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ORIGINAL ARTICLE

# Minimal invasive plating osteosynthesis (MIPO) for distal femur fractures functional outcome.

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**ABSTRACT… Objective:** To determine the functional outcome of minimally invasive plating osteosynthesis (MIPO) for distal femur fractures. **Study Design:** Description Study. **Setting:** Orthopedic Department of Allied Hospital, Faisalabad. **Period:** August 2020 to February 2021. **Material & Methods:** 115 patients of both gender with age ranging from 18 to 50 years and having lower 1/3 femur shaft fractures. Patients having nerve, vascular injury and opened fracture were excluded. All patients were treated with minimally invasive plating osteosynthesis (MIPO). Criteria for bone union was bridging callus formation across the fracture site in antero-posterior and lateral knees x-rays without evidence of loosening breakage and migration of the implants with painless weight bearing on that lower limb. IKDC score at 12 weeks after the procedure was used to assess the functional & clinical outcome. **Results:** These were excellent function result seen in 65 (56.51%) patients, good in 32 (27.83%), fair in 11 (9.57%) and poor out come in 07 (6.09%). 105 (91.30%) patients with distal 1/3 femur shaft fracture had achieved the union. **Conclusion:** Our study concluded minimally invasive plating osteosynthesis (MIPO) is an excellent method for the treatment of distal femoral shaft fractures.

**Key words:** Close Fracture, Distal Femoral Fracture, Minimally Invasive Plating Osteosynthesis, Outcome, Pre Contoured LCP.

## INTRODUCTION

Distal femur fractures are 4 to 6 % percent of all the femoral shaft fractures.[1] There are two discrete mechanism of injury in the supracondylar femur fractures in first group young adults after high energy trauma 60% male less than 40 years of age and in 2nd group elderly patients with low energy trauma (older than 60 years of age). The third common population includes with peri-prosthetic fractures of distal femur proximal to a previous total knee arthroplasty or distal to a total hip arthroplasty. About 30% of the cases are with poly-trauma.[2] 58% have intra articular extensions and 27 % are open fractures.

Distal femoral fractures are rare and serious, with high morbidity and mortality. Treatment have evolved from non-operative to operative treatment over the years to use of distal femur locking compression plate (LCP) over covers many pitfalls over the earlier implant. For several years the minimally invasive plate osteosynthesis (MIPO) technique has been accepted.

There are many methods of internal fixation are available for distal femur fracture. Angle blade plate, condylar buttress plate, condylar blade plate anti-grade /retrograde nailing. There is limited soft tissue dissection, preservation of fracture hematoma, so reduce the incidence of malunion, nonunion and reducing stiffness of the joints by early mobilization.[3]

The Functional outcome for patients with extra articular distal tibial fracture proven safe with this technique.[4] There is a significant excellent functional results after using this technique in distal femur fracture in orthopedic department.

To study at the functional outcome of minimally

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invasive plating osteosynthesis (MIPO) for distal femur fractures.

## MATERIAL & METHODS

This descriptive study was conducted Orthopedic department at allied hospital, Faisalabad. 25th August 2020 to 24 February 2021.

### Inclusion criteria

Patients having fracture lower third femoral shaft in both gender of age group 18-50 year old.

### Exclusion Criteria

Patients with fracture lower one 3rd femoral shaft with neuro vascular deficit.
Patients with open fractures.

### Data Collection

After the approval from ethical review committee (Reg.No.527), inclusion criteria was enrolled in this study after informed consent. Local, systemic and general examination of the patients was done. All other injuries are ruled out. X-rays of injured limb with complete AP and lateral views including complete knee joint and distal femur was done.

All patients were operated with supine posture under spinal anesthesia. Surgical approach for extra articular fracture was modified standard lateral approach and lateral para patellar approach was used for intra articular fracture. Indirect methods were used for reduction in all patients. Alignment in different planes was achieved by using clamps and traction under image intensifier guidance.

After the proper reduction plates of appropriate sized were used (anatomical pre-contoured LCP for distal femur). One end of the plates slid through the sub muscular plane after proper alignment with distal segment of the bone. At least three metaphyses locking screws were used for fixation of distal segment of the bone. Incision was made one the lateral aspect of the thigh under image intensifier at the level of the proximal screw holes. Sometime reduction was maintained provisionally with k-wire placed through the holes in the plate. For simple fracture compression technique was used for comminuted fractures and bridging technique was used at least three screws were beyond the proximal extend of the fracture site and distally plate was not beyond the joint line.

