

ORIGINAL RESEARCH

Comparative Evaluation of Outcome of Various Modalities of Management of Distal Tibia Fractures: An Institutional Based Study

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ABSTRACT

Introduction: Distal tibial fractures remain a challenge to orthopaedic surgeons. High energy observed as the aetiology in young patients whereas in elderly, a simple fall might result in this distal tibial fracture. The aim of this study to compare the functional outcome of various modalities of management of distal tibia fractures.

Materials and Methodology: The present study majorly comprised of 60 distal tibial fracture patients that include both the genders. All were enrolled after obtaining the consent of patients. Ethical clearance was received before the beginning of the study. Demographic data such as name, age, gender etc. was eventually recorded. Patients were divided equally into 3 groups of 20 study participants each. Group I patients were treated with intra-medullary nail, group II patients treated with external fixator and group III patients with MIPO (Minimally Invasive Percutaneous Osteosynthesis).

Results: The study sample distribution involved group I had 12 males and 8 females, group II had 13 males and 7 females and group III had 9 males and 11 females. They type of fractures that are involved GA type 1 was seen in 15, 2 in 10, 3A in 9 and no GA type in 26 patients. AO classification A1 was present in 7, A2 in 8, A3 in 20, B1 in 9, C1 in 10, C2 in 4 and C3 in 2 patients.

Conclusion: The functional outcome and complication rates are obtained with use of IMN and MIPO for the management of distal tibia fractures. But the use of intramedullary nailing is recommended for the effective management of these fractures due to reduced duration of surgery, lower radiation exposure and so on.

Keywords: Road Traffic Injuries, Tibial Fracture, Distal Tibia, MIPO.

INTRODUCTION

Distal tibial fractures remain a challenge to orthopaedic surgeons. They usually occur as a result of high energy trauma in young patients, but in the elderly, they can result from a simple fall. In the elderly, the problem is compounded by poor bone-stock, their limited ability to partially weight bear and co-morbid condition.¹ Data showed that the trauma involving the distal tibial bone approximately contribute almost less than 7% of all the fractures involving the long bones of lower limbs. And in all the lower extremity fractures, it

comprises of less than 10% that belongs to distal tibial fractures. The age group that are more commonly involved are around 30 – 50 years. The spectrum of injuries might vary from low energy impact to high energy impact injuries. The low energy distal tibial fractures are majorly observed in older age group because of the rotational forces that have been involved.² In high energy distal tibial fractures, younger age groups are usually involved due to road traffic accident and fall from height. The major forces that have been involved are axial loading, compression and torsional forces are majorly involved in the injury. The distal tibial fractures are mainly due to road traffic accident, fall from height and twisting of ankle. The fractures that develop around the ankle joint are cumbersome to manage because of precarious vasculature in nature.³

The major challenges that are associated with this type of fractures are the compromised skin and tissues around the fracture area may eventually lead into higher incidence of complications following the initial ORIF, fixation is less rigid and early loosening might be encountered in fracture involving the metaphysis region and comminuted type of fractures might pose great difficulty in attaining rigid fixation.⁴ There have been very few studies that have effectively compared the functional outcome and associated complications related with closed reduction and internal fixation with intramedullary nails with fixation using pre-contoured locking plates using MIPO technique. Likewise, there is no consensus observation regarding the fixation of fibula in such type of fractures.⁵

Distal tibial fractures continued to remain a vital challenge to orthopaedic surgeons. They usually occur as a result of high energy trauma in young patients, but when elderly patients are taken into account, it has been noted they can result from a simple fall. Method that are selected for the initial stabilization should be sufficient enough to maintain the reduction promptly. The best modality of method of management for distal tibial fracture is one that attains and maintains a good reduction and stability and minimizes soft tissue compromise as well as devascularization of the bony fragments.⁶ The aim of this study to compare the functional outcome of various modalities of management of distal tibia fractures.

