



**FUNCTIONAL OUTCOME AND ANALYSIS OF DISTAL TIBIAL FRACTURES TREATED WITH HYBRID EXTERNAL FIXATOR.**

**Dr. Nalli R Gopinath\***

DNB ORTH, Associate Professor Department Of Orthopaedics Government Villupuram Medical College-Villupuram. \*Corresponding Author

**Dr. P. Senthil Kumar**

M.S.Ortho. Associate Professor Department Of Orthopaedics Government Villupuram Medical College-Villupuram 22/9b new karkana street, thiruvannamalai ., 606601.

**Dr.R.Umashankar**

M.S.Ortho Assistant Professor Department Of Orthopaedics Government Villupuram Medical College-Villupuram.

**ABSTRACT**

**Introduction:** Distal Tibial fractures encompass a spectrum of skeletal injury ranging from fractures caused by low-energy rotational forces to those precipitated by high-energy axial compression forces. The fracture may have significant metaphyseal or articular comminution or diaphyseal extension. The fibula is fractured in 85% of these patients.

**Materials and Methods:** We studied a series of Twenty patients with distal tibial fractures age between 22 to 65 yrs were treated with hybrid external fixator ,out of which 12 patients had additional fibula fracture fixation was done. Among the 21 patients 14 of them were compound fractures and 6 is closed one .all patients were followed up for a minimum period of 6-10 months.

**Results:** Union of the fracture is significant .strict non weight bearing protocol for 6 to 8 weeks with ankle mobility, followed by gradual weight bearing .the functional evaluation was excellent in 12 cases 6 had good results and 2 had fair results.

**Conclusion:** Hybrid external fixation of the distal tibia fracture allows satisfactory reduction, maintaining limb length, with minimal soft tissue handling and allows early ankle mobility. In compound fractures allows early soft tissue cover and decreased incidence of infection and bony union.

**KEYWORDS :** hybrid external fixation, distal tibial fractures.

**INTRODUCTION**

The distal tibial fractures are often high energy injuries associated with significant soft tissue damage ,bone comminution and articular surface disruption. The fractures of the distal tibia have been treated by a variety of methods, including plaster immobilization, traction, lag screw fixation, ORIF with plates, and external fixation with or without limited internal fixation. A variety of external fixators have been used: traditional half-pin fixators spanning the ankle, articulated half-pin fixators that allow ankle motion, half-pin fixators that do not span the ankle, and hybrid fixators that combine tensioned wires with half-pins in the tibial diaphysis and do not span the ankle joint.

**Classification:**

The AO/OTA classification

Type A fractures are extraarticular distal tibial fractures, which are subdivided into groups A1, A2, and A3, based on the amount of metaphyseal comminution.

Type B fractures are partial articular fractures in which a portion of the articular surface remains in continuity with the shaft; these are subdivided into groups B1, B2, and B3, based on the amount of articular impaction and comminution.

Type C fractures are complete metaphyseal fractures with articular involvement; these are subdivided into groups C1, C2, and C3, based on the extent of metaphyseal and articular comminution

**Materials and Methods:**

We studied a series of Twenty patients with distal tibial fractures age between 22 to 65 yrs were treated with hybrid external fixator ,out of which 12 patients had additional fibula fracture fixation was done. Among the 21 patients 14 of them were compound fractures and 6 is closed one

**Inclusion Criteria**

1. Age above 21 years
2. Fresh closed and open fractures of distal tibia
3. Intraarticular and extra articular fractures of the distal tibia.

**Exclusion Criteria**

1. Age below 21 years.
2. Associated shaft of tibia fractures, talus fractures, vascular injuries.

**Imaging :**

All patients were taken initially antero posterior and lateral view x rays and fractures classified according to AO/OTA classification. Compound fractures classified according to Gustilo Anderson classification. For intra-articular fractures CT scan of ankle taken to evaluate fracture patterns.

**Management:**

All closed fractures were initially treated with above knee slab. treated electively with hybrid external fixators.

Compound fractures were taken under emergency procedure –wound debridement and hbrid external fixator .soft tissue cover if needed were done subsequently.

**Follow up :**

Closed fractures were discharged after 1 week .compound fractures were treated as inpatient for a period of 15 days .2 patients required soft tissue cove split thickness graft. then they were followed weekly for first month, biweekly for next month and monthly there after Clinical and radiological assessment were done during every visits. minor pin tract infections were treated with appropriate antibiotics.

