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Observation of different modalities of treatment in closed pilon fractures in adults

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Abstract

Tibial Pilon fractures are challenging injuries for the orthopaedic surgeon to manage successfully. The main challenges in the management of these fractures are compromised skin and soft tissue envelope, comminuted fracture, displacement of fragments, metaphyseal region of fracture. In our prospective study, we have done different modalities of treatment of closed pilon fracture with no or minimal soft tissue injury in adults and observed the final functional score and complication rates. 20 patients were followed up to 12-24 month. 12 cases (60%) unite in between 16-20 weeks, 4 cases (20%) are unite in 12-16 weeks and rest 20% cases unite after 20 weeks. Complication like superficial thrombophlebitis in 2 cases which treated conservatively. Superficial skin infection in one case of primary ORIF and 2 cases of MIPPO. Deep infection occur in 1 case of ring fixator. Final functional outcome in our study according to AOFAS Score, 11 patients (55%) had excellent result and 6 cases (30%) good & 3 had fair (15%) result.

Keywords: Pilon fracture, AOFAS score, MIPPO

Introduction

Tibial Pilon fractures are traumatic injuries of the distal part of the tibia involving its articular surface at the ankle joint. It has become more common at present due to increased incidence of road traffic accidents and high velocity trauma. Now it accounts for approximately 7-10% of all tibial fractures. The main challenges in the management of these fractures are compromised skin and soft tissue envelope, comminuted fracture, displacement of fragments, metaphyseal region of fracture. Their outcomes are often unsatisfactory with high percentage of complication. Hence management of these fractures continues to be challenging and controversial. Different modalities of treatment option were conservative like skeletal traction, manipulation and external immobilization in the form of casts and cast bracings. But these methods met with problems like deformity, shortening, prolonged bed rest, stiffness, angulation, joint incongruity, malunion, muscle wasting and post traumatic osteo arthritis. Operative option like ORIF, MIPPO technique, external/hybrid fixator. The research continues, with constant effort to further improve clinical outcome in this difficult to treat fracture. Even with use of advanced operative treatment options, satisfactory outcome is not possible always in pilon fracture and many studies significant complication rate continuing to persist. So, in our prospective study, we have executed different modalities of treatment of closed pilon fracture with no or minimal soft tissue injury in adults and observed the final functional score and complication rates.

Material and Methods

This prospective study was carried out in the Post Graduate Dept. of Orthopaedics SCB Medical College, Cuttack from Dec 2015 to June 2019. Total 20 patients with closed pilon fracture with Tschner grade 0 and 1 soft tissue injury were admitted to our hospital during this period. Patient were followed up regularly for average period of 20 month after receiving treatment at hospital. Among 20 patients there were 15 males and 5 female with age ranging from 22-59 years (mean 38.6 yrs). The analysed data was compared with other series in literature.

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Inclusion criteria

1. Age 18-59 years
2. Closed fractures (with Tschner grade 0 & 1 soft tissue injury)
3. Patient willing to give consent for the procedure.
4. Unilateral fractures.

Exclusion criteria

1. Age less than 18 yr.
2. Open fractures and fracture with tscherne grade 2 & 3 soft tissue injuries
3. Pathological fractures
4. Associated spinal injuries (paraplegia and quadriplegia)
5. Known case of bleeding disorders and sickle cell anaemia
6. Patient with vascular compromise
7. Associated fractures of other bones of same limb (except fibula)

AS soon as patients were brought to the casualty a complete survey was carried out to rule out significance injuries. Then radiographs were taken, both AP and lateral views of the ankle joint. On admission detailed history was taken relating to age, sex, occupation, mode of injury, past and associated illness. The fractures were classified based on Ruedi-Allgower classification in adults. Out of 20 patients 8 were type-I, 10 were type II, 2 were type III. Conservative treatment was given to 2 patients of type I with grade 0 soft tissue injury, rest all patients were undergone different operative modalities depending on fracture anatomy and soft tissue status. are type I and first 3 month and then at 1 month interval. They were examined for presence of any residual

swelling, deformity and condition of wound, tenderness and ankle ROM. During follow up visit once patient started ambulating they were assessed according to AOFAS guidelines regarding any pain, any difficulties in walking, change in daily activities and change in occupation. Patients were examined for any gait abnormalities, weakness of triceps surae and any neurological deficits in foot. Follow up X-ray were taken to assess fracture union, condition of the implant (operated cases), evidence of early ankle arthrosis and any residual deformities.