MATERIALS AND METHODOLOGY

Present study was conducted in Department of Orthopaedics, L. N. Medical College & Research Centre, Bhopal, Madhya Pradesh, India. The present study deals with the analysis of outcome of various modalities of treatment of distal tibial fractures depending on the type of fracture, location of the fracture and the status of the soft tissue envelope. The present study majorly comprised of 60 distal tibial fracture patients that include both the genders. All were enrolled after obtaining the consent of patients. Ethical clearance was received before the beginning of the study. Demographic data such as name, age, gender etc. was eventually recorded. Patients were divided equally into 3 groups of 20 study participants each. Group I patients were treated with intra-medullary nail, group II patients treated with external fixator and group III patients with MIPO (Minimally Invasive Percutaneous Osteosynthesis). The American Orthopaedic Foot and Ankle Society score was noted. Gustilo Anderson (GA) type of fractures and complications were also recorded. Results thus obtained were compared and analysed statistically. And the P value less than 0.05 was considered significant.

The inclusion criteria majorly comprised of the presence of a closed extraarticular distal tibia fracture (fracture line between 3 and 12 cm from the ankle joint) with a concomitant distal fibula fracture at the same level (within 2 cm of the distal tibia fracture) in a skeletally mature patient. The exclusion criteria usually consisted of pathological fractures, compound fractures, associated neurological or vascular injury, presence of multiple fractures or polytrauma, immune-deficiency states. Compound fractures were excluded from the study.

Data analysis was performed using SPSS version 16.0 (SPSS Inc, Chicago, IL, USA). Frequencies of categorical variables were calculated, while continuous variables were

represented as means. Chi-square test and Fischer's exact test were used for comparison between categorical variables, while Student's t-test was used for continuous variables.

RESULTS

Table 1 displays that group I had 12 males and 8 females, group II had 13 males and 7 females and group III had 9 males and 11 females.

Table 2 denotes that GA type 1 was seen in 15, 2 in 10, 3A in 9 and no GA type in 26 patients. AO classification A1 was present in 7, A2 in 8, A3 in 20, B1 in 9, C1 in 10, C2 in 4 and C3 in 2 patients. The difference was notably significant ($P < 0.05$).

Table 3 displays that mean AOFAS score was 74.6 in group I, 71.2 in group II and 89.8 in group III. Complications that were noted: non-union seen in 2, 3 and 3, ankle stiffness in 3, 3 and 2, wound discharge in 0, 3 and 2, vagus deformity in 5, 3 and 0 and valgus deformity in 2, 4 and 3 in group I, II and III respectively. The difference was statistically significant ($P < 0.05$).

Table 1: Gender wise distribution of subjects

Parameters	Type of method	Male: Female
Group I	Intramedullary nail	12: 8
Group II	External fixator	13: 7
Group III	Minimal Invasive Percutaneous osteosynthesis	9: 11

Parameters	Variables	Number	P - value
Gustilo Anderson type	B	15	0.03
	2	10	
	3A	9	
	No GA type	26	
American Orthopaedic classification	A1	7	0.04
	A2	8	
	A3	20	
	B1	9	
	C1	10	
	C2	4	
	C3	2	

Parameters	Variables	Group – I	Group - II	Group – III	P - value
AOFAS score		74.6	71.2	89.8	0.05
Complications	Non – union	2	3	3	0.04
	Ankle stiffness	3	3	2	
	Wound discharge	0	3	2	
	Vagus deformity	5	3	0	
	Valgus deformity	2	4	3	

DISCUSSION

Road traffic injuries assuming it as non-fatal involves fractures as the commonest injuries. Bones of the lower extremity are usually involved in such accidents.⁷ There are two factors that are determined to play a major role in determining the type of injury they are gravitational force and velocity of the vehicle at the time of trauma. The commonest long bone fractured that is usually involved and most common open one is tibia. Based on the anatomic location in the tibial bone, the distal tibia is reported to be the 2nd highest incidence of the fracture that is involved commonly.⁸ High velocity injuries are observed to be

responsible for fractures of distal tibia and its extensive damage to the associated soft tissue. And this pose a greatest confusion to the operating surgeons to decide whether to treat soft tissue injuries or to anatomic reduction and articular congruity in managing these fractures.⁹ Orthopedicians have been challenged with greatest complications post-surgical part like mal-union, delayed union, non-union and wound dehiscence because of poor soft tissue coverage, reduced vascularity of distal tibia region and associated soft tissue injury.¹⁰

