MIPPO Vs ORIF with Plate in Distal Tibial Fractures

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ABSTRACT

Objectives: To evaluate healing time and complications of distal tibial fractures treated by MIPPO and ORIF with plate.

Methods: 30 patients aged 20 - 65 years of either sex with fracture of distal tibia admitted in Fewa City Hospital, Pokhara were randomly divided into two groups. Group A – MIPPO, and Group B – ORIF with plating.

Results: For type A and B fractures healing time in both groups were similar but in type C healing takes longer in ORIF group. Similarly delayed union, non-union and infection were seen in ORIF and malunion in MIPPO.

Conclusions: It can be concluded from the study that MIPPO is better than ORIF for distal tibial fractures.

INTRODUCTION

Closed fractures of the tibial shaft traditionally have been treated with closed reduction and a cast. Since the late 1950s, open reduction and internal fixation (ORIF) was reserved for situations in which an adequate reduction could not be obtained or maintained by conservative means. ORIF often necessitates extensive dissection and tissue devitalisation, creating an environment less favorable for fracture union and more prone to bone infection. As a result, other less invasive methods were developed to treat diaphyseal fractures of the tibia. The most successful, closed intramedullary (IM) nailing, has been associated with shorter time to union and a shorter period of disability before working compared with closed reduction and fixation with a cast. IM nails have been greatly improved in recent years and indications for their use have been extended to fractures closer to the ankle joint.

In recent years, with the development of biological fixation and locking plates, the application of minimally invasive percutaneous plate osteosynthesis (MIPPO) technique in treating extremity fractures has been widely accepted. MIPPO has several advantages compared with traditional treatments. It can avoid direct exposure of metaphyseal fracture lines and adopt indirect induction to preserve vascular per fusion, among others. MIPPO has been successfully used in some fractures. Several studies reported that MIPPO technique could reduce periosteum damage, provide favorable micro environment for fracture healing, improve indirect bone healing, and reduce fracture healing time.

Therefore the present study aims to identify whether the clinical results of MIPPO for Distal Tibial Fractures are better compared with those of traditional open reduction and internal fixation (ORIF) and findings latter evaluated and discussed appropriately. For that purpose we compared the radiographic and clinical results of patients with fractures of the distal third of the tibial shaft, treated with ORIF with plate and those treated with MIPPO.
METHODS
The study was conducted at Fewa City Hospital Pvt. Limited, Pokhara, between January 2011 to July 2012. Patients aged 20-65, diagnosed with closed distal tibial fracture with or without fibular fracture were included in the study. Open fracture, pathological fracture, head injury were major exclusion criteria for the study. This is a prospective study based on convenient sampling. Operation was performed 1 to 5 days after the incidence. Before the operation, patient was treated with analgesic, antibiotic, serratopeptidase, elevation and ice compression.

Operative procedure
For all the patients, pre-anaesthetic check-up was performed. Patients were in supine position. Spinal anaesthesia or general anaesthesia was given according to the condition of the patient in most of the cases. Tourniquet was used for open cases only. Semi-tubular plates were used when there was associated fibular fracture. Antero-medial incision was given. Fracture site was exposed without periosteum stripping. One or two cortical screws used as a lag screw in spiral or oblique fractures. Fracture was completely fixed with a locking plate. In closed group, operation was performed under image intensifier. Plate was inserted percutaneously from distal to proximal in closed group. Alignment and length was maintained under image intensifier. Plate was fixed with locking screws. 6 - 9 screws were applied according to the extent of fracture type. Suction drain was used only in open cases.

Post operative care
Antibiotic (Inj. Cefazolin) was used at least for seven post-operative days may increase up to 15 according to the wound condition. Drain was removed after 48 hours of operation. Active ankle and range of motion were allowed after 24 hours. Patient was allowed non-weight bearing crutch walking after swelling diminished. After radiographic evidence of callus formation appeared, patient was encouraged to weight bear after partial weight bearing exercise. X-ray was taken after 3 - 6 weeks and 3 months after operation. Other complications like sepsis, skin necrosis were recorded. Evaluations were performed based on the range of ankle motion, limb rotation, fracture healing and radiographic alignment. Healing was evaluated by radiological callus formation and pain-free full weight bearing walking. Healing time less than 6 months was considered normal, 6 - 9 months was considered delayed union and non-union after 9 months. Angulation or rotational deformity of 5 degree or more was considered as malalignment.

RESULTS
During the study period of 1 year, a total of 35 patients were included. Out of those total patients 13 were in group A (ORIF) and 17 in group B (MIPPO). 5 patients were omitted as they did not come for follow up. In group A with open reduction and plating 8 were males and 5 were females whereas among 17 patients in group B (MIPPO) 13 were males and 4 females. Mean age in group A was 43.4±12.5 and in group B was 44.3±13.2.

