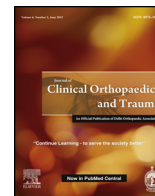




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Full length article

Evaluation of functional outcome of pilon fractures managed with limited internal fixation and external fixation: A prospective clinical study

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ABSTRACT

Introduction: The management of pilon fractures is controversial primarily due to the high rate of complications irrespective of the mode of treatment. Limited internal fixation with external fixation is associated with minimal soft tissue handling. This may reduce the chances of wound dehiscence and infection. This study was designed to evaluate the functional and clinical outcomes in patients treated with limited internal fixation combined with external fixation in pilon fractures.

Material and methods: This study was conducted as a prospective clinical study on 56 skeletally mature patients with closed fractures with poor skin condition, and with open grade 1 and grade 2 distal tibial intra-articular fractures. All patients were treated with combined limited internal fixation and ankle spanning external fixation.

Results: All fractures in this series united with an average time period of union of 18.3 weeks (ranging from 13 weeks to 30 weeks). There was no non-union in any case. There was malunion in 4 cases, varus malunion (>5 degree) in 2 cases and recurvatum in another 2 cases). Excellent to good functional results were observed in 88% cases based on the modified Ovdia and Beals score. The mean ankle dorsiflexion and planter flexion movements were 10.2±5.3 degrees and 27.4±7.2 degrees respectively. Infections occurred in 6 patients which included 4 pin tract infections and 2 superficial wound infection, all 6 healed after removal of pin tract and with oral antibiotics.

Conclusion: The technique of combined external fixation with internal fixation is safe and effective management option for intra-articular distal tibial fractures.

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1. Introduction

Intraarticular distal leg bone fractures involving the weight bearing area of tibia are termed as pilon or tibial plafond fractures and constitute 1% of lower limb fractures and 7% of tibial fractures.^{1–3,7} These fractures result from high energy trauma in young patients with road traffic accidents or from low velocity trauma in elderly patients. High velocity trauma is often associated with intraarticular comminution, multiple metaphyseal fragments and soft tissue injuries, making their management challenging.⁷ The management of these fractures is under debate because of the

associated high rates of complications irrespective of the mode of treatment chosen. The choice of treatment must take into account not only the stabilization of the fracture but also the management of the soft tissue injury.⁸ Management options include manipulative reduction and cast application, open reduction and internal fixation with plates, fibular stabilization alone with plate or intramedullary implant, two staged management, primarily by external fixator followed by definitive internal fixation once skin condition becomes good, or by combined limited internal fixation with external fixation.^{3–6,9,14}

Conservative treatment with cast is often associated with joint stiffness, nonunion, malunion, secondary arthritis and reflex sympathetic dystrophy and has limited indications now a days.⁵ Open reduction and internal fixation is also associated with high rate of complications like wound dehiscence, infection and delayed union.^{4,7} Two staged treatment by initial primary ankle spanning fixator with or without fixation of fibula followed by delayed open

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reduction and internal fixation has the advantage of better soft tissue management. However, accurate anatomical reduction is technically difficult to achieve after three to four weeks of waiting for the skin condition to improve and often require extensive soft tissue dissection. Moreover, two surgeries lead to an increased cost and time of treatment which may not be applicable in developing countries which have limited resources and operating room facilities.^{7,8}

Limited internal fixation with external fixation associated with minimal soft tissue handling, leaving no large implant subcutaneously may lead to less chance of wound dehiscence and infection. With this approach pilon fractures with poor skin condition can be managed definitively early with good results.^{8,10}

Considering all these facts this study was conceived and designed so as to evaluate overall function and clinical outcomes of patients treated with this procedure and to discuss merits, demerits and cost effectiveness of this procedure.

2. Material and methods

This prospective clinical study was conducted on 56 patients with intra-articular fracture of distal tibia treated with combined limited internal fixation and external fixation by a single senior surgeon (MCB) at a tertiary trauma centre, over a period of four years. After exclusion of 6 patients (which were lost to follow up), a total of 50 patients were included for final outcome analysis with minimum of one year follow up. Ethical clearance was obtained from the institutional review board and patients were included after written informed consent was obtained.

Skeletally mature patients with closed fractures and poor skin condition and open grade 1 and grade 2 pilon fractures were included in the study. Patients with metadiaphyseal distal tibial fracture without intra-articular extension, open grade 3 fractures, pathological fractures and patients with multiple musculoskeletal injuries to same or opposite lower limb were excluded. All patients were subjected to a detailed history, clinical and radiological evaluation. Fractures were classified according to Ruedi and Allgover classification.⁴ Open fractures were classified according to Gustilo and Anderson classification.¹¹ Surgery was undertaken within 2 weeks of being injured, depending on the general medical condition and fitness for anaesthesia.

