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A comparative study of intra-medullary interlocking nailing versus locking compression plating in tibial diaphyseal fractures

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Abstract

Background: Tibia is the most commonly fractured long bone in the body and treating the tibial fractures continues to be controversial. In this study we aim to treat the tibial diaphyseal fractures giving them a stable construct which allows early weight bearing with minimal complications.

Material and Methods: In this study we have taken 50 patients with diaphyseal tibia fractures of which 25 are treated with Intramedullary Interlocking nail and the remaining 25 are treated with Tibia locking compression plate. Our study was a comparative and prospective study. We have compared the outcomes in various aspects including the union time, time to mobilisation and post op complications. The functional outcome at one year were measured and compared.

Results: All the 50 patients are in the age range of 20 -70 years. We have identified road traffic accidents (which accounted up to 65%) to be the most common mode of trauma besides the domestic accidents (Which accounted up to 35%). The rate of union is high in patients treated with nailing than the patients treated with plating. The average time for union in patients treated with nailing was 16 weeks (16-22 weeks) when compared to patients treated with plating which was 24 weeks (22-30 weeks), ($p=0.001$). The time for mobilisation is significantly less in patients treated with nailing when compared to patients treated with plating ($p=0.001$). The rate of union is high in patients treated with nailing than the patients treated with plating. Post-operative complications such as infection was found to be of high incidence in patients treated with plating. However, 4 % patients treated with nailing was found to have mal-alignment. The functional score in patients treated with nailing was found to be better than those treated with plating.

Conclusion: We conclude that intra-medullary interlocking nail is a reliable and satisfactory method for the treatment of diaphyseal tibia fractures with high union rates, good functional outcome and low complications.

Keywords: Diaphyseal tibia fracture, intramedullary interlocking nail, tibial locking plate

Introduction

Diaphyseal tibial fractures have been a challenge to the orthopaedic surgeons for over the Past two decades and the management is widely controversial and has been debated all over the world.

The frequent soft tissue injury associated with tibial fractures pose difficulty in treating the tibial fractures. The controversy of choice of implant in treating the tibial diaphyseal fractures is widely debated topic which often lead to controversy among the orthopaedic surgeons. The treatment options of the diaphyseal fractures slowly shifted from closed reduction and casting to the surgical methods since the last two decades. Open reduction and internal fixation had been advised in those cases where an adequate reduction couldn't be obtained from conservative treatments. The time of surgery, blood loss, excessive soft tissue dissection and devitalisation pose a greater risk in treating the diaphyseal fractures with open reduction and internal fixation. The complications such as infections and secondary wound closures are a challenging aspect in open reduction of the tibial diaphyseal fractures. This led to more less invasive methods in treating the fractures of tibial shaft fractures^[1].

Early mobilisation of the patient and high rate of union of the fracture can be obtained by closed reduction and fixation with intra-medullary interlocking nail compared to the patients managed by cast fixation^[2, 3].

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Over the past recent years, the intramedullary interlocking nails have been greatly improved in terms of design and the use of different materials have also ensured their use in treating fractures closer to the ankle joint [4, 5].

Open reduction and internal fixation with locking plates involve extensive soft tissue dissection and excessive periosteal stripping which often increases the risk of infections and delayed wound healing. In this study, we have compared the radiographic and clinical results of patients with diaphyseal tibial fractures, treated with tibial locking plate with those treated by Intramedullary interlocking nailing.

Material and Methods

Fifty patients with a fracture of the diaphyseal tibial fractures are taken up for the study from May 2014 to May 2016. The study was conducted in the Department of Orthopaedics, Guntur Medical College and Government General Hospital, Guntur and Visakha Institute of medical sciences, Vishakhapatnam. In this study 25 patients with diaphyseal tibial fractures were treated by closed interlocking nail and another 25 patients with tibial locking plates. A Thorough history was taken in all the 50 patients to assess the mode of injury and quality radiographs were taken to know the geometry of fracture. After the thorough preoperative assessment, the patients were taken up for surgery. The duration between the occurrence of injury and the fixation is within three to four days in all the cases.

The criteria for inclusion in the study were patients with diaphyseal tibia fractures with patients aged between 20 years and 70 years and patients having a closed or type I (Gustillo and Anderson) compound fractures of tibia. Those patients with pathological fractures of tibia, distal and proximal tibial fractures, type II and type III compound fractures were excluded from the study.

This is a prospective study and the patients who are eligible were randomly divided into two groups. The Nailing Group included 25 patients treated with closed reduction and fixed with intra-medullary interlocking nail [Fig 1, Fig 2] and Plating Group included 25 patients treated tibial locking plate [Fig 3, Fig 4]. Approval from the institutional ethics committee was sought for conducting the study. All patients were immobilized in an above knee slab after radiographic evaluation. Patients were assessed Pre-operatively and an informed written consent for surgery was taken from each of the patients.

Postoperatively, the patients treated with Tibial locking plate were immobilized in plaster two weeks till the sutures were removed. Physiotherapy was actively proposed in both the set of patients. Static quadriceps exercises, hamstring strengthening exercises, straight leg raising exercises were done in all the patients. Strict non-weight bearing walking with walker support was advised in all the patients. A thorough radiological assessment for the signs of callus were done at the end of six weeks and full weight bearing was initiated. A regular follow-up of the patients was done at 6, 12, 18 and 24 weeks and then every three months till one year. Assessment of functional outcome was done by Thoressen's Criteria and Johner and Wruh's Criteria. Statistical analysis was performed using SPSS 16.0 software package with the use of un-paired t test to compare differences between the two groups with regard to mean age, time to weight bear and time to union.



