Original Article

Radiological and Functional Outcomes of Flexible Intramedullary Nailing in Children with Open Tibial Fractures

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ABSTRACT

Objective: To examine the functional outcomes of flexible intramedullary nailing in children presented with open tibial fractures.

Study Design: Retrospective study

Place and Duration of Study: This study was conducted at the Orthopaedic Department, Federal Government Polyclinic Hospital Islamabad from January 2019 to December 2019.

Materials and Methods: Thirty two patients of either gender with ages 5 to 14 years presented with open tibial fractures were enrolled in this study. Patient's detailed demographics were recorded. All patients treated with flexible intramedullary nailing. Radiological assessment was done. Complications associated to procedure were examined. Functional outcomes were analyzed according to the Flyn's criteria. Follow-up was taken at 6 months postoperatively.

Results: There were 24 (75%) male and 8 (25%) were females. 14 (43.75%) patients were ages 5 to 10 years and 18 (56.25%) patients were ages 11 to 14 years. RTA was the commonest etiology found in 15 (46.88%) patients followed by fall from height in 10 (31.25%) patients. None of patient had nonunion. Mean union time was 3.86±1.27 months. Complications found in 3 (9.38%) patients in which 1 patient with wound infection, 1 had shortening of leg and 1 with delayed union. 22 (68.75%) patients had excellent, 7 (21.88%) had good, 3 (9.38%) had fair and none of patient had poor functional outcomes.

Conclusion: Flexible intramedullary nailing for open tibial fractures in children is safe and effective treatment modality. Union of bone achieved all the patients and majority of patients had excellent functional outcomes.

Key Words: Open tibial fractures, Children, Flexible intramedullary nail

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INTRODUCTION

The third most common childhood fracture is Tibia shaft fractures. They represent 10 to 15 per cent of pediatric fractures.[1] The key modality of treatment for pediatric tibial shaft fractures is closed reduction and cast application.

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Surgical treatment is seen in fractures that are unstable, collapsed, open, polytraumatient, compartmental and extreme soft tissue injuries and related neurovascular injuries.[2,3] The outcomes are the outcomes of surgical treatment. During the past, for unstable tibial shaft fracture that required surgical fixation, external fixation and plate and screw fastening were used.[4-6] Elastic nails are devices for load sharing, and enable early mobilization. Bone healing is improved by micromotion at the fracture site. Through its prebend 'C' configuration, which provides stable three-point fixation and serves as an internal splint, titanium elastic nails achieve biomechanical stability.[7] Elastic intramedullary nailing in children with long bone fractures has gained popularity due to its high effectiveness and lower complication risk. Elastic intramedular nailing fulfills all requirements of minimally invasive bone surgery: shorter operating time, limited dissection of soft tissue, smaller incisions and thus smaller wounds, less discomfort, quicker mobilization and fairly simple removal of implants.[8,9]

With proper instructions and good preoperative planning of an skilled surgeon with this minimally invasive treatment approach it is possible to achieve good bone position and stabilization appropriate for children.[10] The present study was conducted aimed to examine the functional outcomes of flexible intramedullary nailing in children presented with open tibial fractures.

MATERIALS AND METHODS

This retrospective/observational study was conducted at Orthopaedic Department of Federal Government Polyclinic Hospital Islamabad from 1st January 2019 to 31st December 2019. A total of 32 patients of either gender with ages 5 to 14 years presented with open tibial fractures were enrolled in this study. All the fractures were classified as Gustillo Anderson classification. Patient's detailed demographics including age, sex, fractures etiology, side of fractures were recorded after taking written consent from parents/attendant. Patients with osteogenesis imperfecta, congenital pseudoarthrosis of the tibial or other skeletal dysplasias were excluded. All patients received elastic titanium nails procedure under general anesthesia. Radiological assessment was done pre and postoperatively. Functional outcomes were analyzed according to the Flyn's criteria as excellent, good, fair and poor. Postoperative complications such as wound infection, limb shortening, delayed union and pain were examined. Patients were followed up for 6 months. Functional outcomes were examined at final follow-up. All the data was analyzed by SPSS 24.

RESULTS

There were 24 (75%) male patients and 8 (25%) were females. Fourteen (43.75%) patients were ages 5 to 10 years and 18 (56.25%) patients were ages 11 to 14 years.

