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Biological plating in extra articular fracture of proximal tibia and distal tibia

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Abstract

The treatment of fractures of proximal and distal tibia is challenging, because of the limited soft tissue envelope and poor vascularity. The best treatment remains controversial and it depends on the fracture morphology, displacement and comminution. Treatment options vary from closed reduction and cast to open reduction and internal fixation with plate. Open reduction and internal fixation with plate can result in extensive dissection and tissue devitalization. We conducted a study on management of these fractures by biological osteosynthesis using Minimally Invasive Plate Osteosynthesis (MIPO) technique with preservation of osseous and soft tissue vascularity.

Methods: In this prospective study of 30 patients of proximal distal Tibia fractures admitted in GMERS Medical college, Valsad, were studied during the period of FEB - 2021 to OCT- 2021

Results: Biological fixation of complex fractures gives stable as well as optimal internal fixation and complete recovery of limb function at an early stage with minimal risk of complications.

Conclusions: The satisfactory functional results and lack of soft tissue complications suggest that this method should be considered in periarticular fractures. Biological fixation of complex fractures gives stable as well as optimal internal fixation and complete recovery of limb function at an early stage with minimal risk of complications.

Keywords: Biological fixation, MIPO, indirect reduction, tibial fractures damage

Introduction

Fractures of the tibia are notoriously difficult to treat, and traditional methods of fixation are often fraught with complications due to limited soft tissue, subcutaneous location and poor vascularity. Young males are more commonly involved with an average of 37 yrs. Open reduction and stable internal fixation allows axial alignment of the limb, permits early mobilisation and results in bony union from endosteal bone healing. However in the tibial fractures the surgical dissection required to achieve anatomical reduction evacuates the osteogenic fracture haematoma and causes soft tissue stripping that may result in infection, wound necrosis and delayed or non-union [1, 2, 4]. A balance between anatomical reduction and soft tissue devitalisation is therefore required. Minimally invasive surgery gives that direct anatomical reduction with rigid fixation and maintenance of alignment by bridging the fracture without compression [3]. Biological plating preserves the soft tissue envelope and the periosteum maintains arterial vascularity and therefore minimizes the surgical trauma to the zone of injury [5, 6]. Stripping of the periosteum is thus avoided, the fragments remain integrated into the soft tissue, and healing occurs spontaneously by way of callus formation.

The advantages of biological fixation are

Soft tissue remains intact.

There is some mobility in the fracture zone which accelerates the callus formation.

Reduced surgical time and tourniquet time along with smaller incision.

Materials and Methods

In this prospective study of 30 patients of proximal distal Tibia fractures admitted in our institute were studied during the period of February, 2021 to October, 2021.

Criteria to include the patients in this series were Closed Fractures of proximal and distal Tibia. These all fractures were classified according to AO Classification.

Inclusion criteria

1. Closed Fractures of proximal and distal tibia in adult age group treated by percutaneous plating.
2. Closed fractures of proximal and distal tibia extending to tibial diaphysis will be included in the thesis.

Exclusion criteria

1. Compound fractures.
2. Pediatric age group.
3. Comminuted fractures with dislocation of ankle joint and knee joint.
4. Pathological fractures.
5. Lower limbs with preexisting neurological deficit.
6. Autoimmune disease.
7. Vascular disease or injury.

Observation and results

Table 1: Sex incidence

| Sr. No | Sex | No of case | Percentage |
|--------|--------|------------|------------|
| 1 | Male | 26 | 86.667 |
| 2 | Female | 04 | 13.33 |