Result

The present study comprised of 20 patients of closed pilon fractures with no or minimal soft tissue injuries. Male predominate the female with a ratio 3:1. Average age of patients 38.6 years with range between 20-60 years. Most of the cases (50%) occur due to RTA followed by fall from height (30%) & sports injury (20%). Out of the 20 cases 10 case (50%) are type II followed by 8 cases (40%) are type I and 2 cases (10%) are type III according to Ruedi and Allgower system of classification. patients were followed up to 12-24 month. 12 cases (60%) unite in between 16-20 weeks, 4 cases (20%) are unite in 12-16 weeks and rest 20% cases unite after 20 weeks. Complication like superficial thrombophlebitis 2 cases which treated conservatively. Superficial skin infection in one case of primary ORIF and 2 cases of MIPPO. Deep infection occur in 1 case of ring fixator. Final functional outcome in our study, 11 patients (55%) had excellent result and 6 cases (30%) good & 3 had fair (15%) result.

Table 1: Showing type of treatment with AOFAS score and results

SL No.	Age/Sex	R.A type of #	method of Treatment	Radiologica union Time (Weeks)	Aofas Score	Result
1	22/M	III	MIPPO	28	85	Good
2	23/M	II	Primary ORIF	17	90	Excellent
3	31/M	II	Primary ORIF	17	95	Excellent
4	38/M	II	MIPPO	24	92	Excellent
5	36/M	I	Primary ORIF	15	91	Excellent
6	56/M	I	Min int fix with cast	15	90	Excellent
7	55/F	I	Primary ORIF	17	93	Excellent
8	48/M	II	Primary ORIF	19	90	Excellent
9	39/F	II	Primary ORIF	18	78	Fair
10	32/M	I	conservative	19	81	Good
11	32/M	II	Primary ORIF	26	85	Good
12	42/F	II	Ring fixator	19	85	Good
13	54/M	II	MIPPO	18	90	Excellent
14	36/M	II	MIPPO	18	96	Excellent
15	34/F	I	Primary ORIF	17	77	Fair
16	34/M	I	Conservative	19	80	Good
17	31/M	II	MIPPO	18	95	Excellent
18	49/M	I	Primary ORIF	16	74	Fair
19	45/M	III	MIPPO	30	80	Good
20	58/F	I	Min Int. fix with cast	14	90	Excellent