<table>
<thead>
<tr>
<th>Sex Distribution</th>
<th>Group A</th>
<th>Group B</th>
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<tbody>
<tr>
<td>Male</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Female</td>
<td>5</td>
<td>17</td>
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<table>
<thead>
<tr>
<th>Types of Fractures</th>
<th>No of Patients</th>
<th>%</th>
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<tbody>
<tr>
<td>Type A</td>
<td>17</td>
<td>56.7%</td>
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<tr>
<td>Type B</td>
<td>8</td>
<td>26.7%</td>
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<tr>
<td>Type C</td>
<td>5</td>
<td>16.6%</td>
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<tr>
<th>Healing Time in months</th>
<th>Group A</th>
<th>Group B</th>
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<tr>
<td>Type A</td>
<td>4.99 ± 1.25</td>
<td>5.32 ± 1.29</td>
</tr>
<tr>
<td>Type B</td>
<td>6.40 ± 1.72</td>
<td>5.58 ± 0.58</td>
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<tr>
<td>Type C</td>
<td>5.60 ± 1.58</td>
<td>10.32 ± 1.68</td>
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<tr>
<th>Complications</th>
<th>Group A</th>
<th>Group B</th>
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<tbody>
<tr>
<td>Delayed Union</td>
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<td>1</td>
</tr>
<tr>
<td>Non Union</td>
<td>1</td>
<td>0</td>
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<tr>
<td>Malunion</td>
<td>0</td>
<td>2</td>
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<tr>
<td>Infection</td>
<td>1</td>
<td>0</td>
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DISCUSSION
In recent years, various reports have argued that the MIPO technique is a safe method of managing distal tibial fractures, while avoiding some complications associated with conventional open plating methods. Some studies have also revealed defects of the MIPO technique. Hasenboehler et al reported that although MIPO seems more advantageous for soft tissue and bone biology, prolonged healing times were observed in simple fracture patterns20. Khoury et al pointed out that for the MIPO technique, reduction should be performed cautiously due to the tendency of sagittal plane malreduction21. Therefore, whether the virtues of the MIPO technique exceed ORIF is
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not clear. The MIPO technique requires only realignment of tibial mechanical axis, and clear exposure of the fracture is not necessary. It is a typical method based on biological fixation which involves minimal soft tissue dissection with preservation of vascular integrity of the fracture. The intraoperative image intensifier helps with the closed reduction and avoids excessive disturbance of the fracture fragments. For comminuted fractures, the MIPO technique is particularly advantageous over ORIF. Based on the theoretical considerations, the MIPO technique claims an earlier union process, as well as lower risks of infection, non-union and other complications.

Cheng W et al didn’t find any significant difference between the MIPO and ORIF for the treatment of distal tibia fractures. They also found out that irritation symptoms were more frequently encountered in the MIPO group. Similar results were reported by Lau et al whereby 52% (25/48) of distal tibia fracture cases treated by MIPO had the implants removed due to skin impingement. This could be related to the thin subcutaneous tissue and suboptimal premoulding of plates. Despite the advantages of closed reduction and slight disturbance of soft tissue, MIPO has the disadvantages of non-accurate reduction. The fragments may be not tightly compressed which could increase the risks of delayed union and non-union, especially for simple fractures. Several studies have reported the rate of delayed union or nonunion to be 5–17%.20,24

Cadaver research suggests that the MIPO technique may carry a higher risk of injury for saphenous nerve and long saphenous vein. Zou J et al concluded that MIPO was superior to ORIF for treating Type C tibia fractures. The healing time of Type C in the open group was longer than that in the closed group (p<.05). The first choice for Type C fractures is MIPPO, whereas that for Type A is open reduction.

In our study we found no difference in healing time in group A and group B in type A and fracture type B. For these fractures both the methods of operation is preferable except there is a long scar in open method. But in case of type C fractures which was comminuted healing time was more in open group than closed one. Less soft tissue entrapping, eliminate many small fragments and periosteal stripping cause faster healing in closed group where as delayed union and non-union seen in open group.

This result was similar to the study done by Collinge and Protzman and Zou and Shi. In their study MIPO technique showed few problems like delayed union and non-union due to intact periosteum, no anatomical reduction due to small incision, rotational and angular deformity. By this study MIPO is the first choice in type C distal tibial fractures. For group A fractures MIPO can try first if not perfect reduction achieved, then switch to open reduction.

CONCLUSIONS

In conclusion, MIPO is one of the better choice of treatment of distal tibial fractures than ORIF.

REFERENCES


