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A RANDOMISED PROSPECTIVE AND RETROSPECTIVE STUDY OF BIOLOGICAL PLATING FOR TIBIAL FRACTURES

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Abstract
A series of 30 patients of proximal and distal tibial fractures treated with minimally invasive techniques have been reviewed after surgery to study the results of fractures of proximal and distal tibia with biological plating. We have scored proximal tibial fractures according to Rasmussen scale and distal tibial fractures by Tenny and Wiss scale. Out of 30 patients, 5 had excellent, 15 had good, 7 patient had fair, and 3 had poor results. Two patients had superficial wound infection and two patients had deep infections. This minimally invasive technique for treatment of distal tibial fractures proves 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 of these fractures.
Keywords: Biological plating of tibia, MIPPO.

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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 mobilization 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 hematoma and causes soft tissue stripping that may result in infection, wound necrosis and delayed or non union. 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. Biological plating preserves the soft tissue envelope and the periosteum maintains arterial vascularity and therefore minimizes the surgical trauma to the zone of injury. 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:

1. Soft tissue remains intact.
2. There is some mobility in the fracture zone which accelerates the callus formation.
3. Reduced surgical time and tourniquet time along with smaller incision.

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Methodology

In this prospective study, 30 patients of proximal distal Tibia fractures admitted in our institute were studied during the period of January 2019 to December 2021. Patients with closed fractures of proximal and distal Tibia were included in this study.

These all fractures were classified according to AO Classification. We used LCP for both proximal and distal tibia fracture fixation. MIPPO technique was used. For distal tibia if there was fibula fracture then it was fixed first to achieve length and then distal tibia fracture was fixed.

Post-Operative Care

Intravenous antibiotic therapy was used for 2-3 days postoperatively according to the wound condition.

Passive ankle and knee joint motion was allowed as soon as possible.

After the soft tissues healed and postoperative swelling was diminished, the patient was allowed non-weight-bearing ambulation with crutches.

Progressive weight-bearing was encouraged once there was radiographic evidence of callus formation.

Fracture healing was assessed in the outpatient clinic at 6 weeks and 3 months postoperatively.

Clinical evidence of septic complications, incision breakdown, and skin necrosis was recorded.

Follow-up, including clinical examination and radiographic examination, was performed once a month until the fractures achieved clinical union based on the standard criteria (pain-free full weight-bearing).

Final evaluation was done for distal tibial fractures as per Teeny and Wiss clinical assessment criteria which is based on 100 points system and radiological assessment by ACFAS ankle score.

Final evaluation was done for proximal tibia fractures as per Rasmussen criteria which is based on 100 points.

Results

Figure 1: Pre-op and Post-op X-rays of distal tibia fractures treated with biological plating

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Figure 2: Range of movement at ankle joint after distal tibia fracture treated with biological plating

Figure 3: Pre-op and Post-op X-rays of Proximal tibial fracture treated with biological plating

Figure 4: Incision scar of biological plating done for proximal tibia fracture with full extension of knee and full flexion in cross legged position

Table 1: Functional Grading of the Patients (As Per Scale)

Sr. No	Grading	No of Cases	Percentage
1	Excellent	5	16.67
2	Good	15	50
3	Fair	7	23.33
4	Poor	3	10

Table 2: Type of Union

Sr. No	Type of fracture	No	Union	Delayed Union	Non Union
1	Type 4 1 A	3	2	1	0
2	Type 41 B	3	2	1	0

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3	Type 41 C	4	3	1	0
4	Type 43 A	18	14	3	1
5	Type 43 B	0	0	0	0
6	Type 43 C	2	1	0	1

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 .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. 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 submuscularly through limited incisions. There was no need of any specialized instrumentation and the method was less time consuming and cost effective. With the introduction of Locking Compression Plates (LCP), minimally invasive techniques have become widely used. 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

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 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 expect 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 radiographic 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, and time for starting full weight bearing was 12 to 22 weeks. The time taken for radiological union was 12 to 24 weeks. The average range of motion at the ankle joint for distal tibial fractures: dorsi & plantar flexion were 5 to 15^0 and 15 to 30^0 respectively. The average range of motion at knee joint for proximal tibial fractures: flexion 60 to 135^0 and full extension and in 4 patients we got extension lag. According to Tenny & Wiss and Ramuseen criteria we got 5 excellent, 15 good, 7 fair and 3 poor results. In our series 2 patients got superficial infection, 2 patients got deep infection and one patient had implant failure.

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