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A prospective study of delta frame as external fixator for open-distal tibial fractures

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Abstract

Distal tibial fractures pose a serious challenge to the orthopaedician because muscular coverage is very less and poorly vascularized [1]. It is further complicated by comminution, joint involvement, open fractures and high energy trauma [1]. The goals of management are proper care of the injured soft tissues, restoration of joint congruity, stable fixation [2]. Ankle spanning external fixation ie Delta frame has become the initial treatment of choice for complex tibial pilon fractures [3]. The 'tripolar configuration' allows facilitation of wound care, plastic procedures and good xray or CT images [4]. The Delta external fixator was found to be the most stable external fixator for treating not stable as type III according AO/OTA's classification [5]. The IM nails often do not provide enough stability in distal tibial fractures and plating requires extensive soft tissue dissection [6]. External fixators can also be used in osteoporotic and unreconstructable comminuted metaphyseal fractures with poor bone stock [6]. However literature support is scanty, hence we decided to do the above study with an aim to analyze its results using the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle Hindfoot score.

Keywords: Delta frame, external fixator, open fracture, IM nail

Introduction

Materials and Methods

The study included twenty cases of open distal tibial fractures treated by Delta frame external fixator at R. L. Jalappa Hospital attached to Sri Devaraj Urs Medical College, Kolar, and Karnataka between Jan 2015 to Dec 2017. This included a followup of six months. The inclusion criteria was skeletally mature patients with Gustilo Anderson open grade I, II, IIIA distal tibial fractures. The exclusion criteria were 1. Patients with grade IIIB and IIIC of Gustilo Anderson fractures.

2. Patients with Pelvic fractures. The data was collected from the history, clinical examination, xrays, investigations, operative notes, postoperative notes and followup notes. Complications were recorded if any. Follow up was done at 4 weeks, 8weeks, 12 weeks, 18 weeks and 6 months. Whenever necessary patient was followed up on the telephone or called to the hospital for data collection of clinical and radiological findings. We have used the American Orthopaedic

Foot and ankle society (AOFAS) ankle hind foot scoring system.

Table 1: Showing the AOFAS scoring

1. Pain (40 points)	
None	40
Mild, occasional	30
Moderate, daily	20
Severe, almost always present	0

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2. Function (50 points)	
Activity limitations, support requirement	
No limitations, no support	10
No limitation of daily activities, limitation of recreational activities, no support	7
Limited daily and recreational activities, cane	4
Severe limitation of daily and recreational activities, walker, crutches, wheelchair, brace	0
Maximum walking distance, blocks	
Greater than 6	5
4-6	4
1-3	2
Less than 1	0
Walking surfaces	
No difficulty on any surface	5
Some difficulty on uneven terrain, stairs, inclines, ladders	3
Severe difficulty on uneven terrain, tairs, inclines, ladders	0
Gait abnormality	
None, slight	8
Obvious	4
Marked	0
Sagittal motion (flexion plus extension)	
Normal or mild restriction (30° or more)	8
Moderate restriction (15°-29°)	4
Severe restriction (less than 150)	0

Hindfoot motion (inversion plus eversion)	
Normal or mild restriction (75%-100% normal)	6
Moderate restriction (25%-74% normal)	3
Marked restriction (less than 25% normal)	0
Ankle-hindfoot stability (anteroposterior, varus-valgus)	
Stable	8
Definitely unstable	0
3. Alignment (10 points)	
Good, plantigrade foot, midfoot well aligned	10
Fair, plantigrade foot, some degree of midfoot malalignment observed, no symptoms	5
Poor, nonplantigrade foot, severe malalignment, symptoms	0
Total=10	

Statistics Statistical analysis was undertaken using SPSS version 22 (SPSS, Chicago, Illinois). The Students t and Chi-Square Tests was used to analyse the variables. P value of <0.05 was considered statistically significant.

Results

The average time to union was 20 weeks. (Range xx to xx weeks). P value = xx. Union occurred in all the 10 patients. Fig x.



