

Outcome of Pediatric shaft Radius-Ulna Fractures managed with Titanium Elastic Nailing System

AUTHORS:

Dr. Juva Nishant D1*

3rd Year Resident, Department of Orthopedics, SMT. NHL municipal medical college, Ahmedabad.

(Corresponding author- n_juva@yahoo.co.in)

Dr. Lil Nadeem A2

Professor and Head of the Unit, Department of Orthopedics, SMT. NHL municipal medical college, Ahmedabad.

Dr. Makwana Vipul R3

Assistant Professor, Department of Orthopedics, SMT. NHL municipal medical college, Ahmedabad

Correspondence Author: Dr. Juva Nishant D1*

3rd Year Resident, Department of Orthopedics, SMT. NHL municipal medical college, Ahmedabad.

(Corresponding author- n_juva@yahoo.co.in)

ABSTRACT:

Aims and objectives: To study the functional outcome of TENS in Pediatric shaft radius-ulna fracture.

Introduction: Symmetrical bracing action of elastic nails inserted into the metaphysis, that bears against the inner bone at three points is the principal of the titanium elastic nailing. Early stability to the involved bone fragments is the benefit of this method and it permits early mobilization and returns to the normal activities of the patients, with very low complication rate.

Materials and methods: A retrospective study of 40 pediatric patients with closed and open grade 1 shaft radius-ulna fracture carried out at our institute between 2018-2019 treated with TENS and observed for a period of minimum 1.5 years.

Conclusion : It can be concluded that TENS nailing in pediatric shaft radius-ulna fractures is an excellent modality of treatment and has very low complication rate.

Keywords: Pediatric shaft Radius, Radius-Ulna Fractures, Titanium Elastic, Nailing System, Pediatric.

INTRODUCTION

- Forearm fractures are the most common injuries in pediatric age group, accounting 45% of all fractures in childhood. Approximately, distal third forearm fractures are 75 to 84%, middle third is 15 to 18% and proximal third forearm fractures are 1 to 7%. [1]
- Treatment of majority of the long bone fractures in skeletally immature is conservative. Conservative management is the mainstay for long bone fractures in

children below the age group of 6 years as the remodeling ability of the immature bone in children is excellent [2]. However, the management of long bone fractures for ages between 6 years and 16 years is controversial [3]

- In older children due to less tolerance of immobilization and less compliance to cast Elastic intramedullary nailing was preferred. Also, there is low potential for correction of mal-alignment in long bone fractures in older children. Unstable fractures, where close manipulation fails to maintain the reduction with withdrawal of the reducing force, with shortening more than 1 cm or angular and rotational deformity >15 degrees, required surgical intervention to maintain reduction and preserve function [4]
 - Biomechanically, these implants have shown to act as internal splints.[5]
 - Early stability to the involved bone fragments is the benefit of this method and it permits early mobilization and returns to the normal activities of the patients, with very low complication rate. [6,7]

AIMS AND OBJECTIVES

- To study the outcome of shaft Radius and Ulna fractures managed with Titanium Elastic Nails in Pediatric age group.

MATERIAL AND METHODS

- 40 patients with displaced shaft radius and ulna fractures that were treated by closed reduction and internal fixation using TENS nail between June 2018 to March 2019 were included in this study.
- Price et al. criteria was used to evaluate the outcome of this procedure.

INCLUSION CRITERIA

1. Age between 5 to 15 years
2. Displaced shaft radius and ulna fractures
3. Grade I open fractures

EXCLUSION CRITERIA

1. Children <5 years and >15 years
2. Fractures with neurovascular injury
3. Physical injury
4. Associated With proximal and distal radioulnar joint disruption.
5. Grade II and Grade III open fractures

