Original Article

Titanium Elastic Nail

Titanium Elastic Nail or External Fixator in Pediatric Femoral Diaphyseal Fractures: Complication Rate

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ABSTRACT

Objective: To compare complications rate of Titanium elastic nail with External fixator in pediatric femoral diaphyseal fractures.
Study Design: Prospective randomized study.
Place and Duration of Study: This study was carried out at the Orthopedic Department, Lahore General Hospital/PGMI, Lahore from 01.10.2013 to 01.10.2015.
Materials and Methods: Complication rate was compared in two groups of children (20 each) of 5-11 years of age with closed or Gustilo type I open femoral diaphyseal fractures treated with Titanium elastic nailing and external fixator.
Results: At final review, 3 patients in External fixator group developed superficial pin tract infection which resolved by oral antibiotics. 2 patients had a LLD (limb length discrepancy) of up to 1cm and 4 patients had mal alignment of 5-10 degree. While only one patient in Titanium elastic nail group developed pain and irritation at medial insertion point and another had mal alignment of 10 degree in AP plane. Overall there was decrease complication rate in Titanium elastic nail group.
Conclusion: Titanium elastic nail is a better choice in children of 5-11 years of age with femoral diaphyseal fractures than External fixator.
Key Words: Pediatric Femoral Diaphyseal Fracture, Titanium Elastic Nail, External Fixator

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INTRODUCTION

Femoral diaphyseal fractures in children have been managed mostly by conservative methods like spica casting and traction until recent past and surgery was reserved only for open fractures, polytrauma patients and patients with head injury.
But for the last few decades there is growing trends towards operative treatment for these fractures. Methods includes external fixation, DCP, flexible and rigid intramedullary nailing.
Until recent past we have been using conservative methods or external fixation for femur fractures in children. Recently we introduced Titanium elastic nailing for these fractures in our institution.
In this study we compared the complication rate between external fixation and titanium elastic nailing of femoral diaphyseal fractures in 5-11 years of children.

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MATERIALS AND METHODS

This study was carried out at the Orthopedic Department, Lahore General Hospital/PGMI, Lahore from 01.10.2013 to 01.10.2015. Children of 5-11 years of age and of both gender were randomly divided into two groups of 20 patients each to be managed by either external fixator or titanium elastic nail. Only patients with closed or Gustilo type I open femoral diaphyseal fractures were included in the study.
At the time of presentation, information regarding patient's biodata, mechanism of injury, fracture pattern and associated injury were collected on a Performa.
After consent and pre-op preparation, under GA fixation was done in supine position on a fracture table under fluoroscopy control.
Titanium elastic nails of variable diameter were used according to femoral canal diameter. Two nails were used for each fracture. Under GA, on a fracture table with patient in supine position, 1cm skin incision was made about 2.5cm proximal to distal femoral physes under fluoroscopy guidance. Blunt dissection up to bone was done with the help of artery forceps. The entry point in the bone was made with the help of drill bit. Titanium elastic nail was loaded on T-handle and inserted first on lateral side then on medial side up to fracture site and then pushed into the proximal segment with fluoroscopy control, one by one. Protruded nail ends were bents slightly and cut short to 1cm from bone surface.

In the second group, AO external fixator was used with two schawnz screws of 3.5 mm diameter in each fragment under fluoroscopy control.

After short hospital stay, during which physiotherapy and instruction regarding implant care were explained to the patient's parents. After discharge, each patient was followed up at 1, 2,6, 9 and 12 weeks.

At final visit, range of movements, complications, parent's satisfaction and outcome assessed and documented.

RESULTS

A total of 40 patients of 5-11 years age of either gender with femur shaft fracture were selected for this study. Male to female ratio in either group was the same i.e 3:1. Mean age was 7.35 in External fixator group and 7.8 in Titanium elastic group.

Table No.I: Gender Distribution and Mean Age

Group	Gender distribution (n)	Mean age (years)
Ex. Fix	Male=15 Female=5	7.35
TEN	Male=15 Female=5	7.8

The cause of fracture was RTA in 65% of cases while 35% cases presented with history of fall.

Both groups showed satisfactory outcome as far as the other parameters are concerned. Complications rate was significantly lower (10%; 2 of 20) in Titanium elastic nail group than External fixator group (35%; 7 of 20).

