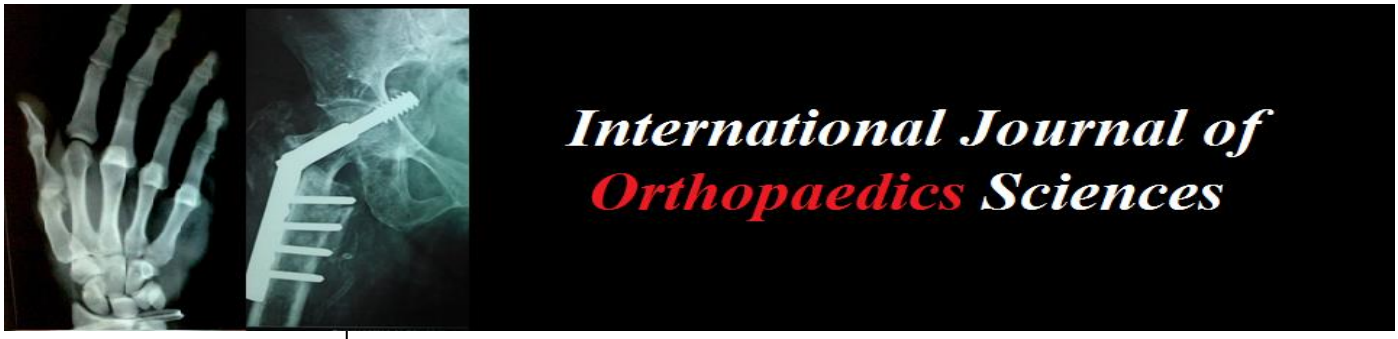

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Study of enders nailing in tibia shaft fracture in paediatric patient

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Abstract
Background and Aim: The exposed anatomical location of the tibia makes it vulnerable to the direct blow and high energy trauma as a result of motor vehicle accidents, thus resulting in comminuted fractures which are frequently open with significant loss of skin and soft tissues. The purpose of our study was to present results of fixation of unstable tibial shaft fractures in children with Ender's nailing.
Material and Methods: This is a study of 30 patients of unstable tibial shaft fractures in children treated with Ender's nailing. 24 were closed fractures & 6 were open grade one fractures with only punctured wounds. Twenty patients had concomitant fibula fractures. In 26 patients tibia fracture was an isolated injury, one had associated same side clavicle fracture and one had associated same side lower end radius fracture.
Results: Average time for fracture union was 9 weeks (range 6 to 15 weeks). All fractures united without 2nd operative intervention. Slight nail back out occurred in many patients, but only in 2 patients significant proximal migration of nails occurred causing some knee irritation, but not requiring any operative intervention before fracture union. In all patients implant removed 6 to 7 months after surgery. There was some restriction of knee movements in 4 patients in which nails were significantly backed out, but after implant removal full knee movements achieved in all patients there was full ankle movements in all patients at final follow-up.
Conclusion: Based on our results, Ender's nailing is an effective method of treatment in these cases, which allows rapid healing of tibial shaft fractures with an acceptable rate of complications.

Keywords: complication, fracture, implant, tibia

Introduction

Fractures of the tibial shaft are important for the reason that they are common and controversial. The exposed anatomical location of the tibia makes it vulnerable to the direct blow and high energy trauma as a result of motor vehicle accidents, thus resulting in comminuted fractures which are frequently open with significant loss of skin and soft tissues. Because of the high prevalence of complications associated with these fractures, management often is difficult and the optimum method of treatment remains a subject of controversy [1, 2].

Flexible unreamed intramedullary nails have long been used to manage diaphyseal fractures of long bones. Enders nail (EN) is an unreamed intramedullary nail used for femoral shaft and intertrochanteric fractures; and now also for tibial shaft fractures [3]. ENs allow early weight-bearing and can be placed with closed technique, which avoids damage to soft tissue and blood vessels. Reports in literature indicating adverse effects of reaming with increased incidence of pulmonary complications and disruption of vascular supply of inner 2/3rd of cortex, have resulted in increased popularity of unreamed nails for fixation of such fractures [4].

These nails rely on three-point fixation in the medullary canal and provide favourable mechanical conditions, as the forces are evenly distributed along the entire length of nails. As the fixation by these nails is not rigid, therefore some amount of micro-motion occurs between the two fragments which in turn stimulate fracture healing. These nails do not ensure sufficient longitudinal stability in grossly comminuted or long oblique fractures with resultant shortening [5].

Many studies have supported the use of this technique in the femur, citing advantages that include closed insertion, preservation of the fracture haematoma and a physeal sparing

entry point. Few studies have also described the use of flexible intramedullary nails in the tibia. But most of those studies are for titanium elastic nails. The purpose of our study was to present results of fixation of unstable tibial shaft fractures in children with Ender's nailing.

Materials & Methods

This is a study of 30 patients of unstable tibial shaft fractures in children treated with Ender's nailing. 24 were closed fractures & 6 were open grade one fractures with only punctured wounds. Age was ranging from 7 to 16 yrs. Average age was 24.5 yrs. 20 boys & 10 girls were there.

