Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 **VOL14, ISSUE 07, 2023**

Results of Ilizarov ring fixator and plate osteosynthesis in extra articular pilon fracture

Gyaneshwar Tonk[1], Jitender Sharma[2*], Manvendra Gaur[3], Sahil Garg[4]

[1]Professor and head, Department Orthopaedic, LLRM Medical College, Meerut

[2]Junior resident (JR-3,) Department Orthopaedic, LLRM Medical College, Meerut [3]Associate professor, Department Orthopaedic, LLRM Medical College, Meerut

[4]Senior resident, Department Orthopaedic, LLRM Medical College, Meerut

***Corresponding Author: Jitender Sharma,**

drjeetkaushik@gmail.com

ABSTRACT

Introduction: The fracture of tibial pilon is a kind of break that basically includes the mass bearing surface of the ankle joint and the crack happens to be at the bottommost of the tibia. A pilon fracture classically ensues as the consequence of an event involving vigorous energy like a car crash or fall from a high altitude. This prospective study involves a number of closed extra articular pilon fractures managed with Ilizarov ring fixator or plate osteosynthesis.

Aims and Objectives: To study the results of Ilizarov ring fixator and plate osteosynthesis in extra articular pilon fracture.

Material and Methods: Our study was a prospective type observational study comprising patients visiting orthopaedics department of LLRM medical college, Meerut for one and half year (April 2021 to October 2022). The functional outcomes were assessed on patients fulfilling inclusion criteria by American orthopaedic foot and ankle society score.

Results: Out of 24 patients involved in the study, 13 were treated with plate osteosynthesis and 11 using Ilizarov ring fixator. In patients of Ilizarov; 8(72.72%) were having good outcome and 3(27.27%) excellent outcome. Patients who were treated with plate osteosynthesis, 7 (53.84%) showed good outcome and 6(46.15%) excellent outcome.

Conclusion: In our study we found that, treatment of extra articular pilon fracture ORIF with plate osteosynthesis is better modality as it results into early mobility and offers adequate stability. The

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management with open reduction aids in attaining drop in difficult conditions and also results in rapid union of the fracture as it delivers better anatomical reduction of the fracture.

INTRODUCTION

The fracture of tibial pilon is a kind of break that basically includes the mass bearing surface of the ankle joint and the crack happens to be at the bottommost of the tibia. This kind of injury generally shatters the other bone in the lower limb also i.e. the fibula. A pilon fracture classically ensues as the consequence of an event involving vigorous energy like a car crash or fall from a high altitude. This kind of fracture is one of the utmost tough fractures to treat and around 1% of all the lower limb fractures are of this type.[1] The fracture of tibial pilon is mainly the outcome of axial loading on it and the fast axial loading spreads an extrasum of energy causing severe injuries.[2] An attempt of open reduction of the displaced fragments of these fractures can result not only to non-union but can also be the reason for high incidence of wound problem due to the precarious blood supply to the bottom end of the tibia.[3,4,5] However then too, several surgeons favor rigid internal fixation after open reduction in these type of fractures and have successfully managed the cases with good clinical results.[6] Various modality of treatment available are conservative management with traction or casting, open reduction internal fixation with plate osteosynthesis, intra medullary nailing, Ilizarov ring fixator, External fixation using AO external fixator and hybrid external fixator. The main objective of this prospective study is to assess functional outcome of Ilizarov ring fixator and plate osteosynthesis in closed extra articular pilon fracture.

MATERIALS AND METHODS

The study has enrolled a total of 24 patients with closed extra articular pilon fractures admitted in the concerned institute from april 2021 to october 2022. All patients visiting the emergency unit with history of trauma around ankle were thoroughly evaluated with detailed history regarding mode of injury, skin condition, oedema, any wound, intra articular involvement etc. Those patients with oedema and skin blisters were kept on limb elevation for minimum of 7 days until the oedema subsided. A true AP, lateral and mortise view were done for all patients with full length view of affected limb to rule out any associated fracture. The study has categorized the fractures on the basis of AO classification. Preoperative CT scan was performed to rule out any articular involvement. Definitive fixation in the form of open reduction in addition to internal fixation with

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plate osteosynthesis was done once associated oedema subsided and wrinkle sign become positive. Post operatively at least for 6 weeks, a non-weight bearing cast was applied. Ilizarov ring fixator was applied on the patients having skin blisters with severe oedema. All patients were given ceftriaxone, 1 gram perioperatively. Ilizarov ring fixator was removed once the union was confirmed on sequential radiographs and and absence of pain during weight bearing and non-weight bearing cast was applied for 6 weeks. Patients were asked to visit again at 3 and 6 months for follow up and then at an interval of 6-8 weeks until 1 year. Functional outcome was assessed using AOFAS Score at 12 months.