Table No.2: Complications of two treatment methods.

Complication	Ex. Fix Group n=20	TEN Group n=20	P value
Superficial pin tract infection	3	--	
LLD	2	--	
Mal alignment	4	1	
Entry site irritation	-	1	

Superficial pin tract infection in Ex. Fix group patients usually settled down within a week after removal of implant and prophylactic oral antibiotic for 5days. Similar was the fate of medial entry site irritation in TEN group patient.

LLD documented in two patients was less than 1cm which is of no clinical significance as documented in literature.

Mal alignment was significantly higher in Ex Fix group patients. Initially 5-10 degree of mal alignment were noted which reduced to 0-5 degree on further follow up due to remodeling process.

DISCUSSION

Femoral diaphyseal fractures constitute less than 2% of all pediatric fractures[1]. Various methods of treatment can be used depending on age of child and fracture pattern. Immediate application of hip spica or traction followed by a cast remains the standard treatment for most of fractures in children younger than six years.[2-5] But the treatment of choice for these fractures is controversial in 5-11 years of age. Conservative treatment was preferred method in the past but due to prolong immobilization, long hospital stay, difficult nursing care and late return to school, there is growing trends towards operative treatment for the last few decades[6]. Choices include external fixation, dynamic compression plate (DCP) and intramedullary nailing.

External fixator provides good stability and early mobilization but is associated with the problems of apprehension of an external device, transfixation of lateral structures, pin tract infection, less callus formation, relatively longer time for fracture union and weight bearing and a definitive risk of refracture[7,8] makes it less favorable choice than Titanium elastic nailing[9].

Plate fixation is effective treatment for pediatric femoral fractures[10]. Advantages include familiarity of technique, anatomical reduction, rigid fixation and better nursing care with increase parent's satisfaction. However it is associated with large exposure, increase periosteal stripping, increase blood loss, risk of infection, prolong period of immobilization, hardware failure, large dissection for plate removal, LLD and chances of refracture[10,11].

Intramedullary nailing used for these fractures include interlocking nail, rigid and flexible nails.

AVN of femoral head and coxa valga have been reported with interlocking nail when attempted in skeletally immature patients[12]. Although results have been good with rigid intramedullary nailing[13] but there has also been increasing number of reports of osteonecrosis of femoral head[14,15].

Flexible intramedullary nailing seems to be a better choice for this age group because it is simple and when applied with close methods so fracture hematoma is not disturbed with less chances of infection. The periosteum is left undisturbed. Flexible intramedullary nail fixation, a sort of internal splint, not only maintains the length and alignment but also permits sufficient micromovements at fracture site to generate excellent callus formation[16]. Because flexible intramedullary nailing allows rapid mobilization of child with little risk of AVN of femoral head, physeal injury or refracture, there is recent surge for this method's popularity[17]. Transvers, short oblique and short spiral fractures with minimal comminution in the 5-12 years age group are the best indication for titanium elastic nailing[17,18,19]. Currently it is the treatment of choice for skeletally immature child older than six year of age with a transverse fracture of middle 60% of femoral diaphysis[14].

Bar-On et al reporte better results with flexible intramedullary nailing than external fixator[9].

Flynn et al found flexible intramedullary nailing advantageous over hip spica in treatment of femoral diaphyseal fractures in children[2].

Buechsenschuetz et al reported that flexible intramedullary nailing is superior to taction and casting

in terms of union, scar acceptance and overall patient satisfaction[20].

The most common complication associated with this technique is entry site irritation and pain[19,21]. These are usually associated with long and prominent distal nail end (more than 2cm). Other common complications mentioned in the literature include angulation, proximal nail migration, minor LLD, inflammatory reaction due to nail and knee stiffness[22].

CONCLUSION

Titanium elastic nail is a better treatment option for the pediatric femoral diaphyseal fractures for the age group of 5-11 years.

