

Outcomes of Conservative versus Operative Management in Fracture Shaft Tibia and Fracture Shaft Femur in Pediatric Age Group

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Abstract

Original Research Article

Background: Tibia is more often involved in open fractures because of its subcutaneous location. Severe open fractures of tibia are associated with high complication rate and poor long term outcomes. 70% of pediatric tibial fractures are isolated injuries and approximately 30% of pediatric shaft tibia fractures are associated with fibula fracture. **AIM:** The aim is to study clinical and radiological outcomes of patient with tibial and femoral fractures, who are treated with closed reduction and internal fixation with nailing versus treated conservatively by casting. **Material and method:** 40 cases with femur or tibia fractures treated with nailing and conservatively between 1st January 2022 to 30th November 2022 at rural medical college, Loni a rural tertiary care hospital was analyzed retrospectively out of which 16 patients treated conservatively and 4 patients underwent operative management for tibia fractures while 16 patients were treated operatively and 4 patients treated conservatively for femur fractures. **Results:** Total 40 patients of shaft femur and shaft tibia fractures were treated conservatively with cast application and Closed reduction and internal fixation by elastic nailing. In comparison for simple transverse fracture, we can conclude that in most patients fracture can be treated conservatively to minimize soft tissue damage but only in unacceptable criteria for conservative management we can opt for minimally invasive procedure like TENS nailing. **Conclusion:** Immobilization time is shorter in surgical group but we have started mobilizing with cast application. It is the only advantage of surgical management which has been given in conservatively managed patients. Outcomes after 3 months.

Keywords: Tibia, femur, fracture, operative, conservative.

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INTRODUCTION

Fractures of tibia are relatively common. Fracture are commonly associated with soft tissue injuries and fracture are not injury to bone but also soft tissue. During treatment soft tissue handling decides the outcome of healing. Tibia fractures are associated with wide range of injury mechanism and severities. The management of tibia fractures are influenced greatly by associated soft tissue injury.

Tibia is more often involved in open fractures because of its subcutaneous location. Severe open fractures of tibia are associated with high complication rate and poor long term outcomes. 70% of pediatric tibial fractures are isolated injuries and approximately

30% of pediatric shaft tibia fractures are associated with fibula fracture [1, 2].

Mechanism of injury for tibia in adolescents is direct blow or vehicular accident while in toddlers low energy twisting or fall are most common causes. The most common cause of low energy tibia fractures are sports injuries while of high energy fractures are associated with vehicular trauma. Most common pattern of fracture in tibia in children is spiral pattern due to torsional injuries [1, 3, 4].

Incidence of femur fractures varies from 1% to 9% of all fractures and often is major source of morbidity and mortality. These fractures are mainly

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because of high energy trauma in younger males like road traffic accidents, fall from height etc [5-7].

Fracture patterns is based on direction and force applied to bone. Bone fails under tensile strain. Bending force create transverse fracture pattern and may also create butterfly fragment on compression side. Rotational force create either spiral or oblique fracture pattern. Fractures of shaft femur is common in boys (2.6:1), and occur in bimodal distribution with a peak during toddler years (usually from simple falls) and then again in early adolescence [6, 8, 9].

Main purpose of treatment is to maintain or restore length, deformity correction, achieving adequate stability and early mobilization. Spiral or oblique fractures if not treated properly has high chance of going in malunion.

The aim is to study clinical and radiological outcomes of patient with tibial and femoral fractures, who are treated with closed reduction and internal fixation with nailing versus treated conservatively by casting. In literature it has been mentioned, that Rate of success of cast treatment of pediatric shaft tibia fracture range from 60% to 90% [10, 11].

In this study, same type of fractures are compared (transverse, oblique and spiral).

MATERIAL AND METHODS

40 cases with femur or tibia fractures treated with nailing and conservatively between 1st January 2022 to 30th November 2022 at rural medical college, Ioni a rural tertiary care hospital was analyzed retrospectively out of which 16 patients treated conservatively and 4 patients underwent operative management for tibia fractures while 16 patients were treated operatively and 4 patients treated conservatively for femur fractures.

Inclusion Criteria:

- Patients of age more than 9 years-20 years with tibial shaft and femoral shaft fracture.
- Patient willing to give consent and undergo Closed reduction and internal fixation with elastic nailing for fracture management.
- Fresh fractures.

Exclusion Criteria:

- Medically unfit patient
- Patient not giving consent
- pathological fractures.
- Loss to follow up were excluded from study.

On admission, a brief history was elicited to document mechanism of injury. Clinical examination followed by haematological and other routine lab investigation were done for all patients. Radiological

investigations include xrays antero-posterior and lateral view of affected site. Written and informed consent was taken from all patients.