RESULT

The present study included a total of 24 patients with complete follow up. The mean age of the patients in the study was 42.26 years, ranging from 25-65 years. As depicted in figure no. 1, out of 24 cases, 18 (75%) were males and the rest 6 (25%) cases were females. All cases were the outcome of vigorous energy trauma. Based on AO classification of fractures, as seen in figure no.2, study comprised of 8 patients (33.33%) with 43A1, 7 (29.16%) with 43A2 and 9 (37.50%) with 43A3 fracture. As visible from table no. 1, 11 patients (45.83%) were treated with Ilizarov ring fixator while 13 (54.16%) with open reduction internal fixation with plate osteosynthesis. The mean duration of operation was assessed to be 10.4 days ranging from seven to fourteen days. The mean duration of fracture union was estimated to be 19.7 weeks varying from twelve to thirty eight weeks. Figure No. 3 depicts that in patients of plate osteosynthesis; 7(53.84%) were having good outcome and 6(46.15%) excellent outcome. 8 (72.72%) patients who were treated with ilizarov showed good outcome and 3(27.27%) showed excellent outcome.

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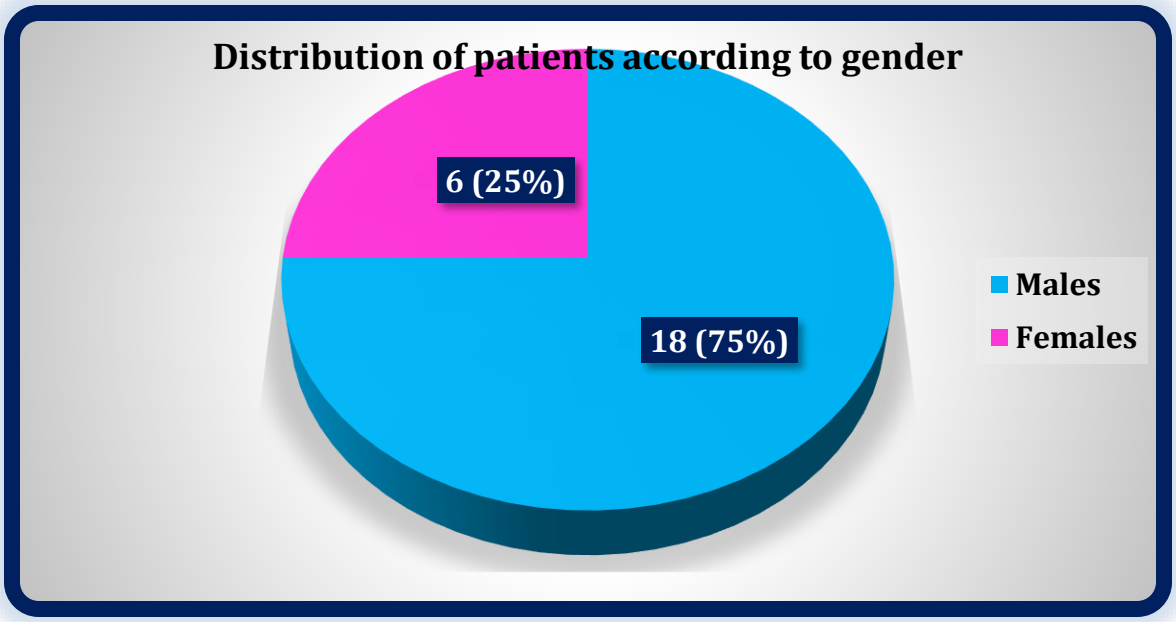

