

## ORIGINAL RESEARCH

# A comparative analysis of hybrid external fixation versus MIPO in the management of proximal tibial fracture

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### ABSTRACT

**Background:** Proximal tibial fracture occur on the flat, top surface of the tibia, which articulates with the femur (thigh bone) to form the knee joint. The present study compared hybrid external fixation and MIPO in management of proximal tibial fracture. **Materials & Methods:** 94 cases of proximal tibia fracture were randomly divided into 2 groups of 47 each. Group I patients were treated with hybrid external fixation and group II with MIPO. Parameters such as location, AO classification, operative time, blood loss, hospital stay, healing time etc. were recorded. **Results:** Group I had 27 males and 20 females and group II had 23 males and 24 females. The etiology of fractures was road traffic accident (RTA) in 25 in group I and 31 in group II, fall in 14 in group I and 10 in group II and domestic violence in 8 in group I and 6 in group II. The difference was non-significant ( $P > 0.05$ ). The mean operative time was 94.2 minutes in group I and 110.6 minutes in group II, blood loss was 120.6 ml and 205.2 ml, healing time was 9.4 weeks and 18.2 weeks, time of recovery to work was 12.6 days and 30.5 days and hospital stay was 13.1 days and 23.4 days in group I and II respectively. The difference was significant ( $P < 0.05$ ). **Conclusion:** MIPO has been shown to be inferior to hybrid external fixation in the treatment of proximal tibia fractures. When compared to MIPO, hybrid external fixation had a lower mean operative time, blood loss, healing time, time to return to work, and hospital stay.

**Key words:** Hybrid external fixation, MIPO, Proximal tibial fracture

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### INTRODUCTION

Proximal tibial fracture occur on the flat, top surface of the tibia, which articulates with the femur (thigh bone) to form the knee joint. Tibial plateau fractures can range from mild to severe and may involve damage to the joint surface.<sup>1</sup>The tibial tubercle is a bony projection just below the knee joint. Fractures in this area typically affect the attachment point for the patellar tendon, which connects the kneecap (patella) to the tibia. These are more complex and often involve multiple fragments of bone, making them more challenging to treat.<sup>2</sup>

Symptoms of a proximal tibial fracture may include pain, swelling, bruising, inability to bear weight on the affected leg, and visible deformity in the knee area.<sup>3</sup> In some cases, there may be associated injuries to the ligaments, meniscus, or other structures within the knee joint. Treatment for proximal tibial fractures depends on the specific type and severity of the fracture. Some stable fractures can be managed without surgery using methods like casting, bracing, or the use of crutches to keep weight off the leg while

it heals. Physical therapy may also be part of the recovery process.<sup>4</sup> More complex or displaced fractures may require surgical intervention. Surgery may involve the use of plates, screws, rods, or pins to stabilize the fracture and restore proper alignment. The choice of surgical technique depends on the specific fracture pattern and the patient's overall health.<sup>5</sup>

Minimal invasive plate osteosynthesis (MIPO) using a locking plate has become alternative technique for proximal tibial fractures. The preservation of periosteal blood supply allowed by MIPO offers a clear biological advantage over traditional plating, because it reduces iatrogenic damage to surrounding soft tissues.<sup>6</sup> The present study compared hybrid external fixation and MIPO in management of proximal tibial fracture.

### MATERIALS & METHODS

The present study consisted of 94 cases of proximal tibia fracture of both genders. All patients were

informed regarding the study and their written consent was obtained.

Baseline characteristics such as name, age, gender etc. was recorded. Patients were randomly divided into 2 groups of 47 each. Group I patients were treated with

hybrid external fixation and group II with MIPO. Parameters such as location, operative time, blood loss, hospital stay, healing time etc. were recorded. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