Table No.1: Patients demographics

Variable	No.	%
Age (years)		
5 – 10	14	43.75
11 – 14	18	56.25
Gender		
Male	24	75.0
Female	8	25.0
Causes		
RTA	15	46.88
Fall from height	10	31.25
Simple Fall	3	9.83
Sports injury	3	9.83
Unknown	1	3.13
Fracture side		
Right	13	40.62
Left	19	59.38

RTA was the commonest etiology found in 15 (46.88%) patients followed by fall from height in 10 (31.25%) patients, 3 (9.38%) patients had sports injury, 3 (9.38%) had simple fall and 1 (3.13%) patient had unknown cause of injury. 13 (40.62%) patients had left side fracture and 19 (59.38%) had right side (Table 1). None of patient had nonunion. Mean union time was 3.86±1.27 months. According to the Flyn's criteria, 22 (68.75%) patients had excellent, 7 (21.88%) had good, 3 (9.38%) had fair and none of patient had poor functional outcomes (Fig. 1). Complications found in 3 (9.38%) patients in which 1 patient had wound infection, 1 had shortening of leg and 1 with delayed union while 29 (90.61%) had no complications (Table 2).

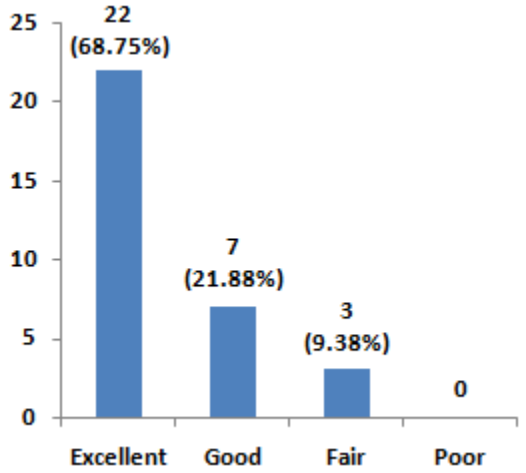

Figure No..1: Functional outcomes at final follow-up

Table No.2: Complications associated to procedure

Variable	No.	%
No complication	29	90.61
Wound infection	1	3.13
Limb shortening	1	3.13
Delayed Union	1	3.13

DISCUSSION

Tibia fractures are commonly found fractures among children of growing age and associated with high rate of disability if they presented late. Many of procedures have been applied for tibial shaft fractures but elastic titanium nailing is considered as better and safe treatment modality due to its easiness and minimal invasive surgery, also higher union rate and fewer rates of minor complications.[11,12] We conducted present study to determine the functional outcomes of open tibial fractures in children treated with flexible intramedullary nailing. In this regard 32 patients were analyzed. Majority of patients in our study were male and accounted 75% while females were 25%. 14 (43.75%) patients were ages 5 to 10 years and 18 (56.25%) patients were ages 11 to 14 years. These

results were comparable to many of previous studies in which male were predominant 65 to 80% and the average age of patients was 10 years.[12,13] RTA was the commonest etiology found in 15 (46.88%) patients followed by fall from height in 10 (31.25%) patients, 3 (9.38%) patients had sports injury, 3 (9.38%) had simple fall and 1 (3.13%) patient had unknown cause of injury. A study conducted by Byanjankar et al[14] reported that fall from height was the commonest mode of injury found in 40.9% children, 31.81% had RTA and 22.72% had sports injuries.

In present study we found that none of patient had nonunion. Mean union time was 3.86±1.27 months. According to the Flyn's criteria, 22 (68.75%) patients had excellent, 7 (21.88%) had good, 3 (9.38%) had fair and none of patient had poor functional outcomes. A study conducted by Pogorelić et al[15] regarding outcomes of elastic stable intramedullary nailing for femoral fractures and the included 103 patients, at final follow-up all the patients in their study achieved complete radiographic healing at a mean of 8.5 weeks. Another study by Alam et al[16] reported that out of 43 children treated by flexible intramedullary nailing for open tibial fractures, 36 (83.7%) patients had excellent while 16.2% patients had satisfactory functional outcomes. Some other previous studies demonstrated that majority of children who treated with elastic intramedullary nailing for tibial fractures ha showed excellent functional and radiological outcomes 75 to 85% with fewer rate of minor complications such as wound infection, limb shortening and delayed in union.[17,18]

In our study complications found in 3 (9.38%) patients in which 1 patient had wound infection, 1 had shortening of leg and 1 with delayed union while 29 (90.61%) had no complications. These results were comparable to other previous studies in which elastic intamedullary nailing associated with fewer rate of complications and accounted for 5% to 10% with no major complication.[19,20]

CONCLUSION

Flexible intramedullary nailing for open tibial fractures in children is safe and effective treatment modality with fewer rates of minor complications. Union of bone achieved all the patients and majority of patients had excellent functional outcomes.

Author's Contribution:

Concept & Design of Study:	Muhammad Bilal
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Data Analysis:	Adil Saidullah, Muhammad Ayaz, Farid Ullah Khan Zimri
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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