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Original research article

A study of diaphyseal fractures of shin bone treated with intramedullary interlock nailing

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Abstract
The total incidence of diaphyseal fractures of the tibia is 26/1, 00,000 population. With the increasing number of vehicles on the roads in India, complex traumatic cases due to traffic accidents are gradually increasing. The method of closed nailing with or without reaming followed by early ambulation and weight bearing has positive advantages over all existing methods, a significantly lower complication rate, and comparable results. This study aimed to review the results of tibial diaphyseal fractures treated with intramedullary nailing
Keywords: Surgery, management, outcome, diaphyseal, fracture, tibia, intermedullary nails

Introduction

The tibia bone is usually a broken long bone in our body. The shaft of a tibial fracture occurs along the length of the bone, below the knee and above the ankle. It takes a lot of force to cause this type of fracture. Traffic accidents are a common cause of tibial fractures. Along with tibial fractures, a smaller bone in the lower leg is also broken. Depending on the force, tibial fractures vary, pieces of the bone may line up correctly (stable fracture) or be out of alignment (displaced fracture). The skin around the fracture may be intact (closed fracture) or the bone may pierce the skin (open fracture). In many tibial fractures, the fibula is also broken.

Fractures of the tibia are classified depending on: the location of the fracture (the length of the tibia is divided into thirds: distal, middle and proximal), the type of fracture (for example, the bone can break in different directions, e.g. transversely), longitudinally or medially), whether it is the skin and muscle over the bone torn by an injury (open fracture).

Bernardino de Sahagun, a 16th-century anthropologist who traveled to Mexico with Hernando Cortes, recorded the first report of the use of an intramedullary device [1]. During the mid-19th century and into the first decade of the 20th century, most work on intramedullary nailing by non-members appears to have revolves around the use of ivory pins. It was observed that ivory pins would be reabsorbed in the human body compared to metal implants that were encased in a fibrous material. Most of this work was described in the German literature at the time [2, 3]. During the 1890s, Gluck recorded the first description of an interlocking intramedullary device [4]. The device consisted of an ivory intramedullary nail that contained holes at the end through which ivory interlocking pins possible to pass. Around the same time period, Nicolaysen of Norway described the biomechanical principles of intramedullary devices in the treatment of proximal femur fractures. Nicolaysen suggested that the length of intramedullary implants be maximized to provide the best biomechanical advantage [5]. Hoglund of the United States reported the use of autogenous bone as an intramedullary implant in 1917 [6]. He described a technique in which a span of cortex was excised. And then passed through the medullary cavity over the fracture site. During World War I, Hey Groves of England reported the use of metal rods to treat gunshot wounds [7]. These rods were inserted into the medullary cavity through an incision made across the fracture site. This technique appeared to have a high infection rate and was not universally accepted. It was not until Smith-Petersen's 1931 report of the successful use of stainless steel nails for the treatment of femoral neck fractures that the application of metallic intramedullary implants began to expand rapidly [8].

Goals and Objectives

To study and evaluate the results of intramedullary nailing in diaphyseal fractures of the tibia.

Materials and Methods

Patients of both sexes belonging to the adult age group suffering from tibial fracture in the Department of Orthopaedics, Yenepoya Medical College, Mangalore. Those who meet our inclusion criteria and are

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surgically eligible are included in the study. This includes a prospective study of 30 cases.

Inclusion and exclusion criteria
Inclusion criteria

1. Age >20 years
2. All closed diaphyseal fractures of the tibia.
3. Open diaphyseal fractures of the tibia type 1 and type 2 (according to Gustilo Anderson classification) occurring within 24 hours after injury

Exclusion criteria

1. Age < 20 years
2. Patients with an open physis
3. Open fractures of the tibia type 3A, type 3B and type 3C (according to
4. Gustilo and Anderson classification)
5. Immunocompromised patients

