

Original Article***Percutaneous Wire Fixation in Close Tibial Fracture in Children in a Tertiary Care Hospital***

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Abstract

Objectives: *The aim of this study was to evaluate the efficacy and the rate of union in the fracture shaft of tibia by the percutaneous intermedullary pinning or K- wire or enders nailing in growing children.*

Background: *The diaphyseal fracture in the tibia is 3rd most common and frequent in the children¹.*

Material and Methods: *The prospective study was carried out in Jahurul Islam Medical College Hospital during the period of January 2020 to July 2021 in 32 children with the age of 4-14 years.*

Results: *In this study, 32 children with the age of 4–14 years were included and among them 19 were girls and 13 were boys. There were 24 left-sided and 8 right-sided fractures. 22 children suffered a road traffic accident and 10 had a fall from a height. All were closed fractures. There were transverse fractures in 19 children, oblique in 6, spiral in 3, comminuted in 4; fractures were at middle one third in 17 children (11 boys and 6 girls), proximal one third in 8 (4 boys and 4 girls) and distal one third in 7 (4 boys and 3 girls) of tibia. There is no certain classification on the fracture tibia in pediatrics orthopedics, but about 50% of the fracture occurs in the diaphyseal region especially in the middle one third².*

Conclusion: *The study observed less period of hospitalization, minimal cost of k-wires as compared to TENS nails, plates and screws. Less surgical time required, implant removal was with ease and least expenses incurred, early functional recovery with good results.*

Key words: *Percutaneous, Fracture.*

Received: 09.01 2022

Accepted: 05.06.2023

Introduction

The diaphyseal fracture in the tibia is 3rd most common and frequent in the children¹. There is no certain classification on the fracture tibia in pediatrics orthopedics, but about 50% of the fracture occurs in the diaphyseal region especially in the middle one third². Also the pediatric orthopedics has no other classification about the region which can be clinically distinguished but by the region proximal, mid and distal³.

The periosteum is thick in case of children and that's why the recovery rate is good in close fracture management in close reduction and minimal intramedullary pinning^{4,5}.

Materials & Methods

This prospective study was conducted at the Department of Orthopedic Surgery in Jahurul Islam Medical College from January 2020 to July 2021. In this study thirty-two children age ranging 4-14 years with mean age 8.3 years were included.

Criteria of subject selection: Displaced fracture, multiple fragment fracture, which is displaced after proper reduction and fracture displaced in traction or manipulation or the patient which has poly trauma, under ICU care or head injury or irritable patients were selected. Excluded the undisplaced fracture in a good position treated by traction or plaster or plaster cast, age less than two years or more than 14 years.

The study result was given in certain criteria of union, non-union, delayed union, and angulation.

Operation Procedure: The subject were operated under general anesthesia. The affected limb was clean and surgical toileting was made and warped by the clean surgical draper. The choice of the operative wire depends upon the diameter of the intramedullary cavity. The implant was choose which is about 40-45% of the diameter of the cavity. In that case K- wire is a very user friendly, available, cheaper and easily removable. So that, it is the prime choice of every orthopedist in stabilizing the tibia fracture in children in semi-urban area compared to the expensive TENS, plates and screws⁶. During the follow ups the pin can be removed, manipulate and can be reused and also be correct the bending to maintain the reduction⁷.



Two stainless steel K wire of 30-45cm in length and 2-2.5mm in diameter were chosen in most of the cases. The angle of the insertion above the epiphyseal plate was 45degree, the sharp point was cut about 2 cm to prevent the penetration and bend slightly so that it can goes to the medullary cavity. There were two little incision was made 2 cm above of distal growth plate on both lateral and medial side anteromedially and anterolaterally. Entry port was made into the proximal metaphyseal region distal to the growth plate. Lateral wire was introduce first. The nail insert at distally up to the end and proximal to the distal growth plate under fluoroscopic guidance (C- Arm). The wire was bend at the entry portal and cut off about 1cm away from the entry portal. Skin wound was then close and dressed. All children given a progressive bolus of broad spectrum intravenous antibiotics. The posterior above

knee cast was immediately given and remain for 4-6 weeks.