SURGICAL TECHNIQUE

- All patients were operated under supine position on operating table with the affected arm placed on a radiolucent arm table. We chose appropriate diameter of Titanium elastic nails. The diameters of nail were about 66% of the medullary isthmus of each bone. Then stab incisions kept over nail entry site, the awl was used to make entry point in the bones. Entry point in the radius was just proximal to the radial styloid sparing physis. The entry point for ulna is distal to tip of olecranon just proximal to physis at the proximal metaphysis. Ulnar nail was inserted manually with the inserter into medullary canal, with the nail tip

perpendicular to the bone shaft. Then, the nail was rotated with the inserter, and the nail tip was aligned with the axis of the medullary canal. The nail was advanced up to the fracture site with rotatory movements. The nail tip was aligned with the medullary canal of the distal fragment. Then, the nail was advanced with rotatory movements until the tip reaches the distal fragment metaphysis. Radius nail was then introduced and progressed in similar manner such as ulna nail. When the nails were correctly positioned in the opposite metaphysis, protruding nail ends are cut approximately 0.5 cm from the bone. In almost all of our cases, closed reduction was done. In some of the cases, where closed reduction was not achieved, a small incision was given over fracture site for the reduction of fracture and internal fixation with TEN done. Postoperatively plaster of Paris slab was given for 2-3 weeks to encourage soft-tissue healing. Follow up was done at 4, 6, 12, and 24 weeks. Early range of exercises was started, and results were evaluated as per Price *et al.* [8] criteria taking pain and range of motion of forearm

Table 1: Price *et al.* criteria

Outcomes	Symptoms	Loss of forearm rotation (°)
Excellent	No complaints with strenuous activity	<15
Good	Mild complaints with strenuous activity	15-30
Fair	Mild complaints with daily activities	31-90
Poor	All other results	>90

(supination/pronation) into consideration.

CASE



Figure 1: Pictures at 2 years follow up of patient depicting full range of motion and excellent results according to price et al



FIGURE 2: X-RAYS A) PRE-OP B) IMMEDIATE POST-OP C) AT 2 MONTHS FOLLOW UP D) AT 2

A 10-year-old male with right radius-ulna shaft fractures came to us with history of fall down, he was managed with radius ulna TENS nail. At 6 months follow up, acc to price et al criteria patient had excellent result.

DISCUSSION AND RESULTS

- All the fractures healed radiographically at an average 10–12 weeks without any malunion. 1 patient had superficial infection which was managed with oral antibiotics. 1 patient had pain due to nail prominence. 1 patient had bending of nails due to fall down from stairs on 21st post operative day which was managed by closed manipulation and alignment under c-arm guidance and 1 patient had restriction of supination and Pronation. Elbow flexion and extension, palmar flexion and dorsiflexion at wrist were normal in all patients. As per Price *et al.* criteria, 37 patients showed excellent results, 2 patients showed good results, and only 1 patient had fair result. There was no patient with poor result.

CONCLUSION

- Although the fracture of both bones of the forearm in children can be managed conservatively, they often lead to complications like malunion with restriction of movements at either elbow or wrist joint. In this study titanium elastic nail system showed excellent results in terms of bony union, functional outcome with minimal complications. Therefore, this minimally invasive method of TENS may be considered as an effective alternative for displaced forearm shaft fractures in pediatric age group.

REFERENCES

1. Armstrong P.F., Jouglin V.E., Clarke H.M., Greene N.E., Swiontkowski M.F. Pediatric fracture of forearm, wrist and hand. Skeletal trauma in children, Philadelphia, Saunders, 1998, 161-257.
2. McKibbin B. The biology of fracture healing in long bones. J Bone Joint Surg Br. 1978; 60:150–162.
3. Saikia K, Bhuyan S, Bhattacharya T, Saikia S. Titanium elastic Nailing in femoral diaphyseal fractures of children in 6-16 years of age. Indian J Orthop. 2007; 41:381–385.
4. Nielsen AB, Simonsen O. Displaced forearm fractures in children treated with AO plates. Injury. 1984; 15:393–396.
5. Johnson CW, Carmichael KD, Morris RP, Gilmer B. Biomechanical study of flexible intramedullary nails. J Pediatr Orthop 2009; 29:44-8.
6. Bellemans M, Lamoureux J. Indications for immediate percutaneous intramedullary nailing of complete diaphyseal forearm bone shaft fractures in children. Acta Orthop Belg 1995;61 Suppl 1:169-72
7. Griffet J, el Hayek T, Baby M. Intramedullary nailing of forearm fractures in children. J Pediatr Orthop B 1999; 8:88-9.
8. Price C.T., Scott D.S., Kurzner M.E. and Flynn J.C. Malunited forearm fractures in children. J Pediatr Orthop 1990; 10:705-12.

Conflict of Interest:

Nil

Funding:

Nil

Acknowledgement:

Nil