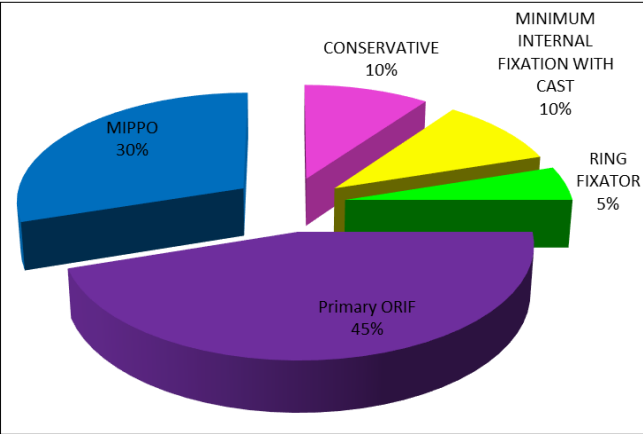


Fig 1: Distribution of types of modalities of treatment

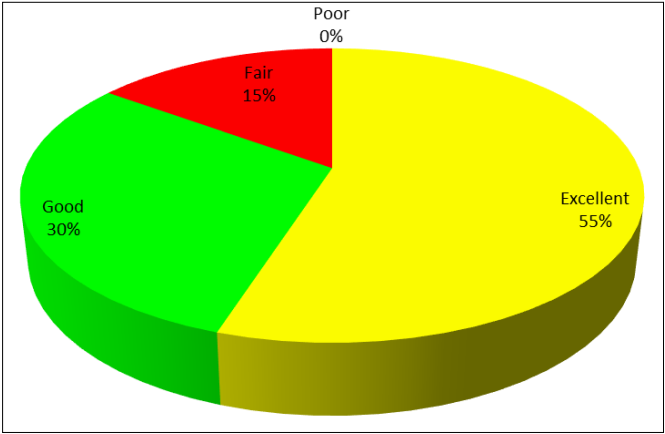


Fig 2: Functional outcome According to AOFAS SCORE

Case 1



Case 2





Weight bearing during squatting



ROM showing ankle dorsiflexion

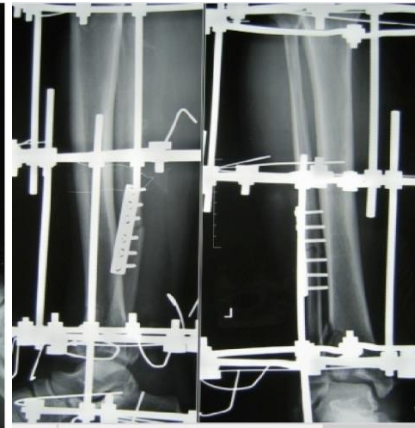


ROM showing ankle plantar flexion

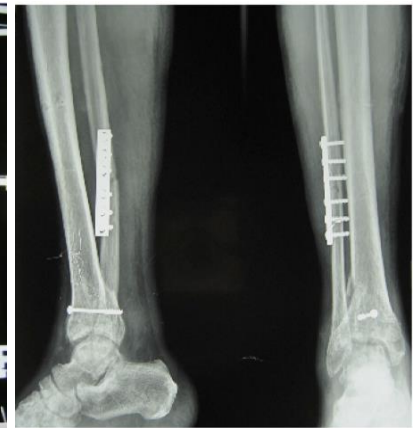
Case 3



Pre-op X ray



Immediate Post OP x Ray



Follow up at 19 weeks



Weight bearing during squatting



ROM showing ankle plantar flexion



ROM showing ankle dorsi flexion

Discussion

Management of fractures of the tibial plafond continues to be challenging and controversial. Although multiple treatment modalities and protocols have been described, there is no common agreement regarding the optimal treatment of these challenging injuries.

In modern era advanced implants and techniques failing to avoid significant post-operative complications as well as lagging to achieve excellent long term result, several authors have studied to ascertain if conservative treatment can be a better alternative.

In 1959 Jergesen ^[1]. Asserted that open reduction and stabilization of serious tibial pilon fractures was impossible. In the same year Fourquet ^[2]. reported the overall poor result of pilon fracture after treatment. So for years cast immobilization has been the most popular method of treatment. In 1979 Ruedi ^[3]. again reported achievement of 75% good & excellent result with ORIF. Following his

principles Heim ^[4]. And later Ovadia ^[5]. and Beals also subsequently reported good results. Bourne ^[7]. in 1983 reported 80% satisfactory result with type I & II fracture while type III has only 44% satisfactory result. Non anatomic reduction, unstable fixation, infection, nonunion, and/or angulations were the usual causes of failure of this form of treatment. In 1986 Dillin ^[6]. Reported infection rates as high as 55% and wound sloughing rates of 36%.

In 1988 JP Ayeni ^[8]. reported good results with conservative treatment in type I fracture, poor result in type II fracture and to type III fracture conservative treatment was not applied. Also post traumatic arthritis rate was as high as 53% (10 out of 19), all being type II or III treated with plaster cast/ORIF AND ORIF only respectively. In 1992 Mc Ferran *et al.* ^[9]. Reported a 40% rate of patients with complication following ORIF of their pilon fractures. In 1993 Teeny and Wiss ^[10]. reported that 37% of their patients experienced deep infections and ankle fusion rate of 26% in type III fracture

after ORIF. In 1996, Wyrsch *et al.* ^[11]. Prospective study of 39 fractures found a 28% infection rate and a 33% wound sloughing rate in the ORIF group compared with a 5% infection rate and a 5% wound sloughing rate in the external fixation group.