Follow-ups: All children were follow-ups over the period of 6- to 12 weeks. In that time proper nursing and care was ensured. Pin tract infection occurs in 5 cases, Culture and proper antibiotics was given to the patient and made cure.

Results

Totally, 32 children with the age of 4–14 years were included in this study and among them 19 were girls and 13 were boys. There were 24 left-sided and 8 right-sided fractures. 22 children suffered a road traffic accident and 10 had a fall from a height. All were closed fractures. There were transverse fractures in 19 children, oblique in 6, spiral in 3, comminuted in 4; fractures were at middle one third in 17 children (11 boys and 6 girls), proximal one third in 8 (4 boys and 4 girls) and distal one third in 7 (4 boys and 3 girls) of tibia. Children achieved union in a mean time of 8 weeks (range, 6-10 weeks). Postoperatively, three children (9.37%) had delayed union, one (3.15%) valgus deformity of lower leg, three (9.37%) post-operative knee pain and twelve (37.5%) skin irritation at pin site. Wires were removed after 8-14 weeks without any complications. No patient was lost to follow-up. The results were excellent in 95.45% and good in 4.55% children.

Table I: Distribution of Children by their different patterns of fracture. (N=32)

Total	32
Boys	19
Girls	13
Transverse Fracture	19
Oblique Fracture	6
Left Side Fracture	24
Right Side	8
Spiral Fracture	3
Comminuted	4
Middle 3 rd	17
Proximal 3 rd Fracture	8
Distal 3 rd Fracture	7

Discussion

Tibial diaphyseal fractures are the most common pediatric lower extremity fracture⁸ and the second most common fracture resulting in hospitalization⁹. The tibia is the second most commonly fractured long bone in children¹⁰. Because of its subcutaneous location, approximately 10% of tibial shaft fractures are open injuries, which meaningfully impacts patient evaluation and management¹¹. Approximately 50% occur in the shaft. Tibial shaft fractures most commonly occur in isolatedly (70%) and the majority of these injuries result from low-energy rotational mechanisms¹¹. Two-thirds of pediatric patients with a tibia shaft fracture have an intact fibula¹². Complete fractures of both bones are usually caused by high-energy trauma, whereas isolated tibia fractures usually result from torsional forces^{13, 14}. Low-energy, rotational tibial injuries often result in spiral fractures of the tibia alone with or without plastic deformation of the fibula or with tibial and fibular fractures at different levels.

Intramedullary fixation with elastic nails that is placed percutaneously through the distal femoral metaphysis without violating the physis has become a popular technique for the treatment of femoral fractures in children.^{12, 13} Closed reduction and plaster application is still the gold standard for tibial fractures in children¹⁴. However, this procedure requires prolonged immobilization and cautious follow-up. Secondary displacement and nonalignment are not exceptional, particularly in cases of isolated tibial fracture¹⁵.

In order to avoid these complications, operative treatment can be performed. Elastic stable intramedullary nailing is the gold standard for osteosynthesis of unstable diaphyseal fractures in children and adolescents^{16, 17}.

The functional outcomes for the intramedullary nailing group were significantly better than those for the external fixation group in the categories of pain, happiness, sports and global function.

The principle of osteosynthesis with intramedullary K-wires is a biomechanical idea that aims at early bridging callus formation leading to rapid restoration of bony continuity which provides combination of the elastic stability and mobility. Full weight bearing was

seen early among the male patients and cast was made below knee by 3rd week and also union of fracture was seen early among the patients with intact fibula¹⁸.

Conclusion

The study observed less period of hospitalization, minimal cost of k-wires as compared to TENS nails, plates and screws. Less surgical time required, implant removal was with ease and least expenses incurred, early functional recovery with good results.

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