Union of the fracture is significant .strict non weight bearing protocol for 6 to 8 weeks with ankle mobility, followed by gradual weight bearing .

**RESULTS:**

The present study consists of 20 cases of fracture of the distal end of tibia

S.NO		NO OF CASES
1.	MALE	17
	FEMALE	3

2.	RIGHT SIDE	12
	LEFT SIDE	8
3	Closed fractures	6
	Grade 1	4
	Grade 2	4
	Grade 3A	4
	Grade 3B	2
4	TYPE OF FRACTURE	
	A1	5
	A2	3
	A3	2
	B1	1
	B2	2
	B3	1
	C1	2
	C2	1
	C3	3
5	FIBULA FIXATION PLATING	
	YES	12
	NO	8
6	Soft tissue cover	2

The functional evaluation was excellent in 12 cases 6 had good results and 2 had fair results. ankle range of motion was recorded in all patients. Dorsiflexion of ankle ranges between 12 to 20 degrees, plantar flexion ranges between 12 to 30 degrees .pin tract infection reported in 5 cases treated with appropriate antibiotics. 2 cases with pin loosening were replaced with fresh pins. 2 compound grade 3 B after initial wound debridement SSG was applied.

**DISCUSSION:**

The goals of treatment of distal tibial fractures are anatomical reduction, internal fixation ,if needed primary bone grafting, fixation of fibula and early mobilisation. however application of these treatment principles in high energy distal tibial fractures is different from surgeon to surgeon because serious complications such as malunion, non union, arthritis, osteomyelitis etc.

Open operative procedure involves damage of already jeopardised soft tissues. Minor injuries to these soft tissues will result in devastating soft tissue complications such as skin necrosis, flap necrosis, persistent infection. .To prevent these kind of serious complication minimally invasive procedures are advocated to attain articular alignment and limb length restoration.

The surgeon must be familiar with the biomechanics of these fixators to ensure a stable construct. In a biomechanical study, Yang et al. found that a bar-ring hybrid fixator consisting of a unilateral fixator body connected to a ring/wire assembly was too flexible. The addition of diagonally placed struts significantly improved the stability of this construct. A two-ring hybrid fixator seemed to have the best mechanical performance. In fractures with extreme articular comminution, the wires may not provide adequate fixation, however. Fixation wires may need to be placed intracapsularly for adequate fixation, and although septic arthritis caused by pin track infection is a potential complication, this has not been a problem in the ankle as it has been in the knee.

Marsh et al. compared 19 patients with pilon fractures treated in a spanning external fixator without ankle motion with 22 patients treated with an articulated spanning external fixator and early ankle range of motion (within 2 weeks of surgery) Watson emphasized the importance of achieving early ligamentotaxis reduction to close large fracture gaps and to reduce fracture hemorrhage and tension on the tenuous soft tissue envelope Sarmiento, Nicoll, and others found that closed treatment with casting or functional bracing is an effective method of treatment for many tibial shaft fractures

that avoids the potential complications of surgical intervention.

In Ruedi et al study Intra-articular fractures of the lower end of the tibia are an interesting challenge. The best functional results in the past series were observed in patients treated according to the following 4 sequential principles: (1) reconstruction of the correct length of the fibula; (2) anatomical reconstruction of the articular surface of the tibia; (3) insertion of a cancellous autograft to fill gaps left by impaction and comminution; (4) stable internal fixation of the fragments by a plate placed on the medial aspect of the tibia. Seventy-five cases had a good or excellent late result (on average 6 years postoperatively) in 70% as compared to 43% to 55% in cases treated by closed and/or open methods.

Early motion of the joint allowed after operative procedure allows maintain congruity of joint, cartilage nutrition and increased blood flow to allow early fracture healing. Many factors influence the functional outcome of distal tibial fractures out of which early weight bearing allows compression stiffness, dynamisation which helps in rapid fracture healing callus maturation and bone remodelling.

**Patient 1**



**Patient 2**



**CONCLUSION**

In our study Hybrid external fixation of the distal tibia fracture allows satisfactory reduction, maintaining limb length, with minimal soft tissue handling and allows early ankle mobility. In compound fractures allows early soft tissue cover and decreased incidence of infection and bony union.

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