

Secondary Intramedullary Nailing After Primary External Fixation In The Treatment Of Tibial Fractures

A Bashir, T Dar, A Badoo, M Ganie

Citation

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Abstract

Results of the treatment of 10 open tibial fractures are reported. Initial treatment involved application of external fixator, debridement of wound and parental antibiotic administration. Secondary procedure was carried out on an average of 8 weeks after the initial procedure. Secondary intramedullary interlocking nailing was done with Gross-Kempf tibial nail. All fractures united at an average of 14 months after secondary procedure. Pin tract infection was seen in four cases and was treated with appropriate antibiotics in three patients and removal of nail in one case. More than five degree deformity in the coronal plane was seen in two cases and 10 degrees of sagittal plane deformity in one case. The over all functional outcome was satisfactory in this series. The findings of the study suggest that primary external fixation followed by secondary intramedullary nailing is a viable option in open tibial fractures in adults.

INTRODUCTION

External fixation is currently accepted as the treatment of choice in Gustilo and Anderson¹ type II and type III open tibial fractures. It has also been advocated for the treatment of closed and type I open tibial fractures, although poor results in the management of these fractures has been reported.

Intramedullary nailing has been a recognized treatment for tibial fractures, and the development of interlocking nail has further popularized this modality. Results of treatment of closed and type I open fractures has been excellent with this technique²³. Intramedullary nailing is associated with a high rate of union, reduced requirement for bone grafting, decreased hospital stay, low incidence of malunion and rapid return to work⁴.

External fixation is associated with a number of complications like- pin tract infection, loss of fixation, non-union, delayed union and malunion⁵. This has discouraged surgeons all over the world in accepting external fixation as a definitive method of fracture treatment. Nonetheless it does have a role in primary treatment until the soft tissues heal and patient is fit to undergo secondary procedure i.e. secondary nailing. We are presenting our experience with this technique of primary external fixation and secondary intramedullary nailing in ten cases of open tibial fractures.

MATERIALS AND METHODS

Ten cases of open tibial fractures were treated with primary external fixation and secondary nailing, between august 2004 to December 2005. There were seven male and three female patients. The average patient age was 35 years [range, 23-47 years]. The fractures were classified according to Gustilo Anderson system. One was type I, six type II and three type III fractures. Seven patients sustained these injuries in road traffic accidents and other three due to fall from height. Six patients had isolated injuries whereas other four had associated injuries.

Initial treatment involved debridement of the soft tissue and stabilization of the fracture by an AO external fixator. The wound was left open. Antiseptic dressings, serial debridement and antibiotics were administered till the wound healed. The average time on external fixator was 6 weeks with a range of 4 to 9 weeks. There were three reasons for secondary conversion of external fixator to intramedullary nail. In four cases external fixation was done to facilitate transport the patient to neurosurgery unit to rule out/manage head injury. Another four cases showed no signs of union and were planned for definitive procedure. In the remaining two cases malunion was reason for secondary procedure.

Secondary procedure was done under general, spinal or epidural anesthesia. Gross-Kempf reamed intramedullary nail of proper length and diameter was used in each case.

Medial parapatellar incision was given to make an entry portal just medial to the tibial tuberosity with the help of a tibial awl. A guide wire was passed in to the canal and reaming done to a diameter 1 mm higher than the diameter of the nail to be used. Nail was hammered into place and proximal locking carried out through the jig. Distal locking was carried by free hand technique. Postoperatively, full mobilization of all adjacent joints was encouraged. Fracture union was defined by the usual clinical and radiological criteria with absence of pain at rest being the most useful clinical sign of fracture healing.

Malreduction or malunion was defined as being present if there was more than 5 degree of angular or rotational deformity or one cm of leg length discrepancy. Pin tract infection was defined as the presence of erythema and discharge from a pin site from which bacteria were cultured.

RESULTS

All the fractures united after secondary intramedullary nailing, and bone grafting was not required in any case. The average time to union in this case series was 14 week after the secondary procedure [range 11-20 weeks].

Pin tract infection developed in four patients, requiring frequent debridement and eventually removal of nail in one patient. Nail was also removed in two more case after the fracture union due to recalcitrant anterior knee pain. Out of four patients who developed pin tract infection two had type II open and other two type III fractures. Three patients grew staphylococcus aureus on culture and the fourth one pseudomonas aeruginosa. Staphylococcus infection responded to appropriate antibiotics, but in case of pseudomonas, infection subsided with the removal of nail.