Twenty patients had concomitant fibula fractures. In 26 patients tibia fracture was an isolated injury, one had associated same side clavicle fracture and one had associated same side lower end radius fracture. On admission patients were given above knee slab, elevation, analgesics and antibiotics (In open fracture).

During surgery, after proper anaesthesia pt. is taken on fracture table. Debridement of wound done and thorough was given in open fracture. Traction is given to achieve reduction. Under IITV proximal tibial physics is seen. Nail size is determined by keeping it on leg under IITV. Nail should be 1.5 to 2 cm distal to proximal epiphysis & should end 1.5 to 2 cm proximal to distal epiphysis. Nails are inserted in antegrade (proximal to distal) direction. The starting point of nail insertion is 1.5 to 2 cm distal to the physics, sufficiently posterior in the saggital plane to avoid injury to the tibial tuberosity apophysis. First hole is made at that level either medially or laterally. The owl is further advanced in proximal medullary canal. We used 3.5 Ender's nails in all patients the nail is given slight bending at the tip & slight general bending then introduced into the proximal tibia. Reduction checked under IITV and then the nail is advanced across the fracture site into the distal fragment.

At this stage reduction may not be perfect but it gets corrected by rotating the nail at time, and at other times by introducing other nail. The nail is pushed up to 1.5 to 2 cm proximal to distal tibial epiphysis. The second nail is introduced similarly from opposite side. In all patients close procedure was done. Proximal end of nails must not protrude much from the hole, otherwise later on with slight proximal migration it may cause knee irritation.

After slab/cast removal at 6 weeks post-operative, patients started partial weight bearing physiotherapy. One patient with comminuted fracture started partial weight bearing at 8 weeks post-operative.

Results

After plaster removal monthly follow up of all patients were done. In each visit patient was assessed by clinical and radiological examination. Clinical examination included incision site (Infection, dehiscence), severity of pain, swelling, tenderness, distal neurovascular status, deep infection, range of motion, muscle power and any back out of nails.

Radiological examination included position of fragments, amount of callus, status of implant and any other complication. Average time for fracture union was 9 weeks (Range 6 to 15 weeks). All fractures united without 2nd operative intervention. Slight nail back out occurred in many patients, but only in 2 patients significant proximal migration of nails occurred causing some knee irritation, but not requiring any operative intervention before fracture union.

In all patients implant removed 6 to 7 months after surgery. No implant breakage found in any case. There was no wound infection found in any case. At final follow-up no pain or swelling was found in any case. There was some restriction of knee movements in 4 patients in which nails were significantly backed out, but after implant removal full knee movements achieved in all patients there was full ankle movements in all patients at final follow-up.

At final follow up only 2 patients had more than 50 malalignment, one having 60 recurvatum and one having 70 varus. No patients developed obvious rotational abnormality, limb length discrepancy or physeal arrest as a result of treatment.

Discussion

Paediatric tibia fractures account for approximately 15 % of all fractures in children after radius/ulna and femoral fractures. Historically operative treatment has been recommended rarely for tibial shaft fractures in children [6].

During the past few years, there has been a renewed interest in intramedullary nailing of tibial shift fractures. However, there is no consensus of opinion regarding the timing of operation, the type of nail to be used or the necessity to ream. The degree of stability following intramedullary nailing depends upon the length and the shape of the fracture configuration and the technique of nailing itself [7, 8].

Open reduction and internal fixation with plates and screws has yielded unacceptably high rates of infection. This method may be selected with more severe or local injuries associated displaced intra-articular fractures of knee and ankle. Immobilization in a plaster cast has been used most commonly in the past, but it does not always maintain the length of the tibia and it leaves the wound relatively inaccessible [9].

Isolated tibial shaft fractures may develop varus and tibia fractures associated with fibula fractures may develop valgus & shortening. Cast immobilization has been a standard treatment for vast majority of uncomplicated paediatric tibial shaft fractures. But muscle atrophy and reduction in tissue oedema may allow fracture to displace into unacceptable malalignment [10].

The most common & the only complication in our study was proximal nail end irritation which is a minor complication 11, which can be decreased by not keeping proximal nail ends much out from the bone. There was more than 50 malalignment in two patients in our study, which can remodel with growth of child. Partial weight bearing walking is usually started around 6 weeks, but it depends on fracture pattern, fracture stability, patient compliance and any other associated injuries.

Table 1: Cause of fracture

Cause of fracture	No. of patients
Road traffic accident	16 patients
Fall from height	4 patients
Domestic fall or sports related injury	5 patients

Table 2: Location of tibial shaft fractures

Location of fracture	No. of patients
Upper third	2 patients
Distal third	8 patients
Middle third	16 patients

Table 3: Types of fractures

Types of fracture	No. of patients
Long oblique	4 patients
Transverse or short oblique	16 patients
Comminuted	2 patients
Spiral	8 paatients

Conclusion

Based on our results, Ender's nailing is an effective method of treatment in these cases, which allows rapid healing of tibial shaft fractures with an acceptable rate of complications. Being closed procedure there is minimal risk of infection. It has advantage of causing small incision, slight injury of soft tissue, short surgery time and minimal blood loss. It is a load sharing implant & gives relative axial, translational & rotational stability. There is a short learning curve with this treatment & implants are inexpensive.

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