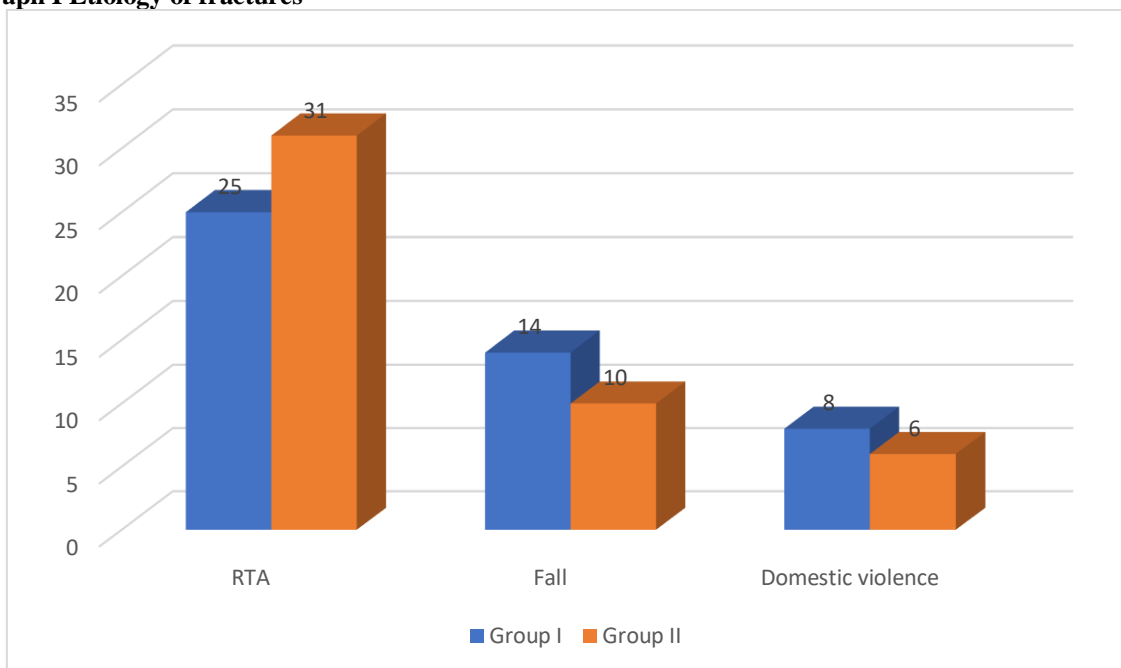
**RESULTS**

**Table I Distribution of patients**

Groups	Group I	Group II
Method	Hybrid external fixation	MIPO
M:F	27:20	23:24

Table I shows that group I had 27 males and 20 females and group II had 23 males and 24 females.

**Graph I Etiology of fractures**



Graph I shows that etiology of fractures was road traffic accident (RTA) in 25 in group I and 31 in group II, fall in 14 in group I and 10 in group II and domestic violence in 8 in group I and 6 in group II. The difference was non-significant (P > 0.05).

**Table II Assessment of parameters**

Parameters	Group I	Group II	P value
Operative time (min)	94.2	110.6	0.62
Blood loss (ml)	120.6	205.2	0.01
Healing time (weeks)	9.4	18.2	0.02
Time of recovery to work (days)	12.6	30.5	0.01
Hospital stay (days)	13.1	23.4	0.02

Table II shows that mean operative time was 94.2 minutes in group I and 110.6 minutes in group II, blood loss was 120.6 ml and 205.2 ml, healing time was 9.4 weeks and 18.2 weeks, time of recovery to work was 12.6 days and 30.5 days and hospital stay was 13.1 days and 23.4 days in group I and II respectively. The difference was significant (P < 0.05).

**DISCUSSION**

Fractures of the proximal tibia are serious injuries and present a treatment challenge.<sup>7</sup> Because they result from high energy injuries, damage is usually

extensive and open fractures, compartment syndromes, and vessel injuries are commonly associated.<sup>8</sup> Traditional open plating presents complications, such as, infection and delayed soft tissue breakdown, despite developments over past decades.<sup>9</sup> Due to the emphasis now placed on soft tissue care, it is known that intramedullary nails and external fixators present lower infection risks and cause no more soft tissue damage than conventional compression plating techniques.<sup>10</sup> The present study compared hybrid external fixation and MIPO in the management of proximal tibial fracture.

We found that group I had 27 males and 20 females and group II had 23 males and 24 females. Jan et al<sup>11</sup> conducted study on 40 patients with proximal third tibia fractures. Patients were divided into 2 groups depending on the surgical treatment received; observation group comprised of 20 patients treated by external fixation and the control group comprised of 20 patients treated by open reduction internal fixation with locking compression plate. At one week post op, radiological assessment showed that 18-patients (93%) got anatomical reduction in LCP group as compared to 16-patients (80%) in the external fixation group. Average duration of bone union in external fixation was 14-weeks and that in LCP group 16-weeks. 2 cases in the external fixation group had pin tract infection, which were resolved with administration of antibiotics and local pin site care; no infection was noted in the LCP group. There were 2 cases of delayed union in LCP group and these were re-operated using locking plates and auto bone grafts. We observed that the etiology of fractures was road traffic accident (RTA) in 25 in group I and 31 in group II, fall in 14 in group I and 10 in group II and domestic violence in 8 in group I and 6 in group II. Cheng et al<sup>12</sup> compared minimally invasive plate osteosynthesis (MIPO) and open reduction and internal fixation (ORIF). 30 cases of distal tibia fracture (15 pairs of ORIF and MIPO) were compared for operative time, blood loss, healing time, time of recovery to work, implant irritation symptoms, and union status. No malunion occurred and one case of osteomyelitis developed in the ORIF group. In the ORIF group, ten cases were evaluated as excellent, three as good, one as fair and one as poor. In the MIPO group, ten cases were excellent and five good. The MIPO technique is not distinctively superior to ORIF in treatment of distal tibia fracture.

We found that the mean operative time was 94.2 minutes in group I and 110.6 minutes in group II, blood loss was 120.6 ml and 205.2 ml, healing time was 9.4 weeks and 18.2 weeks, time of recovery to work was 12.6 days and 30.5 days and hospital stay was 13.1 days and 23.4 days in group I and II respectively. Kim et al<sup>13</sup> assessed the results of minimally invasive plate osteosynthesis (MIPO) for open fractures of the proximal tibia. 34 patients with an open proximal tibial fracture were treated by MIPO. Primary union was achieved by 24 of the 30 study subjects. Early bone grafting was performed in 6 cases with a massive initial bone defect expected to result in non-union. No patient had malalignment greater than 10°. The mean Knee Society score was 88.7 at final follow-up visits, 23 patients achieved an excellent result, and 7 a good result. There were 3 superficial and 5 deep infections, but none required early implant removal. Functional results were similar for primary and staged MIPO. Fracture pattern and open fracture grade were not found to influence the results.

The limitation of the study was small sample size.

## CONCLUSION

Authors found that MIPO has been shown to be inferior to hybrid external fixation in the treatment of proximal tibia fractures. When compared to MIPO, hybrid external fixation had a lower mean operative time, blood loss, healing time, time to return to work, and hospital stay.

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