO with distal femur LCP in the department of orthopaedics, TMC Agartala between July 2013 to December 2015. Variables of each patient were recorded during subsequent follow up and the following variables were recorded: range of motion of knee and hip, complications like, shortening, muscle wasting, infection, implant failure etc and sign and symptoms of union. The statistical analysis consisted of percentages, range, mean and standard deviation wherever it is applicable.

Patients were between 18-55 years of age, with a mean

age of 31.4±9.0 years. The age group of 21-30 yrs comprised the highest number of patients (55.33%). This is similar to findings of Valles et al¹⁰ where the significant of predominant was found in between ages of 20-29 years and O Bostman et al¹² reported it as 35.4 years.

There were 22 male and 8 female patients (m: f =2.7:1). Similar male preponderance was seen by other authors; M Luechoowong¹⁴ reported 13 male to 6 female patients (m: f = 2.1:1), 2.5:1, JB Giles et al¹³ reported it as 2.2:1 and Ej Yeap et al⁴ as 1.7:1.

Road traffic accidents (RTA) accounted for majority of fractures (70%) and fall from height accounted for the remaining (30%), equal finding by Su Qi et al¹¹. In O Bostman et al¹² reports the figure is 74% and 26% respectively. Other author report as Valles et al¹⁰ 73% and 27%, Ej Yeap et al⁴ as 63% and 37% respectively.

The right femur was involved in 18 (60%) patients and left femur in 12 (40%) patients. Ej Yeap et al⁴ reported as 63% and 37%. Valles et al¹⁰ reported right sided involvement in 29 patients (55%), and left in 23 patients (45%). Su Qi et al¹¹ documented 34% right sided involvement and left sided involvement in 66% of their case series.

The mean operating time was 122.3 ± 12.4 minutes (80-140 minutes). This is nearly identical to reports by the Ej Yeap et al⁴ who spent 119.2 minutes (80-180 min). Yu X et al¹⁵ reported it as 126 minutes (48-248 min). Other author like El Ganaiy et al¹⁶ reported it as 100 min..

Clinical union was seen at a mean time of 12.65 ± 3.78 weeks (10 -30 weeks) in all cases. Weight et al¹⁷ reported mean of 12 weeks (8-26 weeks), JPS Walia et al¹⁸ reported having clinical union between 12 – 16 weeks post-operative day and Bae SH et al¹⁹ reported mean time to union as 14.3 weeks.

Radio logically, bridging callus was seen at 12 - 16 post operative week and mean time to complete radiological union was 23.68 ± 3.17 weeks (20 - 36 weeks). Yu X et al¹⁵ reported mean of 20.6 weeks Luechoowong¹³ reported it as mean of 17 weeks (12-38 weeks), Ej Yeap et al⁴ 18 weeks (6-36 weeks)

Major complications were encountered in the form of non-union in 1 case, implant failure in 1 case, and 1 minor skin infection in 1 case (10%). Non-union was found to be due to infection which was managed by removal of the plate and replacement with a new longer LCP with bone graft in 2 separate operations and subsequently united.

Based on the assessment parameters (Sanders)⁹ used in this study, 26 patients (86.67%) had excellent, 3 patients (10%) had good outcome and 1 failure (3.33) in the final result. Bae SH et al¹⁹ reported excellent to good outcome in 17 patients (81%), fair in 3 (14.2%) and failure in 1(4.7%) patients, while Su Qi et al¹¹ reported excellent in 22, good outcome in 18 and fair in 4 patients and reported overall satisfactory result of 90% using the Sanders criteria. Other authors as Ej Yeap et al⁴ reported 72.7%, Valles et al¹⁰ reported it as 71% (n- 52).

This high incidence of excellent outcome in our series may be due to small sample size, strict inclusion criteria and proper adherence of patients to the follow up protocol.

Conclusion

Fractures of the shaft of femur are a catastrophic event with an age and gender-related bimodal distribution and occur most frequently in young men after high-energy trauma and in elderly women after a low-energy fall. It has posed considerable therapeutic challenges throughout the history of fracture treatment. Distal femoral fractures are treated directly and indirectly, open and minimal invasive technique. MIPO avoids direct exposure of the fracture site. Although it is still possible to perform minimally invasive plating with the use of conventional plates, the distal femoral LCP do not require pre-contouring is the best adjunct to go with the MIPO technique. MIPPO in distal femoral fractures with LCP gives satisfactory outcomes but should be approached with caution because of possibility of axial alignment.

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