The present study was conducted in order to compare the functional outcome of various modalities of management that are currently available for managing distal tibia fractures. In present study, group I had 12 males and 8 females, group II had 13 males and 7 females and group III had 9 males and 11 females. *Solanki et al*¹¹ in their study included 30 patients of distal tibial fractures. Patients treated with Intra-Medullary Nail had mean AOFAS (American Orthopaedic Foot and Ankle Society) score of 75.2, while patients treated with External Fixator and MIPO (Minimally Invasive Percutaneous Osteosynthesis) had mean AOFAS (American Orthopaedic Foot and Ankle Society) score 71.5 and 87.1 respectively. GA type 1 was seen in 15, 2 in 10, 3A in 9 and no GA type in 26 patients. AO classification A1 was present in 7, A2 in 8, A3 in 20, B1 in 9, C1 in 10, C2 in 4 and C3 in 2 patients. *Nara et al*¹² included 24 patients with distal tibia extra-articular fractures, AO type 43 A1, 43A2, 43A3 were randomly selected and 12 of them were managed with multidirectional interlocking nailing and remaining 12 with anterolateral locking compression plate. The patients were followed up on regular basis for a period of one year and were assessed clinically and radiologically with respect to tenderness at the site of fracture, abnormal mobility, infection, pain on movement of knee, ankle joints and anteroposterior and lateral radiographs of the leg for union of the fracture.

In multidirectional Interlocking intramedullary group average time for union was observed to be around 4.5 months when compared to 6.4 months in plating group which was significant. We observed that mean AOFAS score was 74.6 in group I, 71.2 in group II and 89.8 in group III. Complications that were noted: non-union seen in 2, 3 and 3, ankle stiffness in 3, 3 and 2, wound discharge in 0, 3 and 2, vagus deformity in 5, 3 and 0 and valgus deformity in 2, 4 and 3 in group I, II and III respectively. Non-surgical management have a very limited and narrow role in medically unfit patient. For those patients, the treatment modalities involved with traction or plaster of paris but the associated complication rate is higher which consisted of shortening, malunion, secondary osteoarthritis of the ankle and limited range of movements. Moreover, the long bed ridden patient are more prone for pneumonia, deep vein thrombosis and pressure sores which are more likely to be observed in some of the patients. *Tscherne* classification of soft tissue injury was proposed by the AO group to grade and assesses each component the skin, neurovascular tissue and the musculotendinous structure gave way for reconsideration of open reduction and internal fixation of distal tibial fractures. For distal tibial fractures various modalities of internal fixation have been described.¹³⁻¹⁵ AO medial plating using medial buttress plate, cloverleaf plate and dynamic compression plates. Each plate osteosynthesis has their own advantages and their complications.

There were also a some of the major limitations associated with this study. Firstly, the patients in conservatively managed fibula group and fibula fixation group had statistically dissimilar mean age which made it cumbersome to compare the post-operative outcome. Likewise, patients in IMN group and MIPO group differed in the interval between timing of injury and surgery. Secondly, the small number of patients in various groups that were prone to develop complications or required secondary treatment option made it impossible to establish a significant relation between these complications and various treatment options.⁶

CONCLUSION

To conclude, the functional outcome and complication rates are obtained with use of IMN and MIPO for the management of distal tibia fractures. But the use of intramedullary nailing is recommended for the effective management of these fractures due to reduced duration of surgery, lower radiation exposure, decreased interval between injury and surgery along with biomechanical advantage that permits early mobilization when compared to the use of plates using MIPO technique.

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