

MANAGEMENT OF PAEDIATRIC LONG BONE FRACTURES WITH TITANIUM NAILS – A PROSPECTIVE STUDY

Orthopaedics

Article Submitted on: 12
May 2019
Article Accepted on: 21
May 2019

Corresponding Author

Dr. D. R. Galfat, MS
Professor, Department of
Orthopaedics and
Director Academics,
PIMS, Udaipur (Rajasthan)

Pradeep Kumar Tiwari¹, D.R. Galfat²

¹ - Post-graduate Medical Officer (Orthopaedics), Trauma Center G.R. Medical College, Gwalior (MP)

² - Professor, Department of Orthopaedics and Director Academics, PIMS, Udaipur (Rajasthan)

Abstract:

Introduction: Several modalities of treatment options are available to treat long bone fractures in children. These methods are open reduction and internal fixation with plates and screws, external fixators and closed reduction with internal fixation with titanium nails. The aim of present study is to assess the outcome of management of long bone fractures in paediatric age group with elastic titanium nails.

Material and methods: 25 patients of age group 8 to 15 years were managed between 2016 and 2017 with elastic titanium nails. Out of them, there were 15 males and 10 females. Under GA, closed reduction and internal fixation of fractures was done with elastic titanium nails under control of image intensifier. Antero-posterior and lateral views were used to assess any angular deviations.

Results: There were 15 males and 10 females. The mean age was 12 years ranges between 8 to 15 years. Right side was involved in (n = 20) 80% of the subjects, while left side was involved in (n = 5) 20% of subjects. Majority of subjects met with an accident (n = 10) 40%. Subjects (n = 5) sustained injury due to collision and rest of subjects (n = 10) 40% sustained trauma due to fall. Shortening was noted in 16% (n = 4) cases.

Conclusion: Closed reduction and percutaneous fixation of long bone fractures in paediatric age group subjects with elastic titanium nails is viable option for fixation of paediatric long bone fractures.

Keywords: Elastic titanium nail, paediatric, long bone fractures.

Introduction:

There is revolutionary change in management of paediatric long bone fractures. Non-operative technique still remains the choice of treatment of long bone fractures as children have higher remodeling potential.¹ With the help of non-operative treatment, more than 95% union rates have been achieved and functional recovery has been 100%.² Technique of closed reduction includes

the use of plaster cast after reduction with traction and manipulation under guidance of image intensifier. Method of open reduction and internal fixation with plates and screws is indicated when there is male rotation, excessive shortening or angulations at the fracture site.³ Various intramedullary devices like Rush nail, Square nail, etc are available as an option to treat fractures of long bones in children, but all these provide poor stability against rotation and hence multiple pins needed to

be inserted for stabilization. In the recent time, there has been abundant use of elastic stable intramedullary nails.⁴ Titanium elastic nails are frequently used now a days for fixation of diaphyseal fracture. It has an advantage of being inserted into the medullary canal without disturbing the growth plate.

Material and methods:

25 subjects, 20 males and 5 females between the age group of 8 to 15 years having long bone fractures were managed with elastic titanium nails during the period of 2016 and 2017 in various orthopaedic centers. Closed reduction was done under GA, under control of image intensifier and elastic titanium nails were inserted sparing the growth plates of long bones. Subjects were administered appropriate antibiotic prophylaxis preoperatively and limb was protected in plaster slab. Anterio-posterior and lateral radiographs were used to assess any angular deviations.

Results:

All the fractures in 25 subjects united well within average time of 10 weeks ranging from 6 weeks to 12 weeks. Gender distribution is shown in Table 1, site affected is shown in Table 2, mode of injury is shown in Table 3 and complications encountered during post-operative period are shown in Table 4.