Figure No. 1- Distribution of patients according to gender

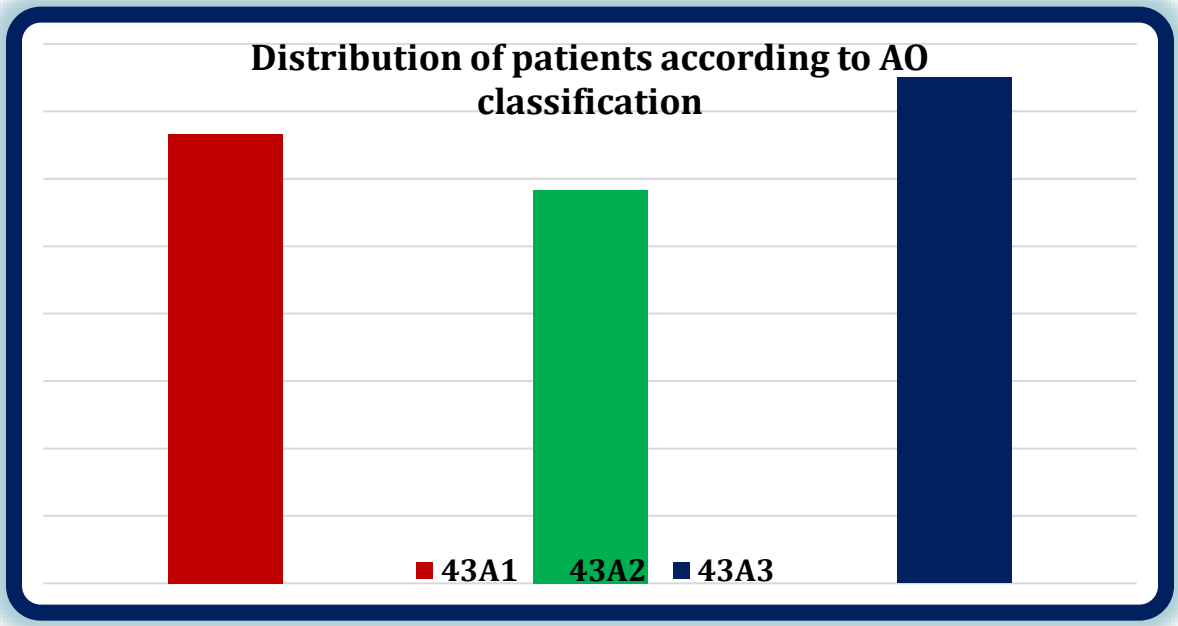

Figure No.2- Distribution of patients according to AO classification

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Table no. 1- Distribution of patients based on technique used in treatment

Technique used in treatment	No. of patients (%)
Open reduction -Plate osteosynthesis	13 (54.16%)
Ilizarov ring fixator	11(45.83%)
Total number of patients-24	