Surgical method-

For shaft tibia and shaft femur fractures-

After giving general anesthesia. IV antibiotic was given. Surgery was performed in supine position. Medial and lateral condyles exposed through lateral and medial incision.

After exposing the bone, reduction as achieved by traction and hold in position with bone holding forceps. TENS nail is inserted through medial and lateral condyle. Reduction confirmed under C- arm fluoroscopy. Skin suturing done and sterile dressing applied after skin closure along with slab application. Pillow elevation was given.

Post op dressing done regularly and patients were discharged on post op day 5 or 9. Slab was removed on post op day 12 and physiotherapy initiated like knee ROM, ankle pumps and quadriceps strengthening. Patient was allowed to do routine activities after 6 weeks post operatively.

Conservative method-

For femur fractures-

Patient is placed on operative table with wooden extension, supporting weight of legs with manual traction and cast is applied with hips in 90 degree flexion and 30 degree abduction. The leg should be placed in 15 degree of external rotation to align distal fragment with external rotation of proximal fragment.

For tibial fractures-

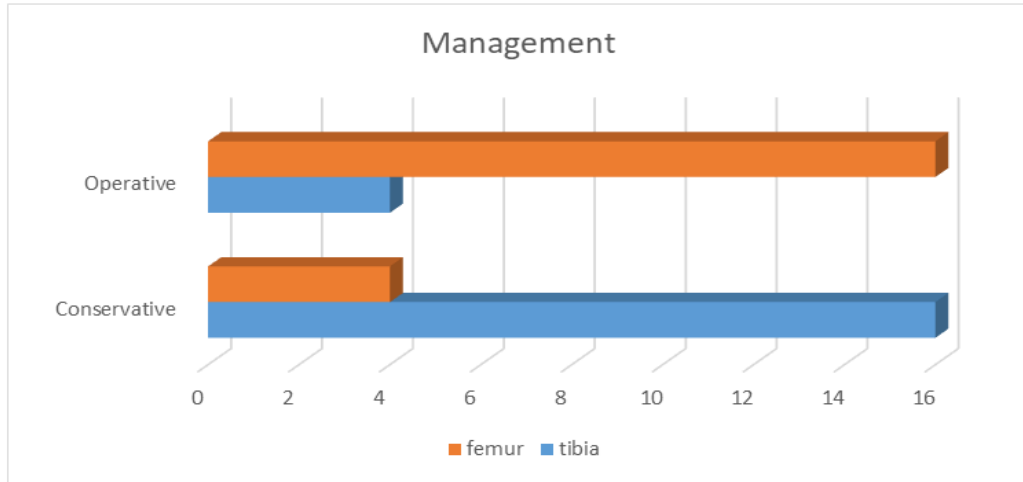
If fracture is stable and undisplaced or displaced which is manageable for closed reduction is treated conservatively by slab or Cast immobilization with foot in appropriate position and either valgus or varus mold at fracture site, depending upon fracture pattern and alignment, and is extended to mid thigh with knee flexed.

RESULTS

Total 40 patients of shaft femur and shaft tibia fractures were treated conservatively with cast application and Closed reduction and internal fixation by elastic nailing. In comparison for simple transverse fracture, we can conclude that in most patients fracture can be treated conservatively to minimize soft tissue damage but only in unacceptable criteria for conservative management we can opt for minimally invasive procedure like TENS nailing. Immobilization time is shorter in surgical group but we have started mobilizing with cast application. It is the only advantage of surgical management which has been given in conservatively managed patients.

Outcomes after 3 months

	Fracture Shaft Femur and Fracture Shaft Tibia	
	Conservative	Operative
Rotational deformity	2	1
Limb length discrepancy	1	0
Knee stiffness	2	0
Implant palpable	0	5
Superficial Infection	0	2
Pain at the site of nail insertion	0	5
Inflammatory reaction/bursitis at entry site	0	5
Knee swelling	0	8



Outcomes after 6 months

	Fracture Shaft Femur and Fracture Shaft Tibia	
	Conservative	Operative
Rotational deformity	0	0
Limb length discrepancy	0	0
Knee stiffness	0	0
Implant palpable	0	3
Superficial Infection	0	1
Pain at the site of nail insertion	0	2
Inflammatory reaction/bursitis at entry site	0	0
Knee swelling	0	2

According to our study we found there is no significant difference between conservative and

operative group because of complications rates are almost equal in both the groups.

