ORIGINAL ARTICLE

Outcome Of Closed Reduction And Interlock Nailing Of Tibial Shaft Fractures: TM Distractor Versus Manual Traction

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ABSTRACT

Background: Tibia is the second largest bone of the body after femur and it is one of the principal load bearing bone.
Aim: To compare the outcome in patients with tibial shaft fracture treated by closed reduction and IL nail using manual traction versus modified NA fixator.
Study Design: Quasi experimental study.
Methodology: Present study was held in the department of orthopedic surgery, Nishtar, Multan Pakistan after ethical approval. In group-A IL tibial nailing was done using TM distractor while in group B manual traction was used. Various parameters like operative time, contact after fracture reduction, rotation of limb, limb length discrepancy and infection rate was studied between the two groups. Mean and standard deviation was calculated for quantitative variables. Frequencies and percentages were calculated for qualitative variables. Chi – square and independent sample t test were applied. A p-value <0.05 was considered significant.
Results: In our study, the operative time was 79.50±17.73 minutes, in group A 75.90±19.23 minutes in group B 83.10±15.45 minutes (p=0.042). No mal rotation occurred in any case in both groups. There was no contact between major bone fragments in 16%, in group A 18% in group B 14% (p=0.786).
Conclusion: Present study concluded that TM distractor has similar outcome as compared to manual traction as there was no statistical difference in both groups in terms of contact after reduction, limb length discrepancy, radiological union and infection rate.
Keywords: Inter locking nail, Modified NA distractor, Tibial nail and TM distractor.

INTRODUCTION

Tibial fractures are common fractures in orthopedics[1,2], occurring in 17/100000 persons per year[3]. Tibia is the second largest bone of the body after femur and it is one of the principal load bearing bone[2]. High energy trauma is the commonest mechanism of injury[2], with diaphyseal fractures occurring more frequently in younger adults. Most fractures of the tibial shaft have some degree of comminution as well. These fractures are presented with pain, swelling and deformity of the limb. An ipsilateral knee injury occurs in about 10% cases[1]. The tibial shaft fractures are stabilized early to decrease blood loss and making the nursing care easy.

Closed intramedullary nailing is the method of choice for most tibial shaft fractures that was first time advocated by Kuntscher in 1940[2]. Successful Intramedullary nailing results in a short hospital stay, a rapid return of motion in all joints, prompt return to walking, and a relatively short total disability time. Maintenance of reduction, accessibility of whole tibia, 90° flexion at knee and possibility of traction adjustment during the internal fixation is a requirement for successful procedure[4,5]. This traction and reduction of fracture is attained by using manual traction, traction table or distractor. Manual traction is inconsistent and need strong assistant[6], traction table provides very good consistent traction[7,8,9] but traction table reduces the access to the whole extremity specially the other leg[6] for comparison of rotation[4], it may also increase the intercompartmental pressure[10,11].

Manual traction or traction table cannot be used In conditions like ipsilateral femoral shaft and acetabulum fracture, ipsilateral vertically unstable pelvic fracture, simultaneous operations on both lower extremities, single lower extremity with multiple levels of injury requiring operative intervention, obesity, unstable spine fractures[4,6].
In the literature, the distractor has been described to be helpful for tibial nailing[4]. These distractor devices may be temporary fine wire frames[7,12], full pin frames[13,14], AO universal distractor using unilateral half pin frames[15]. Rubenstein et al.[15] used universal AO distractor applied on the medial side with two 4.5 or 6mm Schanz screws and found it useful for maintaining length and alignment with the additional benefit of provision of compression at fracture site if needed.

Based on the same principles and technique as described by Rubenstein et al.[15] modification of commonly used NA fixator (TM Distractor) has been made by Dr Tariq Mehmood (Associate Prof. Orthopaedics) to use it for reduction during insertion of IL nail in tibial shaft fractures. This is applied in supine position using radiolucent table that makes easier to use image intensifier to view AP and Lateral views.

The objective of the study was to compare the outcome in patients with tibial shaft fracture treated by closed reduction and IL nail using manual traction versus modified NA fixator.

METHODOLOGY

This quasi experimental study was conducted in the department of orthopedic surgery, Nishtar medical university Multan Pakistan after ethical approval. One hundred patients were included using nonprobability

sampling technique fulfilling the inclusion criteria. Tibial shaft fractures of less than 4 week duration were included from both genders between the age of 18 to 60 years. All infected, maltreated, unwilling, poly trauma, ischemic, previously operated, pathological and patients with ASA grade IV and above were excluded from the study. Patients were divided in two groups; in group-A IL tibial nailing was done using TM (Tariq Mahmood) distractor (modified NA fixator) while in group B manual traction was used. Number of images in a procedure, operative time, contact after fracture reduction, rotation of limb, limb length discrepancy, radiological union time and infection rate were studied and compared between the two groups.

In both groups the number of images and duration of surgery noted and reduction checked per operatively under image intensifier. The rotation of 5° was accepted normal and corrected per operatively if required. The contact between two major fragments after reduction and IL nailing was looked under image intensifier and labeled as no contact if in between fragment was comminuted or in case of segmental fracture. LLD assessed clinically per operatively (comparing with the normal side) and measured post operatively and noted. The patients were followed periodically till radiological union in outpatient department to look for any complication (infection, nonunion). Up to 5° angulation in any plane, < 1 cm translation, LLD <1cm were considered acceptable. All the assessments were done by two surgeons independently and a dispute between these two was solved by assessment by a third most senior surgeon.