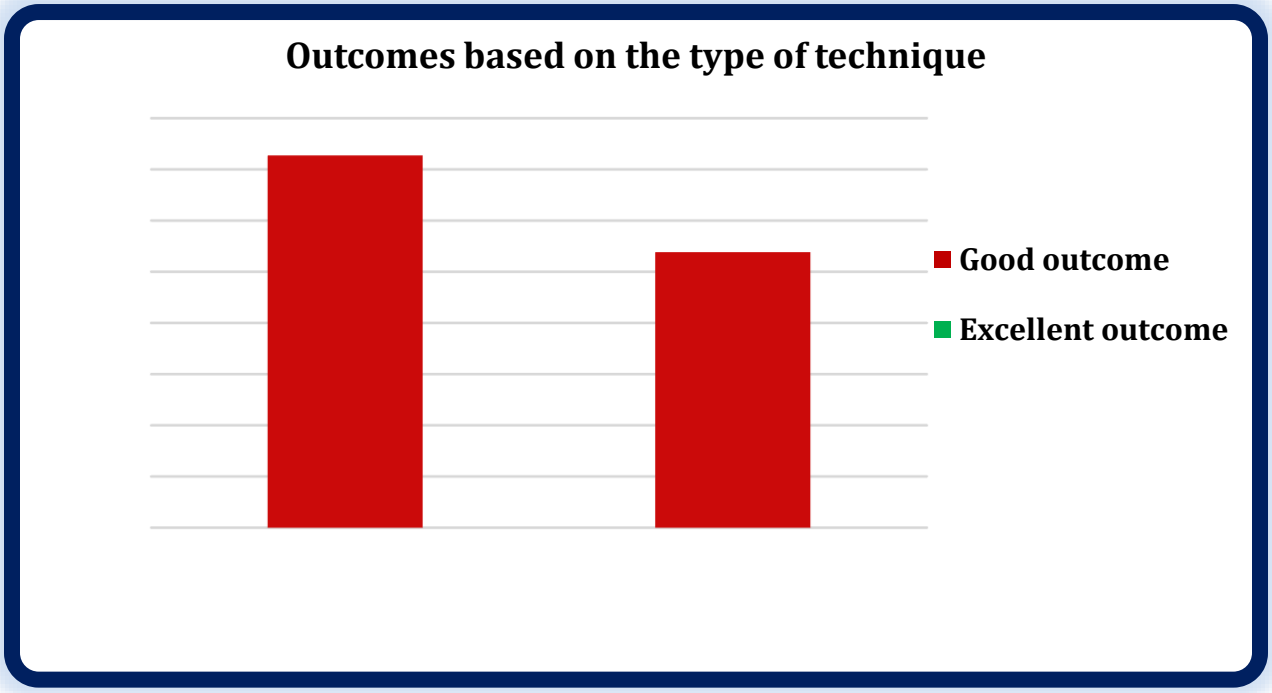

Figure No. 3- Outcomes based on the type of technique

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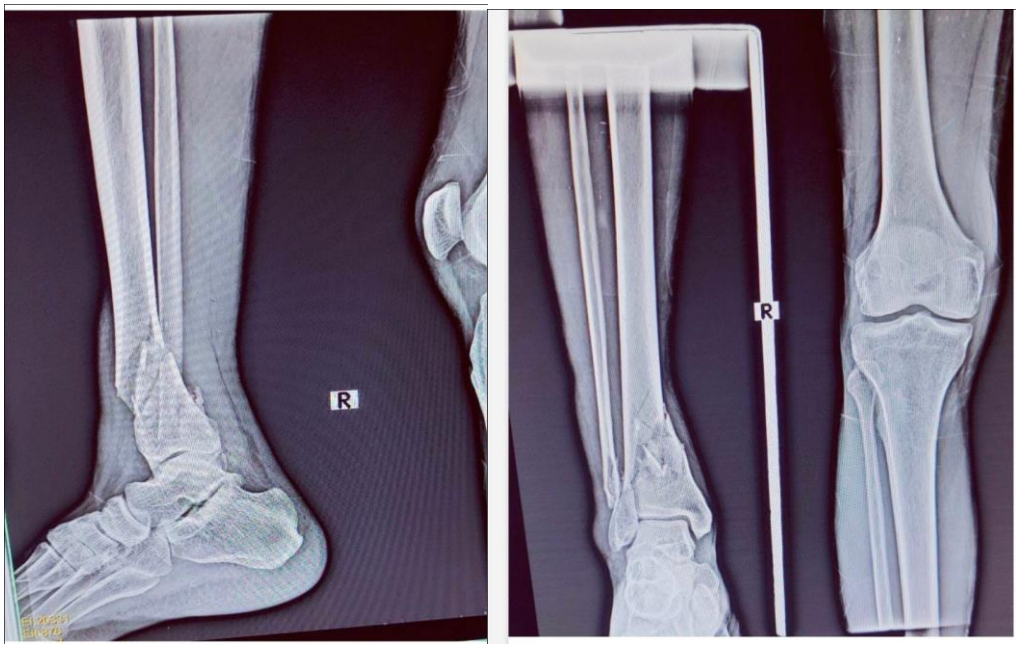
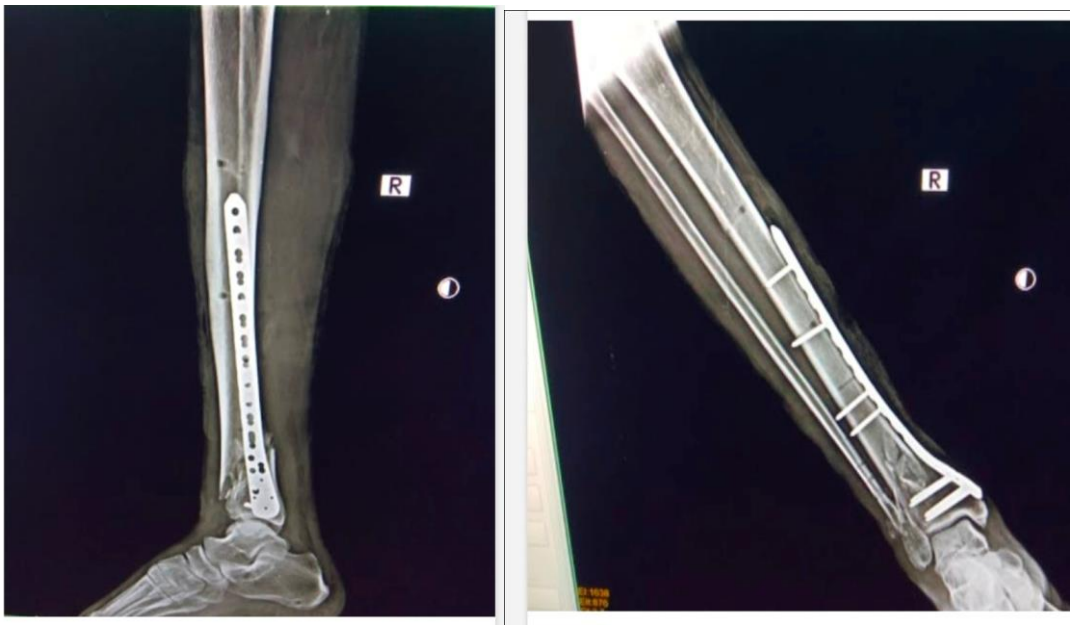