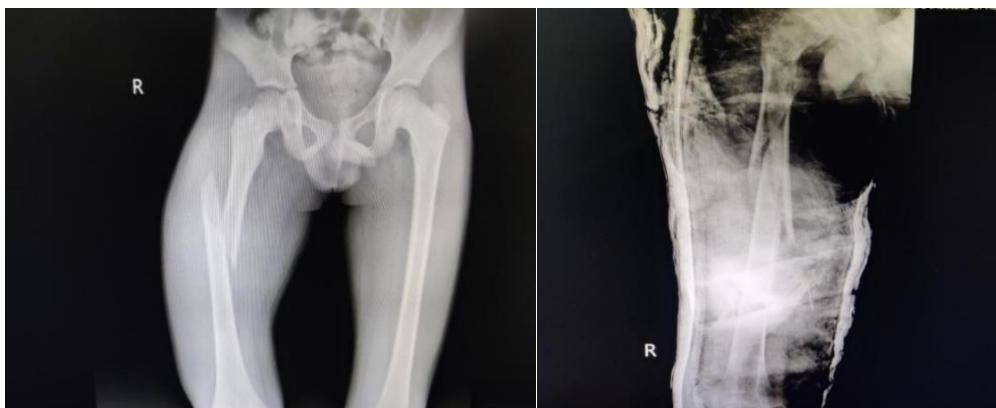


Figure 1: Fracture shaft femur



Figure 2: 1 week follow up



Figure 3: Fracture shaft tibia



Figure 3: After 1 week follow up



Figure 4: Fracture shaft femur



Figure 5: Immediate post op



Figure 6: Fracture shaft tibia



Figure 7: Immediate spot op

DISCUSSION

The tibia is second largest bone in the body. The shaft of tibia is shape of prism with broad proximal extent that decreases in size till distal third. Tibia crest is prominent anteromedially from tibial tubercle to the tibial plafond and is subcutaneous without overlying musculature [12]. The fibula fracture may be complete or incomplete with some plastic deformation. Shaft tibia fracture associated with fracture of fibula often tends towards varus angulation due to actions of muscle in anterolateral aspect of leg. If fibula is not fractured, conservative management fails in most of the cases because of height is maintained with intact fibula, no micromotion occurs at the fracture site.

Few patients for shaft tibia fractures were managed on OPD basis by fibre cast application and allowed to weight bear on the principle of functional cast bracing.

As per wolfs law, bone in a healthy animal will adapt to the loads under which it is placed. If loading on a particular bone increases, the bone will remodel itself

over time to become stronger to resist that sort of loading. This principle has been applied in our study.

It has been observed in few patients, patients present with out-toeing gait in follow up. Fewer children limp with out-toeing gait on involved extremities for several weeks to months after cast is removed. This is secondary to muscle weakness, joint stiffness, and tendency to circumduct the limb during swing phase, rather than malalignment or malrotation of fracture. As muscle atrophy and weakness resolve, limp improves. The increase in diameter and area of bone result in increased area moment of inertia, leading to increase in strength. Conservative management of shaft femur fractures can be done by Spica casting. Spica casting is best treatment for isolated femoral shaft fractures in children. Advantages of spica include low cost, excellent safety profile and very high rates of good results with acceptable leg length equality, healing time and motion in patients with age group less than 4 years because of high remodelling [13, 14]. Spica is removed after 6 weeks, patient experience stiffness in hip and knee joint. Parents are encourage to allow child to stand and walk until stiffness resolves. Marengo *et al*.

reported that on analyzing retrospectively on 80 closed, displaced tibial shaft fractures, with 26 tibia treated with flexible intramedullary nails and 54 tibias treated with closed reduction and casting [15]. Valgus and procurvatum deformities significantly improved in flexible nailing group. Immobilization time was shorter in surgical group. In contrast to Femoral shaft fractures, studies have failed to find poorer outcomes in regard to malunion rate or time to union in use of intramedullary flexible nail in pediatric age group [15, 16]. Advantage

of conservative management over surgical management are no post anesthetic complications and minimal soft tissue damage whereas nail can cause soft tissue irritation. In shaft femur fracture due to forces acting on femur are high, reduction manuverere is difficult, hence patients of shaft femur fracture are advised operative intervention.

Acceptable reduction parameters-

In conservative management of shaft tibia fracture-

Alignment	Accepted Parameter
Angulation in sagittal plane	<5-10°
Angulation in coronal plane	<5-10°
Rotation	<5°
Cortical apposition (%)	>50

This is particularly the case for undisplaced or minimally displaced tibial shaft fractures. If there is no significant soft-tissue swelling or injury, a long-leg cast

is applied for 4–6 weeks, followed by progressive weight bearing [11, 17, 18].

In operative management for shaft tibia fracture-

Absolute
Unacceptable reduction
Fracture instability
Significant soft-tissue injury
Compartment syndrome
Open fractures

If patient is meeting absolute criteria, patient is advised for surgery.

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