Table 1: Gender distribution of the study population

Sex	Number
Male	15
Female	10
Total	25

Table 2: Patient distribution according to the side affected

Side affected	Number
Right	20
Left	5
Total	25

Table 3: Distribution of patient according to source of injury

Injury	Number
Fall	10
Collision	5
Accident	10
Total	25

Table 4: Complications encountered during postoperative period

Complications	Number
Wound infection	1
Hardware prominence	3
Shortening	4

Discussion:

Fractures of long bones in paediatric age group are sustained due to high impact trauma. Elastic titanium nail fixation has recently gained popularity as treatment modality for management of paediatric bone fractures. Elastic stable intramedullary nails are being used now a days for long bone fractures in children, they cause minimal scarring.⁵ History of intramedullary pins dates back to mid 19th century when ivory nails were used for purpose of fixation.⁶ Elastic titanium stable nails are safe and offer a minimally invasive alternative with lower complication rates.⁷ These are made up of titanium and offer high consolidation rates up to 97 – 100%.^{8,9} The duration of hospital stay is also reduced. In our study, main complication was shortening in (n = 4) 16% of subjects. Hardware prominence was seen in (n = 3) 12% of subjects. There was (n = 1) 4% of subjects that showed presence of superficial infection and overgrowth. Shortening and angular deviation were seen in a study conducted by Sink during early post-operative period.¹⁰ Rathjen, et al¹¹ encountered complications while treating unstable fractures with flexible femoral nails, which were similar to those while treating stable fractures. Atul Bhasker, et al¹² conducted a study consisting of 60 patients with various long bone fractures using titanium elastic nails and he encountered wound infection in 2 cases and leg length discrepancy in 3 children. In a study conducted by Vrsansky, et al¹³, this flexible nailing system was used in 308 fractures, all the cases showed stable union. The sample size of our study was small, a larger sample size could give better perspective of complication rates.

Conclusion:

Titanium intramedullary nails provide a safe and a viable alternative for the stabilization of paediatric long bone fractures. They have fewer complication rates. In our study, shortening had the highest percentage (16%) though various minor complications were seen along with it.

References:

1. McKibbin B. The biology of fracture healing in long bones. *J Bone Joint Surg (Br)*. 1978;60:150-162.
2. El-Adl G, Mostafa MF, Khalil MA, et al. Titanium elastic nail fixation for paediatric femoral and tibial fractures. *Acta Orthop Belg*. 2009;75:512–520.
3. Sankar WN, Jones KJ, David Horn B, et al: Titanium elastic nails for pediatric tibial shaft fractures. *J Child Orthop*.2007;1:281–286.
4. Lee SS, Mahar AT, Newton PO. Ender nail fixation of paediatric femur fractures: a biomechanical analysis. *J Pediatr Orthop (Am)*. 2001;21:442- 445.
5. Helenius I, Lamberg TS, Kääriäinen S, et al: Operative treatment of fractures in children is increasing. A population-based study from Finland. *J Bone Joint Surg Am*. 2009;91:2612–2616.
6. Fischer LP, Fessy MH, Bejui J, et al. Ollier: the father of bone and joint and of reconstructive surgery (1830-1900). *Maîtrise orthopédique* http://www.maitriseorthop.com/corpusmaitri/orthopedic/ollier_synth/ollie_us.shtml (accessed 25/05/04).
7. Johnson CW, Carmichael KD, Morris RP, Gilmer B. Biomechanical study of flexible intramedullary nails. *J Pediatr Orthop*. 2009;29:44-8.
8. Moroz LA, Launay F, Kocher MS, Newton PO, Frick SL, Sponseller PD, et al. Titanium elastic nailing of fractures of the femur in children. Predictors of complications and poor outcome. *J Bone Joint Surg Br*. 2006;88:1361-6.
9. Mahar A, Sink E, Faro F, Oka R, Newton PO. Differences in biomechanical stability of femur fracture fixation when using titanium nails of increasing diameter. *J Child Orthop*. 2007;1:211-5.
10. Sink EL, Faro F, Polousky J, Flynn K, Gralla J. Decreased complications of pediatric femur fractures with a change in management. *J Pediatr Orthop*. 2010;30:633-7.
11. Rathjen KE, Riccio AI, De La Garza D. Stainless steel flexible intramedullary fixation of unstable femoral shaft fractures in children. *J Pediatr Orthop*. 2007;27:432-41.
12. Bhaskar A. Treatment of long bone fractures in children by flexible titanium elastic nails. *Indian Journal of Orthopaedics*. 2005;39:166.
13. Vrsansky P, Bourdelat MD et al. Flexible stable intramedullary pinning technique in the treatment of pediatric fractures. *J Pediatr Orthop*. 2000;1:23-27.