Fig 1 & 2: Patient with tibial diaphyseal fracture treated with locking compression plating – preoperative and post-operative x-rays



Fig 3 & 4: Patient with tibial diaphyseal fracture treated with intramedullary interlocking nailing - preoperative and post-operative x-rays

Results

This study includes 50 patients of which, 25 patients were treated with Intramedullary interlocking nail and another 25 were operated with tibial locking compression plate. Twenty-six patients included in this study were aged between 34- 55 years which account for 52% of the total patients and another fifteen patients were aged between 20 to 33yrs which account up to 28%. The remaining 10 patients were aged between 55- 70 years which account up to 20%. In this study males constitute 38 patients which account to 78% and another 12 were female patients which account to 22%. Out of fifty patients, thirty-two patients (60 %) had diaphyseal tibial fracture due to road traffic accident and eighteen patients (40%) had diaphyseal tibial fracture due to domestic accident. The average time to fully weight bear on the operated limb in patients treated with Intramedullary interlocking nail is 14.2 ± 1.12 (range, 13-17 weeks) weeks. Whereas, the average time to fully weight bear on the operated limb in patients treated with locking compression plate is 14.2 ± 1.12 (range, 13-17 weeks) weeks. The patients treated with Intra medullary nailing were able to fully weight bear early when compared to the patients treated with plating (P value 0.001). The rate of union is high in patients treated with nailing than the patients treated with plating. The average time for union in patients treated with intramedullary interlocking nailing was 17.1 ± 1.12 (16-22 weeks) when compared to patients treated with plating which was 22.8 ± 1.18 (22-30 weeks), ($p=0.001$). Three patients from the plating group had delayed union. The functional score of the patient is assessed by Thoressen's Criteria. The mean functional score of the patients treated

with intramedullary interlocking nail at the end of one year was higher (80.6) when compared to those treated with locking plate (70.3). Five patients treated with locking compression plate had infection in post-operative days, whereas none of the patients treated with intramedullary nail had infection. However, 4 % of patients treated with intramedullary nailing was found to have mal-alignment.

Discussion

Good results are obtained with Diaphyseal tibial fractures using AO principles with open reduction and internal fixation. In this prospective study, the Diaphyseal tibial fractures treated with Intra medullary interlocking nail and locking compression plate were compared and assessed in terms of functional outcome. The mean age of patients treated with Intra medullary interlocking nails was 46 years and those treated with locking compression plate is 43 years. Road traffic accidents were the commonest mode of trauma in both the set of patients. Mohammed A *et al.* [6], conducted a study in which the mean age of the patients was found to be 42 years and the ratio of male to female is 4:1 with common mode of trauma being road traffic accidents. The patients treated with Intra medullary interlocking nail was allowed to fully weight bear on the operated limb was found to be 14.2 weeks, where as those patients who are operated by plating was found to be 17.6 weeks (p-value: 0.001). The patients treated with intra medullary interlocking nail were able to weight bear early when compared to those who are treated with plating. Jayesh V *et al.* [7], has stated in his prospective study that the patients treated with intra medullary nail had significantly early full weight bearing. In our study the mean time for the union of the fracture in patients treated with intra medullary nail was found to be 17.1 where as those treated with plating was found to be 22.8 with a significantly high statistical difference (p-value: 0.001). As similar study by Kasper W *et al.* [8], has observed the average time for union is 21 weeks in the patients treated with open reduction and internal fixation when compared to the patients treated with intra medullary nail which was 19 weeks. In our study, all the patients treated with intra medullary nail had satisfying union of the fractures. None of our case has reported non-union. However, three patients treated with plating found to have delayed union. Kasper W *et al.* [8], observed 16.7% delayed union with open reduction and internal fixation. Post operatively 5 patients treated with plating were found to have deep seated infections in the operative site. Krzysztof Piatkoski *et al.* [9], observed 5 (11.1%) patients to have late infection of the metal implant among 45 patients in his study. Our study showed a satisfying functional score of 80.6 in patients treated with intra medullary interlocking nail when compared to the patients treated with locking plate. Statistically, the difference isn't significant among both the set of patients. Three patients treated with intra medullary inter locking nail had valgus mal alignment of greater than 5 degrees whereas none of our patients treated with locking plate had any significant mal alignment. Krishan A *et al.* [10], in his study of 35 patients, two patients are found to have an angulation of greater than 5 degrees in any plane. A similar study by Egol K A *et al.* [11], has stated that the failure of nail or locking screws and nail is a reported complication in intra medullary inter locking nail. However, there wasn't any such case in our study

Conclusion

This study concludes that tibial diaphyseal fractures treated with intra-medullary interlocking nail gives better results when compared to fractures treated with tibia locking compression plate. Nailing ensured early mobilisation, high rates of union and less complications. locking compression plating of tibial diaphyseal fractures were associated with high incidence of complicates such as infections and often required secondary surgical procedures for wound closure. protected weight bearing was required in patients treated with locking compression tibial plate. Thus, we would like to conclude that intra-medullary interlocking nail is a safe, reliable and satisfactory method for treatment of fractures of tibial diaphyseal fractures with high union rates, good functional results and with comparatively less complications.

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