Statistical analysis: All the data was entered in SPSS version 25.0. Mean and standard deviation was calculated for quantitative variables like age and duration since injury. Frequencies and percentages were calculated for qualitative variables like gender, type of fracture, class of fracture, union, presence or absence of pin track infection. Stratification was done with regards to age, gender, class of fracture, and duration of fracture. Chi – square test was applied to compare quality of reduction while independent sample t test was applied to compare duration of surgery, no. of images (fluoroscopy duration). All statistical tests were applied at 95 % CI and p value ≤0.05 were considered significant.

RESULTS

In our study data of 100 patients was analyzed (50 in each group). The demographic data and main outcomes are illustrated in table-1. The accepted rotation at fracture site after reduction was 5^0 and there was no mal-rotation in our study.

Table 1: Demographic data and main outcomes (n=100)

	Both Groups	***TM.Distractor***	***M.Traction***	***P-value***
Age (years)	33.10±12.67	34.96±12.58	31.24±12.61	0.143
Gender				
Male	87%	88%	86%	0.999
Female	13%	12%	14%	
Time since injury (days)	7.17±3.28	6.54±3.50	7.80±2.94	0.054
No. of images	34.93±10.64	37.18±11.56	32.68±9.21	0.034
Operative time (minutes)	79.50±17.73	75.90±19.23	83.10±15.45	0.042
Contact after reduction	84%	82%	86%	0.786
Limb length discrepancy (cm)	0.10±0.26	0.08±0.23	0.12±0.29	0.455
Radiological union (months)	5.25±1.78	5.44±1.61	5.06±1.92	0.287
Non union	5%	4%	6%	0.999
Infection	4%	4%	4%	0.999

DISCUSSION

Tibial shaft fractures are common and in adults most of the times they are managed surgically by intramedullary nailing. The concept of closed nailing is not new and has many advantages over open technique. During closed nailing various methods can be used to reduce fracture and insertion of nail. Traction table is a little expensive, cumbersome at times and not suitable for poly trauma and obese patients[16]. Manual traction is usually used in this procedure but in some cases manual traction can't be used so other effective methods are also in vogue like distractor.

In our study most of the patients were young (33.10±12.67 years), males were dominant probably because they are more prone to road traffic accidents as they usually ride bikes and drive cars in our society. The time between trauma and definitive surgery was 7.17±3.28 days because all the surgeries were done on routine elective lists after resuscitation in emergency and preparation in ward. In 16% cases direct contact between major fragments could not have been achieved either due to segmental fractures or comminution while only 0.10±0.26 cm shortening was observed as length was tried to achieve per operatively. Five fractures failed to unite for which we have to do bone grafting. Four cases got minor infection at locking screw site that were managed by local cleansing and few days antibiotic.

We found no significant difference in outcome between TM distractor group (A) and Manual traction group (B) in terms of age (p=0.143), gender (p=0.999), time since injury (p=0.054), contact of major fragments after reduction (p=0.786), limb length discrepancy (p=0.455), radiological union (p=0.287), nonunion (p=0.999) and infection (p=0.999).

The number of images during procedure were significantly (statistically) more in group A as compared to group B (p=0.034). This was probably due to few more images required to insert Schanz screw in proximal and distal tibia for application of TM distractor.

The operative time was found significantly (statistically) more in manual traction group (p=0.042). This

was probably due to difficulty in obtaining and maintaining reduction by inconsistent manual traction.

Wysocki RW et al[17] reported high rate of acceptable alignment in terms of angulation and LLD in 39 out of 42 patients treated by IL nail tibia using intra operative two pin external fixator.

Moed BR et al[14] reported in a series of 44 tibial fractures requiring intramedullary nailing and recommended intra operative external fixation pin frame for correction of angular deformity and LLD during IM nailing of that would otherwise require use of the universal distractor.or fracture table. They used one pin os calcis and other in proximal tibia creating a rectangular frame with compressor/distractor clamps.

Rommens PM et al[18] also described different techniques of fracture reduction during intramedullary nailing of tibia including large distractor, external fixator and extension table.

Rubinstein RA et al[15] described the technique and case series of 20 patients using the universal AO/ASIF distractor. They used Schanz screws proximally and distally in tibia. They reported that fracture alignment was anatomic or near anatomic in all cases at follow up of on average 5.2 months, the alignment was not changed and most of the tibias showed clinical and radiological union. They showed additional benefit of external distractor as to apply primary compression at fracture site per operatively if needed.

Buehler KC et al[19] reported results of AO/ASIF distractor technique in a case series of 14 patients. They reported mean anterior displacement of 3.0 mm (range 0–17), mean coronal plane alignment as 2.0 degrees valgus (range 28º varus to 128 º valgus). They reported no case with nonunion.

A prospective analysis was conducted by Somenistyy AA et al[20] for 30 patients with tibial fractures. They observed acceptable reduction in all patients with mean duration of fluoroscopy 85.9±4.8 seconds. There were two cases with infection, one with superficial and other with deep infection.

CONCLUSION

Present study concluded that TM distractor has similar outcome as compared to manual traction as there was no statistical difference in both groups in terms of contact after reduction, limb length discrepancy, radiological union and infection rate. However number of images in a procedure were less in TM distractor group in our study while operative time was more in manual traction group. The use of TM distractor group is recommended for close IL nail tibia.

Limitations: Our study had several limitations like financial constraints and fewer resources. It was a single centre study.

Author's contribution: TM & MB: Overall supervision, write up and literature review.

MKC & SA: Statistics application analysis literature review, help in write up.

AR and MAT Literature review help in write-up.

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