2.1. Surgical technique and rehabilitation

Under all aseptic precautions, patients were operated under spinal or general anaesthesia with patient in supine position on a radiolucent table under tourniquet control. Preoperative intravenous antibiotic (cefuroxime) was administered to all patients. A thorough debridement and wound irrigation was done in patients with open fractures. The fibula was fixed first after open reduction using 1/3 tubular plates in spiral or comminuted fibula fractures and by closed reduction and fixation with Rush pin or Kirschner wire (K-wire) in transverse fractures, to maintain the length and rotation of the limb. The tibial fracture was reduced under image intensifier using traction and manipulation. A 4.5 cm Steinmann pin or Denham's pin was used inserted into the calcaneus was used for traction. The reduction was maintained by application of reduction clamps, inserted through stab (0.5 cm) skin incisions. Blunt dissection was done down to the bone using a straight hemostat and k wires and/or screws were used to fix each major periarticular fragment. If needed small curved periosteal elevators were inserted through stab incisions to elevate the depressed articular fragments. Two 4.5 mm Schanz screws were inserted in the tibia and connected to each other. The schanz screws were then connected to the calcaneal pin to complete the ankle spanning external fixator. Bone grafting using cancellous bone from the iliac crest of the same side was done as and when deemed necessary to fill up the metaphyseal void formed. Thus, the limited internal fixation was obtained by using K wires and/or screws and the fracture was stabilized using the ankle spanning external fixator (Figs. 1 b and 2c,d).

Postoperative intravenous cefuroxime along with amikacin was given for three days. The limb was elevated on two pillows and patients were advised to do active toe movements. Wound was inspected after 48 h of surgery. Suture removal was done after two weeks of surgery. External fixator and k wire removal was done after radiological callus formation and a below knee cast applied subsequently for a period of 4 to 8 weeks depending upon signs of radiological and clinical union. Patients were allowed non weight bearing crutch walking after removal of the sutures and a decrease in the swelling. Partial weight bearing crutch walking was allowed after the below knee cast was applied and full weight bearing mobilization was allowed only after fracture union.

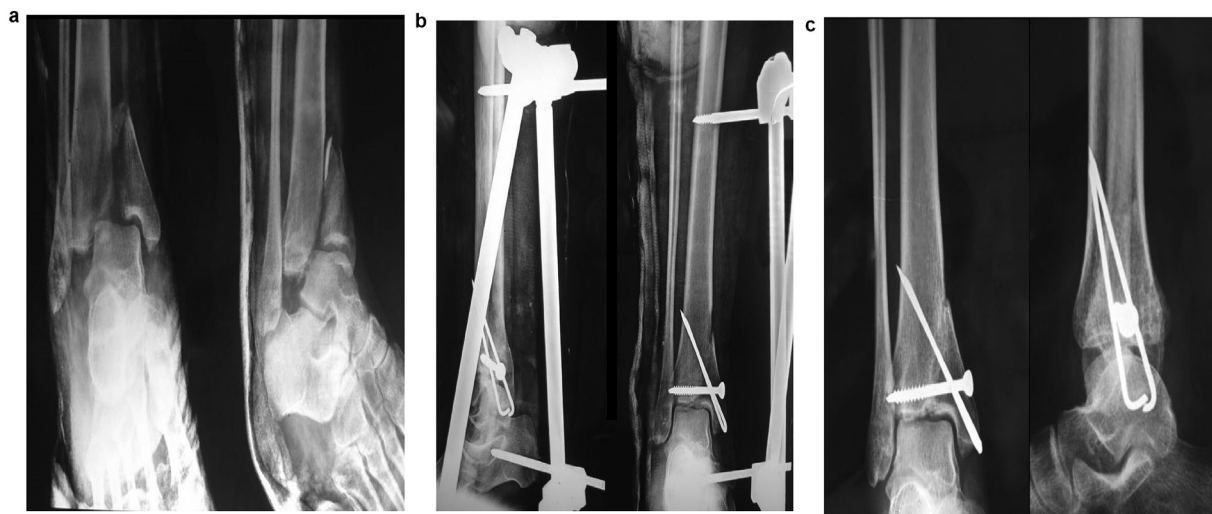


Fig. 1. a,b,c Type 2 pilon fracture treated with combined internal and external fixation with good outcome.

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