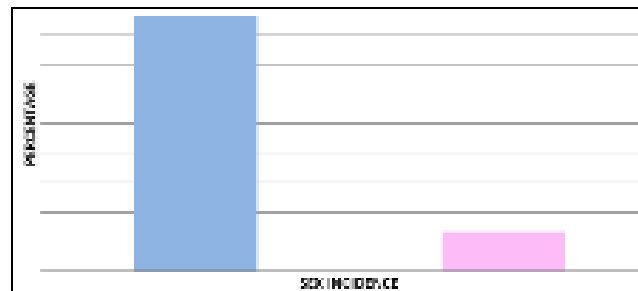


Fig 1: Majority of patients were male

Table 2: Mechanism of injury

| Sr. No | Mechanism of injury | No of Cases | Percentage |
|--------|---------------------|-------------|------------|
| 1 | RTA | 15 | 50 |
| 2 | Fall from height | 7 | 23.33 |
| 3 | Accidental Fall | 6 | 20 |
| 4 | Sports | 2 | 6.667 |

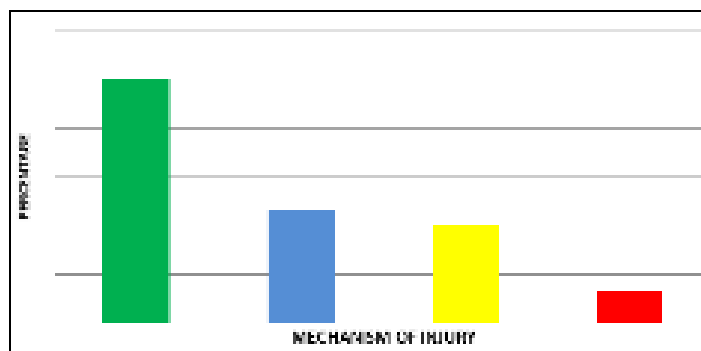


Fig 2: Majority of patient's mechanism of Injury was RTA

Table 3: Age Incidence

| Sr. No | Age group in year | No of case | Percentage |
|--------|-------------------|------------|------------|
| 1 | 20 to 30 | 1 | 3.33 |
| 2 | 30 to 40 | 10 | 33.33 |
| 3 | 40 to 50 | 10 | 33.33 |
| 4 | 50 to 60 | 8 | 26.67 |
| 5 | >60 | 1 | 3.33 |

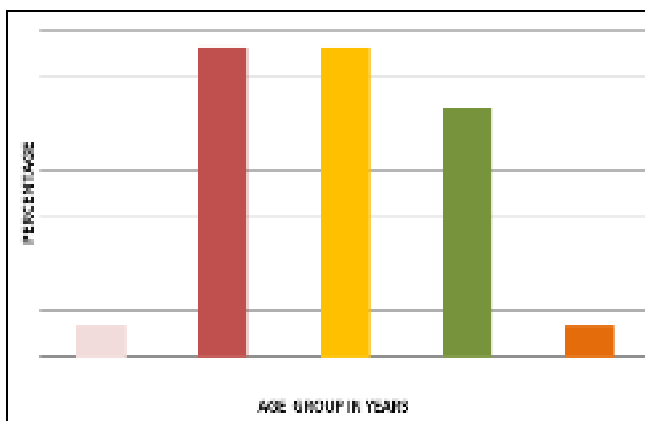


Fig 3: Majority of patients were in the age group of 30 to 40 and 40 to 50

Table 4: Side of Injury

| Sr. No | Side | No of Cases | Percentage |
|--------|-------|-------------|------------|
| 1 | Right | 21 | 70 |
| 2 | Left | 9 | 30 |

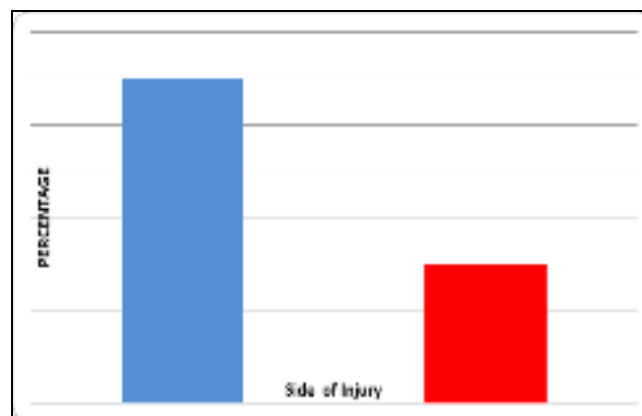


Fig 3: Majority of patients had right sided injury

Majority of patients were in the age group of 30 to 40 and 40 to 50
Majority of patients had right sided injury

Majority of patients had no associated injury
Duration of surgery was between 1.20 hrs. to 2.30 hrs.