Malunion of more than 5 degrees was seen in the coronal plane in two cases, and of 10 degree in sagittal plane in one case. This however, did not affect the final outcome.

DISCUSSION

Open tibial fractures were previously treated by closed reduction and casting, with a window created at the fracture / wound site for care of the soft tissue. The introduction of external fixator revolutionized the management of open fracture and this was particularly true with regard to the high velocity trauma sustained in road traffic accidents and firearm injuries. External fixator and intramedullary nail is currently the method of choice in the treatment of open tibial fractures. There are reports ⁴ on the combined use of these two methods in the treatment of open tibia fracture

highlighting the advantages of external fixation for the management of soft tissue problems with the advantages of intramedullary nailing in avoidance of malunion, reduced incidence of delayed union and early rehabilitation. Wheelwright and Court-Brown ⁴ reported the results of primary external fixation and secondary intramedullary nailing of 21 tibial fractures. They concluded that if secondary nailing is delayed until after granulation of the pin sites the technique is associated with a low infection rate. The union time of tibial fractures compared well with that of external fixation, although in closed and Gustilo type I open fractures primary intramedullary nailing gives superior results.

Blachut et al ⁶ reported five percent deep infection rate and 95 percent satisfactory alignment. They had five percent non-union but all their fractures were open. We had no non-union in the present series and malalignment was seen in three cases. McGraw and Lim ⁷ experienced considerable difficulty with this technique. They analyzed the results of 16 patients with open tibial fractures and reported 50% non-union rate and 44 percent rate of deep infection. Maurer et al. ⁸ analyzed the results of 24 patients with open tibial fractures. Out of these 29 percent developed pin tract infection, and five subsequently developed infections after nailing. Only one of the sixteen patients who did not develop pin tract infection developed infection after nailing. The overall infection rate was 25 percent and they concluded that pin site infection after external fixation was a contraindication to secondary intramedullary nailing. However their series differed from our series and other latest reports in that they used an older version of AO nail which did not have an interlocking capability.

Wheelwright et al adopted the policy of allowing the pin tract infection to granulate before secondary nailing was undertaken. This was done either by calcaneal traction and patient immobilization or by the application of a patella-bearing cast. We did not pass calcaneal pin in any case and the limb was conditioned in a PTB cast before the secondary procedure was contemplated.

Pin tract infection rate in our series was 37 %. The pin tract infection rate reported by others is 33 % with fracture infection rate of 4.8%. This difference could be due to the difference in the type of fractures, age of the patient, type of external fixator used and postoperative care. The rate of pin tract infection can be decreased by meticulous surgical techniques, predrilling before the insertion of pins, early

ambulation and proper antibiotic prophylaxis. The rate of infection with ring fixator is somewhat lower than that reported with AO fixator, and it could be due to lesser soft tissue insult with small diameters of ring fixator.

Recent reports on intramedullary nailing of type II and type III open tibial fractures have shown excellent results⁹. We have not been able to adopt this modality, however, due to lack of emergency facility for intramedullary nailing and external fixator still remains the primary method of treatment in our case. There are centers in the world that prefer primary external fixation followed by delayed intramedullary nailing for open tibial fractures and this has been our protocol. In case of defects due to loss of a segment we prefer Ilizarov ring fixator to an intramedullary nail due to the acknowledged versatility of the former in managing infection, defect non-unions, and deformity obviating the need for multiple secondary procedures.

CONCLUSION

The treatment of open tibial fractures is a fast evolving subject. In the best trauma centers of the world primary nailing is preferred to application of an external fixator, which has been labeled as a non-union machine. There are others who use primary external fixator followed by secondary intramedullary nailing after the soft tissue has healed. We achieved satisfactory result with the second modality and we would, suggest that nailing should be avoided in the initial phase and consideration should be

given to other modes of treatment as well like Ilizarov ring fixator.

CORRESPONDENCE TO

Govt; Hospital for Bone & Joint Surgery, Barzulla, Srinagar
Cell: 9419006751 Email: drarshadbashir@gmail.com

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Author Information

Arshad Bashir, M.S.Ortho

Bone & Joint Hospital Barzulla

Tahir A. Dar, M.S Ortho

Bone & Joint Hospital Barzulla

Abdul Rashid Badoo, M.S Ortho

Bone & Joint Hospital Barzulla

Muzaffar A. Ganie, M.S Ortho

Bone & Joint Hospital Barzulla