Active hip, knee movements and quadriceps strengthening exercise were used post operatively. Progress in healing of the fracture was assessed at monthly intervals with proper radiographs. The assessment of bone union was done by bridging callus formation across the fracture, absence of breakage implants and pain less weight bearing. Functional clinical outcome assessed by IKDC score after 12 weeks of procedure.

## RESULTS

In this study patients from 19-50 years with mean age of 37.13 + 7.43 year were included (Table-I). Out of 115 patients 36 (31.30%) were female and 79 (68.70%) were male. The female and male ratio was 1:2.2 shown in Figure-1. Patient's distribution regarding the side effect is shown in Figure-2. In 65 (56.51%) patient functional outcome was excellent, good in 32 (27.83%), fair in 11 (9.57%) and poor in 07 (6.09%) patient Table-II. In 105 (91.30%) patients union was achieved Figure-3. 10 patients went into nonunion that were dealt by 2nd surgery and bone graft. Table-III, IV, V have shown the functional outcome regarding and age groups, gender and side affected. Where union with respect to age, gender and side effected has been shown in Table-VI, VII & VIII.

| Age In Years | No of Patients (%) |
|---|---|
| 19-35 | 57 (49.57%) |
| 36-50 | 58 (50.43%) |
| Total | 115 (100.0%) |

**Table-I. Distribution of patients according group. (n=115)**
**Mean + SD = 37.13 + 7.43 years**

| Function Outcome | No of Patients (%) |
|---|---|
| Excellent | 65 (56.51%) |
| Good | 32 (27.83%) |
| Fair | 11 (9.57%) |
| Poor | 07 (6.09%) |

**Table-II.**

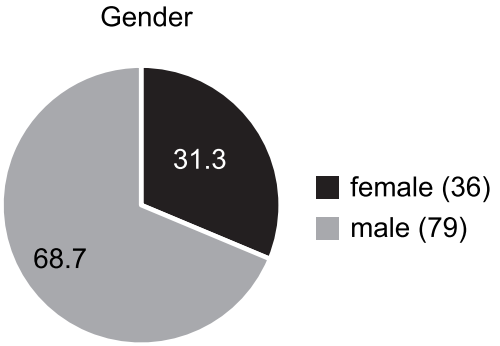


**Figure-1. Gender distribution. (n=115)**

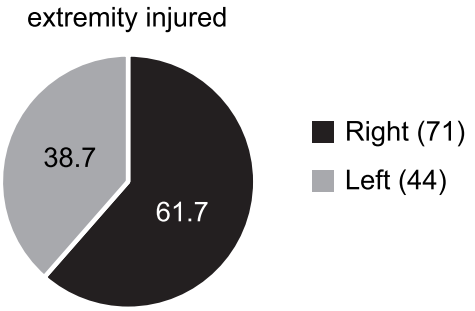


**Figure-2. Patients regarding to side affected. (n=115)**

| Function Outcome | No of Patients (%) |
|---|---|
| Excellent | 65 (56.51%) |
| Good | 32 (27.83%) |
| Fair | 11 (9.57%) |
| Poor | 07 (6.09%) |

**Table-II.**

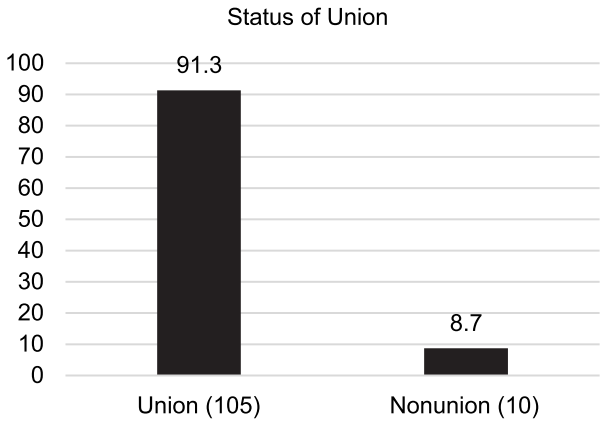


**Figure-2. Patients regarding to side affected. (n=115)**

| Age in year | Functional outcome regarding to age | | | | |
|---|---|---|---|---|---|
| | Excellent | Good | Fair | Poor | P-Value |
| 19-35 | 34 | 12 | 07 | 04 | |
| 36-50 | 31 | 20 | 04 | 03 | 0.378 |

**Table-III.**

| Gender | Functional outcome regarding to gender | | | | |
|---|---|---|---|---|---|
| | Excellent | Good | Fair | Poor | P-Value |
| Male | 51 | 19 | 05 | 04 | 0.061 |
| Female | 14 | 13 | 06 | 03 | |