Majority of patients had distal tibial fractures in my series
1) Case of Distal Tibial fracture treated with MIPPO



Fig 4: Case of proximal Tibial fractures treated with MIPPO

Discussion

The results of operative treatment are dependent on the severity of the initial injury and the quality and stability of the reduction. The mechanism of injury, the status of the soft tissues and the degree of comminution affect the long term clinical result^[8, 9]. The interval for radiological union was 12 to 20 weeks in our study in accordance to previous study. However, the most important factor is to achieve stable fixation and to allow early range of motion without unnecessary osseous and soft tissue devascularization. Minimally invasive techniques are based on principles of limited exposure, indirect reduction methods and limited contact between bone and implant. As a result of these principles this technique, as seen in present study, avoided major soft tissue complications and shortened the length of

the patient's stay in the hospital. The bone healing was excellent with this type of fixation because the stresses were distributed over a longer segment of bone. This technique can be used in fractures where locked nailing cannot be done like vertical slit and markedly comminuted fractures. There was rapid fracture consolidation due to preserved vascularity. There were fewer incidences of delayed union and non-union^[7]. There was decreased need for bone grafting. There was less incidence of infection due to limited exposure. There were less chances of refracture. There was no chance of vascular complication by carefully inserting the plate sub muscularly through limited incisions. There was no need of any specialized instrumentation and the method was less time consuming and cost effective in the present study in a similar fashion as reported by previous authors. With the introduction

of Locking Compression Plates (LCP), minimally invasive techniques have become widely used [10]. The plates act as internal fixators in a bridging manner, thus resulting in secondary bone healing. Thus, Biological plating for tibial fractures will prove to be a feasible and worthwhile method of stabilization while avoiding the severe complications associated with the more standard methods of internal or external fixation.

Conclusion

Minimally invasive plate osteosynthesis (MIPO) of the proximal and distal tibia offers several theoretical advantages compared to classic open reduction and internal fixation. A mechanically stable fracture-bridging osteosynthesis can be obtained without significant dissection and surgical trauma to the bone and surrounding soft tissues. In this study we looked at the results and complications in 30 consecutive patients treated with percutaneous plating for fractures of the distal and proximal tibia and plafond with a minimum follow-up period of one year. No significant soft tissue problems occurred. The need for bone grafting should be carefully evaluated in every case as we encountered 6 delayed unions. All fractures healed within one year except 2 which went into non-union; there were 2 malunions. The use of indirect reduction techniques and small incisions to insert hardware is technically more demanding and requires strict radioscopic control throughout the procedure, but it considerably decreases surgical trauma to the soft tissues. Most of the patients were in age group of 20-40 years (70%) with mean age of 36 years. Road traffic accidents were found to be the commonest mode of trauma (50%). Right limb was involved more often (70%) than the left. The mean time taken for starting partial weight bearing was 6 weeks, time for starting full weight bearing 12 to 22 weeks. The time taken for radiological union was 12 to 24 weeks. The average range of motion at the ankle for distal tibial fractures dorsiflexion & plantar flexion were 5 to 150 and 15 to 300 degrees respectively. The average range of motion at knee for proximal tibial fractures was flexion 60 to 135 degrees and full extension and in 4 patients we got extension lag. According to Tenny & Wiss and Ramuseen criteria we got 4 excellent, 15 good, 7 fair and 3 poor results. In our series 2 patients got superficial infection, 2 patients got deep infections and one patient had implant failure.

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