Fig 1. Preop x-ray AP

Lateral view

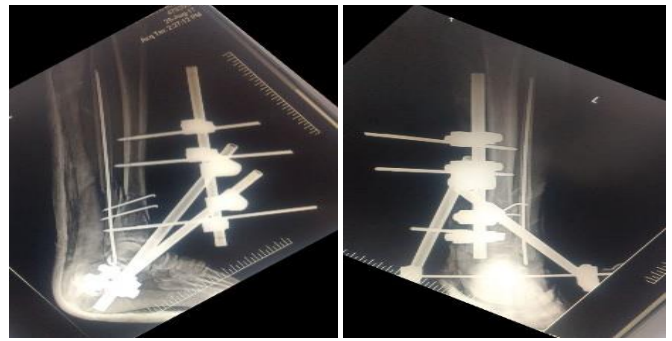


Fig 2: Immediate postop x-ray AP view Lateral View



Fig 3: 5 month x-ray AP Lateral View



Fig 4: 6 months x-ray AP view Lat view: # united



Fig 5: Preop x-ray AP view Lat view

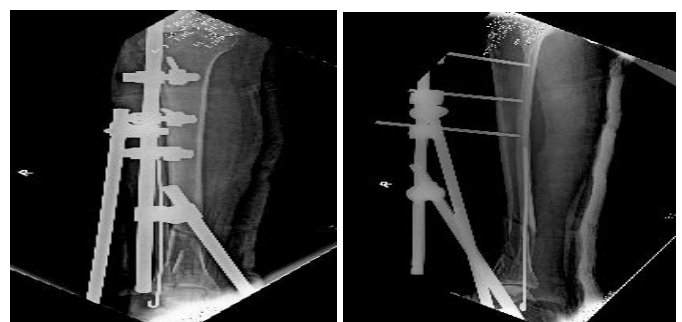


Fig 6: Immediate postop x-ray AP view Lat view

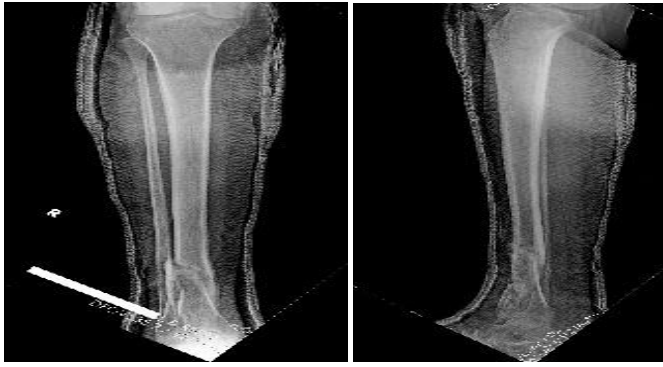


Fig 7: 5 month postop x-ray AP view Lat view and showing union

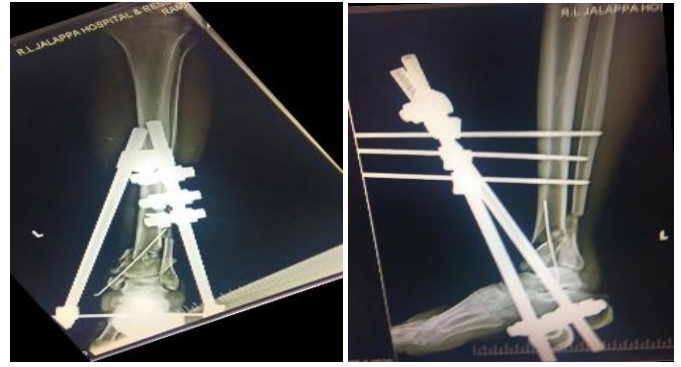


Fig 11: Immediate postop x-ray-AP view Lat view

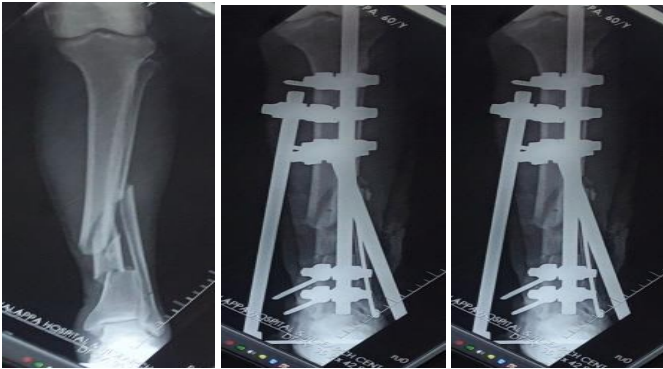


Fig 8: Preop x-ray AP view immediate postop x-ray AP view lateral view



Fig 12: Plating of fibula AP view at 3 months AP view Lat view

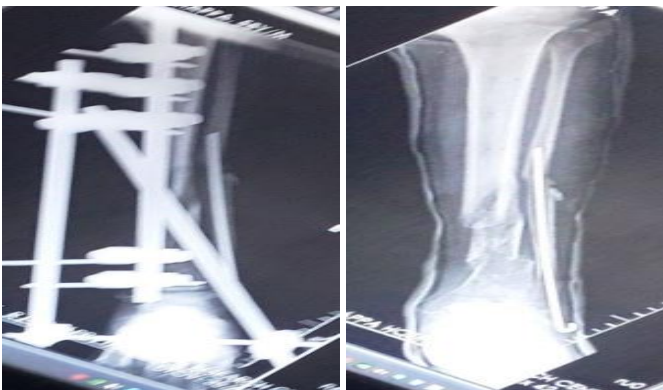


Fig 9: 4 month X-ray AP view 5 1/2 month X-ray AP view

One patient was suspected of delayed union and was converted to interlocking nailing. Fig 13