Sands *et al.* ^[12]. In 1998 performed a retrospective review of 27 out of 64 patients with plafond fractures treated with ORIF with help of SF-36 forms, which showed a decrease in all 8 Categories with significantly decreased physical function and role limitations attributed to physical health. 1999 Patterson & Michael ^[13]. Showed 77 % good results, 14 % fair results and 9% poor results. There were no infections or soft tissue complication.

Bhattacharyya, Timothy ^[14]. Found in 2006 while using stage ORIF with posterolateral approach found 47% complication rate including infection, nonunion and post traumatic arthritis. In 2009 Kline AJ ^[15]. Got 19% infection rate and 16% nonunion rate in normal group while comparing them with DM group which very high rate of infection (71%) and nonunion (43%). In 2010 Lisa K. ^[16]. Canada found 2% deep and 5% superficial infection while treating 55 pilon fractures in 43 patients. In 2012 Justin E. Richards, Mark Magill ^[17]. Reported only 3.7 infection rate and 3.7% of nonunion rate with patients treated with ORIF in staged procedure compared to 11% infection and 22% nonunion in external fixation group.

In our study with average follow up period of 20 months (14-30 months) we got 55% excellent and 30% good & 15% fair results with primary ORIF with plate in both type I and II with negligible soft tissue trauma (Tscherne grade 0 and 1). Ruedi and allgower reported 93% (70 out of 75) excellent and 33% good results. Bornes *et al.* reported their results in 17 patients as 47% excellent, 41% fair and 12% poor. In the conservative treatment we got 100% good results in type I. We got 100% excellent and good results in all types of closed fractures with no or minimal soft tissue injury (Tscherne grade 0 & 1). Observing the complications, we got stiffness as a complication for both the conservatively treated patients, pin tract infection in the patient treated with ring fixator and superficial skin infection in 1 out of 9 treated with primary ORIF and 2 out of 6 treated with MIPPO.

Conclusion

The ultimate goal of pilon fracture are restoring an anatomic articular surface, restoring mechanical alignment, maintaining joint stability, achieving fracture union and restoring functional and pain free weight bearing and motion while avoiding complication. One must understand the mechanism of injury because this can reflect on the amount of associated soft tissue damage. Factors to consider in the formulation of a treatment plan include the fracture pattern, soft tissue injury, patient co morbidities, fixation resources and surgical experiences. Treatment of fractures with no or little displacement or Communion (R-A type I, II) has yielded much better functional results with far fewer complications than that of more severe fracture pattern (R-A type III, AO types B3 & C3. Non-displaced fracture like R-A type I, AO type A1, B1, C1 have been treated successfully with operative and non-operative methods. These are the only fracture types in which cast immobilization alone may be suitable. The patient should be observed closed for displacement and weight bearing should be restricted for at least 8 weeks if the joint is non arthritic. Limited fixation with 3.5 or 4 mm screws, inserted after either percutaneous or limited open reduction, combined with plaster immobilization

may be adequate for R-A type I, AO types A1, B1 and stable C1 fractures. If the stability of the fractures is uncertain, however, an external fixator should be used instead of cast. External fixation accomplishes the same goal of fracture reduction through ligamentotaxis and allow the patients to be mobilized, but the patient compliance and pin tract infection are matter of concern. Excellent and good results are seen with primary ORIF with plate and screw or MIPPO among various studies, for treatment of pilon fractures with Tscherne grade 0 and 1 soft tissue injuries. But the surgeon must be careful for the complication like wound breakdown and infections. Open and high energy wound should not be treated with this technique because of fewer successful rate and devastating complications. Tscherne grade 2 and 3, and open fractures should be treated with staged procedure.

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