Plate osteosynthesis :Pre-Operative



Post Operative

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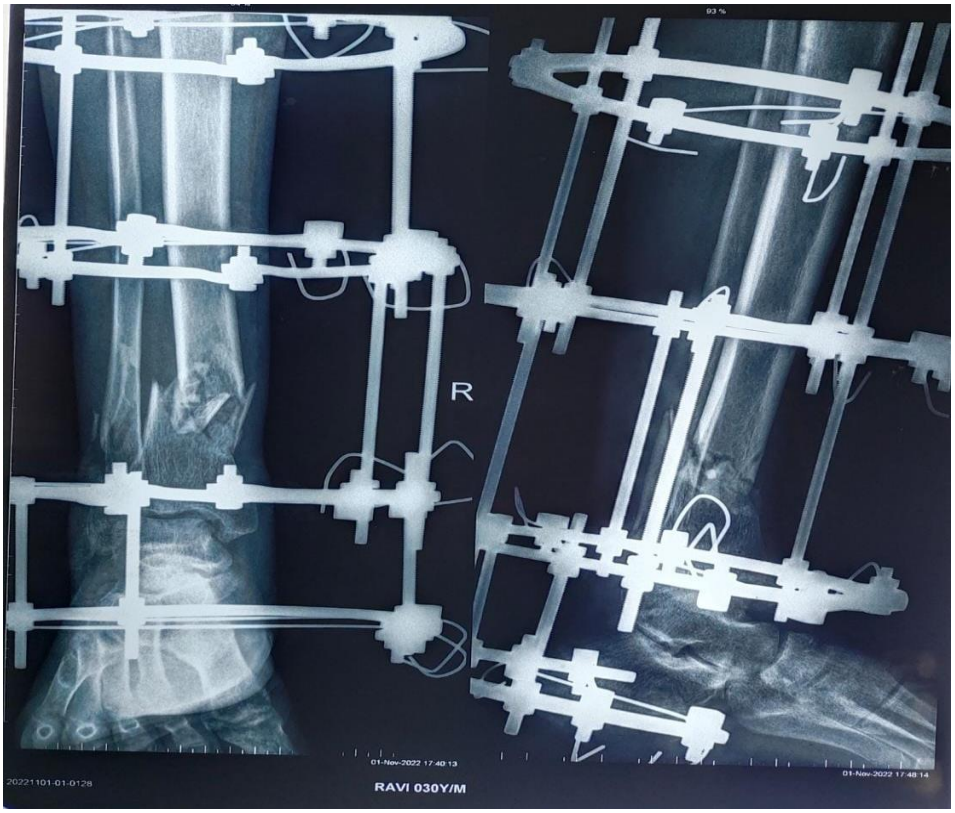
Ilizarov :Pre-Operative



Post Operative

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DISCUSSION

All the fractures in the distal tibia specially with comminution are difficult to manage . The condition of the soft tissues, the grade of comminution during injury affects the clinical outcomes in the long term. The aim of surgical management is to attain anatomic readjustment of the displaced fragments while maintaining sufficient stability for early mobility. This ought to be attained using procedures that reduce osseous fragments and prevent devascularisation of soft tissue which may prevent the future complications. Our study aimed to compare the outcome of treatment of the pilon fracture by open reduction internal fixation with plate osteosynthesis and Ilizarov ring fixator.