**Table-IV.**

Functional outcome regarding to gender

| Side Affected | Functional Outcome | | | | |
|---|---|---|---|---|---|
| | Excellent | Good | Fair | Poor | P-value |
| Right | 47 | 16 | 04 | 04 | 0.046 |
| Left | 18 | 16 | 07 | 03 | 0.046 |

**Table-V.**

Functional outcome regarding to side affected

| Age Group Year | Union | | P-Value |
|---|---|---|---|
| | Yes | No | |
| 19-35 | 48 | 09 | 0.007 |
| 36-50 | 57 | 01 | 0.007 |

**Table-VI.**

Union regarding to age groups

| Age Group Year | Union | | P-Value |
|---|---|---|---|
| | Yes | No | |
| Male | 72 | 07 | 0.926 |
| Female | 33 | 03 | 0.926 |

**Table-VII.**

Union regarding to gender.

| Side Affected | Union | | P-Value |
|---|---|---|---|
| | Yes | No | |
| Right | 63 | 08 | 0.214 |
| Left | 42 | 02 | 0.214 |

**Table-VIII.**

Union regarding to side affected.

## DISCUSSION

In closed femoral shaft fracture closed intramedullary nailing is the standard treatment.[5] But in certain cases of femoral shaft fracture closed intramedullary nailing may not be ideal. Bridge plating practically useful in distal metaphyseal comminuted or articular fracture that cannot be reduced.

Farouk Et al[6] introduced the results of MIPO

technique maintains the integrity of the nutrient arteries, perforations and superficial periosteal and which medullary perfusion. Sank Et al[7] used ppercutaneous sub muscular bridge plating in the treatment of 27 unstable femoral fracture with early stable bony union in 11.7 weeks without complications. Wenda et al[8] departed 17 case of comminuted femur fracture with MIPO, 13 case had excellent results with 3 needed bone graft there was no bleeding from perforation vessel injury. No infection was noted.

There are number of methods for the treatment of the fractures open reduction and internal fixation is the one of method in which denied visualization, reduction and fixation but having some draw backs of periosteal stropping soft tissue damage, distribution of fracture hematoma and deep infection. Therefore some people use the illizrove fixation to avoid these problems. But with their fixations there is a chance of nonunion and pin tract infection.[9,10] In minimally invasive plate osteosynthesis (MIPO) improves the healing by preserving the fracture hematoma disinfection, normal soft tissue dissection and blood supply of the fracture fragments.[11,12] Designed locking Plate is easy application with reduced fixed proximally and distally from the fracture site in a bridging avoid that allows easily rehabilitation at the patients.

The locking plates are more useful in severe osteoporotic bones then conventional plates due to higher pull out strength of the screws[13,14] In our study 65 (56.51%) patients had excellent functional outcome, good in 32 (27.83%), Fair in 11 (9.57%) and 07 (6.09%) with poor outcome. According to NEER's Score 50% level excellent results 35% good and 15% with fair results majority of the patients had gait, weight bearing and rage of motion of the knee joint within the acceptable limits 3. In another study 92% radiological union achieved at 12 weeks in 115 male patients of middle age group: regarding to knee society score had 27.8% excellent 60% good and 12.2% fair results 16 By using the MIPO technique Zhongguogushang et al concluded that out of 39 supra condylar fracture 28 got excellent, 10 got good & remaining got fair results.[15]

Doshi Et al and Khursheed Et al.[16,17] used locking plates with minimally invasive approach the clinical outcome of distal femur fractures in geriatric patients resulted in favorable outcome. This method appears to be safe and useful with minimally mortalities and complications Lec et al.[18] used MIPO technique in 35 patients with proximal tibial fracture with 105 degree range of motion on average. Suik et al[19] treated 27 unstable distal femoral fracture with percutaneous sub muscular bridge plating with early union in 11.7 weeks without significant complications. 17 patients with comminuted femur fracture were treated with MIPO technique.

## CONCLUSION

Our study had excellent functional outcome using MIPO technique used for fracture of the distal femur. Therefore we recommend the MIPO technique for the treatment of distal femur fracture due to less morbidity and complications.



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|---|---|---|---|
| 1 | Basharat Manzoor | Author. | |
| 2 | Hafiz Salman Saeed | Data analysis & Critical analysis. | |
| 3 | Afzal Javid | Proof reading. | |
| 4 | Zohaib Nadeem | Data collection. | |
| 5 | Khawar Shahzad | Statistical analysis. | |
| 6 | Allah Rakha | Found additional, Literature for information. | |