Patients were regularly followed up on an outpatient basis at 4, 8, 12, 16, 20 weeks and 6 months and, if necessary, between them. Complaints were recorded and patients underwent clinical and radiological examination for pain, swelling, malignancy and shortening of the tibia, range of motion of the knee, ankle and foot. Pain was recorded as none, sporadic, significant, and severe. Swelling recorded as none, minor, significant, and severe. Malaligned tibia in the form of valgo/varus in degrees. Shortening was recorded in measurement form and was recorded in cm or marked as zero if missing.
Anteroposterior alignment was determined by measuring the angle between the lines parallel to the proximal fragment and the distal fragment on the lateral radiographs. Rotations were evaluated clinically. Malunion was considered when varus valgus angulation was more than 5º, anterior-posterior was more than 10º, internal and external rotation was more than 10º, and shortening was more than 10 mm. Radiological assessment is done based on whether it is a callus, union, or whether the fracture is consolidated. Weight bearing was performed, initially partial weight bearing or as tolerated and depending on the type of fracture and stiffness of fixation. Full weight bearing is allowed after bridging callus is seen on radiographs. Late delayed complications such as screw breakage, nail bending, mal-union, non-union, lameness, pain and infection of the anterior knee are recorded and any secondary procedure is recorded on the pro forma. Functional evaluation of the results is one based

A. Resumption of activities of daily living

b. Restoration of occupation

C. Painless movements and walking

Result:

Table 1

Complications	Numberofpatients
Superficialinfection	1
Proximalscrewbreakage	---
Distalscrewbreakage	---
Nonunion	---
Delayed union	2
Anterior knee pain	8
Malunion	---
Fat embolism	---
Shortening	4

Deformity assessment

Table 2

Deformity(in degrees)		Number of patients
Valgus	None	30
	2-5	5
Varus	None	30
	2-5	1

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Table 3

Deformity(in degrees)		Numberofpatients
Flexion deformity	None	30
	0-5	1
Recurvation	None	29

Range of motion

Table 4

Movements Flexion		Extension	Number of patients
KNEE	> 120^o	05^o	26
	120^o	10^o	2
	90^o	15^o	2
	<90^o	>15	0
Ankle	Dorsi flexion	Plantar Flexion	
	> 20^o	>30^o	23
	20^o	30^o	2
	10^o	20^o	5
	< 10^o	< 20^o	0
Foot Motion (as compared to normal)	5 / 5		24
	2 / 3		2
	1 /3		4
	< 1/3		0

Functional outcome

Table 5

Functional outcome	Numberofpatients
Excellent	20
Good	7
Fair	3
Poor	0
Total	30

Discussion

The use of nonoperative treatment for tibial diaphyseal fractures that are widely displaced or that result from high-energy forces is associated with a high prevalence of malunion, joint stiffness, and poor functional outcome.

Due to the subcutaneous localization, the tibia is the most common bone fracture that is commonly encountered in orthopedic practice. Open fractures are more common because a third of its surface is subcutaneous for most of its length. In addition, the blood supply to the tibia is more uncertain than in bones closed by heavy muscles. The presence of articulated joints in the knee and ankle does not allow for any adaptation to rotational deformity after fracture. Delayed union, non-union and infection are relatively frequent complications, especially after open fractures of the tibial diaphysis.

Because of its frequency, topography, and mode of injury, it has become a major source of temporary disability and morbidity. Therefore, special care and expertise are required in the treatment of such fractures. It requires the widest experience, the greatest wisdom, and the finest clinical judgment to select the most appropriate treatment for a particular type of injury. Treatment of tibial diaphyseal fractures has remained a controversial topic despite advances in both nonoperative and operative care. Sir John Charnley stated in 1961 that "we still have a long way to go before it is possible to definitively establish the best treatment for tibial diaphyseal fracture". Several published series on the treatment of tibial diaphyseal fractures have shown that closed treatment of fractures can have excellent results. However, the disadvantages of prolonged healing time, malalignment, and patient reluctance led to the idea of other treatments, which eventually led to the use of closed interlocking intramedullary nailing, which provided excellent results. The method of closed nailing with or without reaming followed by early ambulation and weight bearing has positive advantages over all existing methods, a significantly lower complication rate, and comparable results. Intramedullary nailing under image intensification meets the goal of stable fixation with minimal tissue damage, resulting in better and faster fracture union. An important aspect for its use is its ability to prevent axial collapse, rotational and angular deformities, and most importantly walking as fast as possible. This study aimed to review the results of tibial diaphyseal fractures treated with intramedullary nailing.

Conclusion

Patients operated on with this technique can in most cases be discharged early without external immobilization, patients are allowed to return to work as soon as tolerated, and this procedure also

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shortens hospital stay and increases patient morale.

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