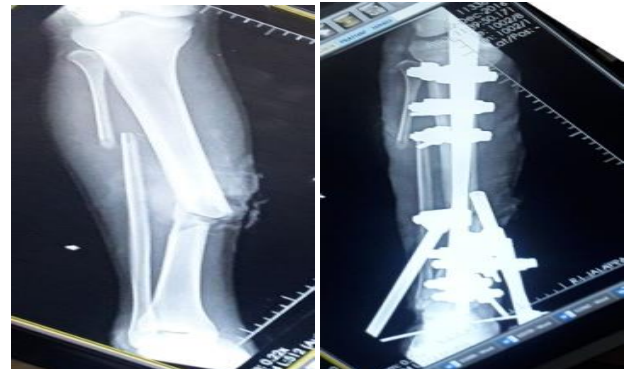


Fig x 13: Preop x-ray AP view immediate postop X-ray AP view

Fig x: Immediate postop X-ray AP view

AOFAS Ankle Hind foot score was excellent in 9 good in 10 cases. Fair in 1 case, patient had Malalignment, he underwent realignment and fibular plating twelve days after index surgery Fig 9



Fig 10: Preop AP view Lat view



Fig 13: 3 months after nailing, showed signs of union. AP view

In another patient, we have converted into Locked compression plating. Fig 15

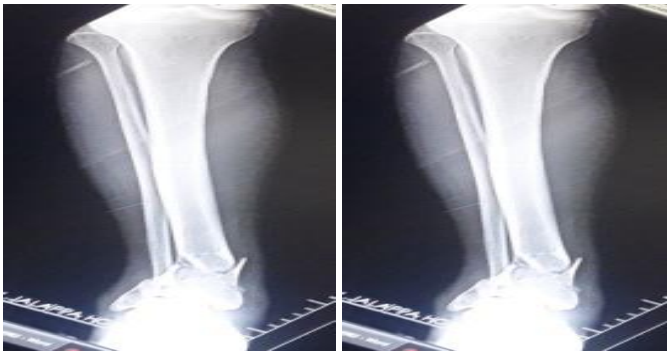


Fig 14: Preop X-ray AP view Lat view



Fig 15: Immediate postop X-ray AP view Lat view 3 months after locking compression plate to tibia AP view

Discussion

Our study showed good results with Delta exfix for open distal tibial fractures. Bone *et al.* 1993 have used Delta frame external fixator for their twenty patients with severely comminuted pilon fractures or open pilon fractures. The time to union averaged 4.5 months, which is the same as in our study. All fractures healed. Three delayed unions required bone grafting and two had plate stabilization. Two patients required ankle arthrodesis because of posttraumatic arthritis.

In Shikari *et al.* study, twenty two patients with compound tibial fractures were treated with delta external fixator. Mean time to union was 5.5 months (3-16 months). AOFAS scoring showed excellent in 81%. There were two delayed union and one nonunion case.

Giuseppe Rollo *et al.* treated 23 open tibialpilon fractures with delta frame. 13 had complications like osteoarthritis, infection and malalignment.

In the study by Venkatesh gupta *et al.* twenty five fractures of the distal tibia united with an average of 14.42 weeks (13-22 weeks) after hybrid external fixator. There were two cases of delayed union and no cases of non-union. 8 cases developed pin tract infections that healed with short course of appropriate antibiotics and daily antiseptic dressings. They had 12 (48%) Cases of ankle stiffness.

Daghino *et al.* have performed external fixation in a 'tripolar configuration' in 36 cases. But they have used it as a temporary fixation.

Conclusion

Delta frame external fixator for open distal tibial fractures is a useful technique enabling good soft tissue healing and providing stable fixation with good results and can be used as a definitive treatment. It is especially useful when the patient has financial constraints.

References

1. Giuseppe Rollo *et al.* The damage control in tibialpilon open fractures with a new external Fixator delta frame. J Acute Dis. 2017; 6(5):222-6.
2. Shikari A, Wani A, Padha K, Bhatti M, Dang H. Fixation Of Compound Fractures Of Distal Tibia Using A Delta External Fixator As A Definite Modality Of Treatment With Or Without Fibular Plating/ Limited Internal Fixation With K-Wires. The Internet Journal of Orthopedic Surgery. 2010, 18(2).
3. Shikari A *et al.* Fixation of Compound Fractures of Distal Tibia Using a Delta External Fixator as a Definite Modality of Treatment With or Without Fibular Plating/ Limited Internal Fixation with K-Wires. Foot Ankle Int. 2007; 28(7):823-30.
4. Dagghino W, Messina M, Filipponi M, Alessandro M. Temporary stabilization with external fixator in 'Tripolar' configuration in two step treatment of tibialpilon fractures. Open Orthop J. 2016; 10:49-55.
5. Ramlee MH, Kadir MR, Murali MR, Kamarul T. Finite element analysis of three commonly used external fixation devices for treating Type III pilon fractures. Med Eng Phys. 2014; 36(10):1322-30.
6. Venkatesh Gupta SK, Sunil G. Management of Tibial Metaphyseal Fractures by Hybrid External Fixator. Open Journal of Orthopedics. 2014; 4:84-9. <http://dx.doi.org/10.4236/ojo.2014.43014>