Our study observed that this type of injuries were more common in males with 75% which was in agreement to studies done by other authors probably due to the fact that in India, males are more likely to do rash driving, travel more often than females and are more prone to the other occupational injures etc. The study by Andrew and Heather also reported majority of males being affected by these injuries although proportion found by them was 67% in male patients.[7,8] The present study correlates with Cory et al. study as in our study all our patients were of high energy trauma. The research article by Cory Collinge et al[9] also reported all the cases in their study to be the high energy fractures. However Andrew Grose et al[8] depicted only fifty eight percent of the fractures to be caused by high energy trauma. Ruedi and Allgower[10] in their study described open reduction with plate and screw fixation as their standard way of treatment. Out of 84 patients, they observed satisfactory results in 74 percent of the cases and the outcome was maintained for 9 years with no deterioration of functions . Although 16 cases of type III fractures managed by Ruedi with open reduction and internal fixation attained good outcome in only forty four percent of the cases. Another study by Bourne and colleagues[11] was also in harmony with our study as out of 42 fracture patients, they found 62% of them were sufferers of high energy trauma. The chief complication associated with the fracture cases was arthrodesis in 32% cases followed by non-union and infection in 25% and 13% cases respectively. Im GI et al[12] managed to have better placement of fracture fragments in 30 patients by treating the patients using open reduction and internal fixation with anatomic plates and screws and attained 88.2% good results using Oleurd and Mollander function ankle score A study by Gao et al[13] involved 32 cases having very short metaphyseal

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fragments in fractures of distal tibia and the patients were managed using polyaxial locking system. The study revealed that these patients showed around 87.3 functional results based on American Orthopaedic Foot and Ankle Society score when managed by polyaxial locking system, stating this treatment as reasonable management choice as probably it proposes higher fixation adaptability.

The study by Aggarwal et al[14] involved patients with tibial periarticular fractures caused due to high energy trauma. They treated the cases with hybrid external fixation and the outcomes observed by them were maximally good to excellent in 30(86%) cases followed by poor and fair outcomes in 3(8%) and 2(6%) cases respectively. However study by Zeman[15] et al on such cases observed maximum outcomes to be very good in 6 (32%) cases trailed by excellent 5 (26%) and satisfactory results in 5 (26%) cases and the poor outcomes were seen in 3 (16%) patients. A retrospective review research done by Ozkaya U et al[16] observed twenty two cases of tibial fractures of distal third, which were managed by titanium locking compression plates by means of a minimally invasive procedure. They suggested this technique as a good biological fixation method to be used in such cases as they reported good to excellent results in eighty one percent of cases based on American Orthopaedic Foot and Ankle Society score. In present study pilon fractures were treated using two techniques, i.e. ORIF with plate osteosynthesis and Ilizarov ring fixator. It was found that patient treated with ORIF with plate osteosynthesis presented with good functional outcome and good ankle range of motion as compared to Ilizarov ring fixator. According to the study, out of 24 patients with pilon fracture, 13 had undergone ORIF with plate osteosynthesis. This treatment method delivered satisfactory stability and permitted early mobility. The technique offered indirect anatomical reduction of the fracture without disturbing the vascularity of fracture fragments which helps in rapid union of the fracture. The utmost gain in using this technique is that the good anatomical reduction is achieved. The procedure is beneficial for the cases of extra articular fractures limited to 5cm of the concerned joint as intramedullary nails generally do not deliver adequate stability here. So for primary stabilization with external fixators may be used until soft tissue oedema get subsided. Even though illizarov technique takes a longer time, but yet it showed a good result. ORIF is simple and its application is also quick and straight forward which decreases the time of surgery in extra and intra articular fractures due to usage of novel locking compression plates which are anatomically contoured for these type of fractures. Open reduction and internal fixation with plates is a simple method and

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cumbersome to the patient but sufficient time should be given for the soft tissue healing to prevent problems of wound healing.

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