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Canale ST, Beaty JH, Campbell WC. Fractures and dislocations in children In: Campbell's Operative Orthopaedics. 11th ed. Elsevier Health Sciences; 2007.p.1504-1517
2. Flynn JM, Leudtke LM, Glaney TJ. Comparison of titanium elastic nail with traction and a spica cast to treat femoral fractures in children. J Bone Surg (Am) 2004;86-A:770-7.
3. Czertak DJ, Hennrikus Wl. The treatment of pediatric femur fractures with early 90-90 spica casting. J Pediatr Orthop 1999;19:229-32.
4. Cases J, Gonzalez-Moran G, Albinana J. Femoral fractures in children from 4 years to 10 years: Conservative treatment. J Pediatr Orthop (200?; 10:56-62.
5. Stans AA, Morrissy RT, Renwick SE. Femoral shaft fracture treatment in patients age 6-16 years. J Pediatr Orthop 1999;19:222-8.
6. Hughes BF, Sponseller PD, Thompson JD. Pediatric femur fractures: effects of spica cast treatment on family and community. J Pediatr Orthop 1995;15:457-60.
7. Skaggs DL, Leet AI, Money MD, Shaw BA, Hale JM, Tolo VT. Secondary fracture associated with external fixation in pediatric femur fracture. J Pediatr Orthop 1999;19:582-6.
8. Prob R, Lindsey RW, Hadley NA, Barnes DA. Refracture of adolescent femoral shaft fracture: a complication of external fixation. A report. J Pediatr Orthop 1993;13:102-5.
9. Bar-On E, Saglv S, Porat S. external fixation or flexible intramedullary nailing for femoral shaft fractures in children. A prospective randomized study. J Bone Joint Surg Br 1997;79:975-8.
10. Fyodorov I, Sturm PF, Robertson WW Jr. Compression-plate fixation of femoral shaft fractures in children aged 8-12 years. J Pediatr Orthop 1999;19:578-81.
11. Kregor PJ, Song KM, Routt ML Jr, Sangeorzan BJ, Liddell RM, Hansen ST. Plate fixation of femoral shaft fractures in multiply injured children. J Bone Joint Surg Am 1993;75:1774-80.
12. Letts M, Jarvis J, Lawton L, Davidson D. Complications of rigid intramedullary rodding of femoral shaft fractures in children. J Trauma 2002; 52:504-16.
13. Cramer KE, Tornetta P, Spero CR, Alter S, Mirallakbar H, Teefey J. Ender rod fixation of femoral shaft fractures in children. Clin Orthop 2003;376:119-23.
14. Sanders JO, Browne RH, Mooney JF, Raney EM, Horn BD, Anderson DJ, et al. Treatment of femoral fractures in children by pediatric orthopedists: Results of 1998 survey. J Pediatr Orthop 2001; 21:436-41.
15. Beaty JH, Austin SM, Warner WC, Canales T, Nichols L. Interlocking intramedullary nailing of femoral shaft fractures in adolescents: preliminary results and complications. J Pediatr Orthop 1994; 14:178-83.
16. Flynn JM, Hresko T, Reynolds RA, Blaseir RD, Davidson R, Kasser J. Titanium elastic nailing for pediatric femur fractures: a multicenter study of early results with analysis of complications. J Pediatr Orthop 2001;21:4-8.
17. Flynn JM, Skaggs DL, Sponseller PD, Ganley TJ, Kay RM, Kellie Leitch K. The operative management of pediatric fractures of lower extremity. J Bone Joint Surg Am 2002;84:2288-2300.
18. Heybelly M, Muratli HH, Celeb L, Gulcek S, Bicimoglu A. The results of intramedullary fixation with titanium elastic nail in children with femoral fractures. Acta Orthop Traumatol Turc 2004;38: 178-87.
19. Narayanan UG, Hyman JE, Wainwright AM, Rang M, Alman BA. Complications of elastic stable intramedullary nail fixation of pediatric femoral fractures and How to avoid them. J Pediatr Orthop 2004;24:363-9.
20. Buechsenschuetz KE, Mehlman CT, Shaw KJ, Crawford AH, Immerman EB. Femoral shaft fractures in children:traction and casting versus elastic stable intramedullary nailing. J Trauma 2002;53:914-21.
21. Flynn JM, Luedtke L, Ganley TJ, PIII SG. Titanium elastic nail for pediatric femur fractures:Lessons from learing curve. Am J Orthop 2002;31:71-4.
22. Moroz LA, Launay F, Kocher MS, Newton PO, Frick SL, Sponseller PD, et al. Titanium elastic nailing of fracture of the femur in children: Predictors of complications and poor outcome. J Bone Joint Surg Br 2006;88-b:1361-6.