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Outcome of titanium elastic nailing system in diaphyseal femoral fractures in children: A clinical study

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Abstract

Introduction: There has been an increasing tendency towards a more operative approach in patients over six years old since the last two decades. Titanium Elastic Nail System has now become the selection for stabilization in pediatric long bone fractures, particularly the femoral shaft fractures.

Methods: 20 children (15 boys, 5 girls) with femoral diaphyseal fractures (all closed) and aged 6-16 years were treated with Titanium Elastic Nail System (TENS). The fractures were in the proximal third (n=4), middle third (n=14) and in the distal third (n=2). All patients underwent surgery within 8 days of their injury and were followed up within the OPD, 24 months post-surgery. The results were evaluated using Flynn's scoring criteria.

Results: All 20 patients were available for evaluation till 24 months (22-26 months) of follow up. Radiological unions were achieved in all the cases in a mean time of 8 weeks and full weight bearing was possible in a mean time of 10 weeks. Mean duration of stay in hospital was 12 days. The results observed had been excellent in 12 patients (60%), successful in seven (35%) and poor in one patient (5%). All patients were able to have early return to school.

Conclusions: Titanium Elastic Nail System is an effective kind of intramedullary fixation in properly selected patients for the treatment of paediatric diaphyseal femoral fractures.

Keywords: Titanium Elastic Nails, children, diaphyseal femoral fractures

Introduction

Femoral shaft is the most typical major orthopedical injury of the lower limb requiring hospitalization. Historically the treatment has been age-related and is influenced by the situation and kind of the fracture and associated injuries^[1, 2]. Speedy healing potential and spontaneous correction of angulation of most of the shaft of thigh bone in children younger than six years old may be treated guardedly^[1, 2]. The problem arises once operative stabilization becomes necessary to get or maintain an appropriate reduction of the fracture by conservative strategies. The effective and best treatment between 6 and 16 years old could be a matter of discussion. Since the last 20 years it is seen that there has been a growing tendency towards an additional operative approach in patients over 6 years old^[1, 2]. The various operative strategies for stabilization of shaft of femur fractures include External Fixation, Compression Plating, Submuscular Bridge Plating and Rigid Intramedullary Nailing^[3-7]. Ender's nails and elastic nails were the two sorts of versatile intramedullary nails used over the years^[8]. Titanium Elastic nailing i.e, Elastic Stable Intramedullary Nailing, has become the selection of stabilization in paediatric shaft of femur fractures.

Materials and Methods

This longitudinal study was conducted on 20 patients attending the casualty or inpatient department of orthopedics at Silchar Medical College and Hospital, a tertiary health care center between Dec 2019 and Dec 2021 with the aim of finding out the outcomes of Titanium Elastic Nail System in pediatric diaphyseal femoral shaft fractures. Solely those patients were enclosed within the study who were between 6 to 16 years old and had traumatic fractures of the diaphysis of femur (Transverse, oblique, spiral diaphyseal fractures) with no associated fracture of the lower limb and no associated neurovascular compromise.

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Patients were excluded from the study if they had severely comminuted fractures, fractures of the neck of the femur, trochanteric fracture and supracondylar femur fractures extending into the metaphysis and epiphysis and polytrauma patients with life threatening injuries. Only those patients satisfying the inclusion and exclusion criteria were enclosed within the study. All the patients were explained regarding the surgery, the aim of the study and consent was taken. All the patients were immobilized using a below knee skin traction and Thomas Splint application before the surgery. All the 20

patients were immobilized using Thomas splint and Tobruk application after the surgery and continued upto 1 month following surgery. 20 kids (15 boys, 5 girls) aged 6-16 years with limb diaphyseal fractures (all closed) were treated with Titanium Elastic Nail System (TENS). These fractures were within the proximal third (n=4), middle third (n=14) and within the distal third (n=2). Majority of the fractures were as a result of fall from height during this series. All the fractures were treated by retrograde Titanium elastic nail fixation.

Table 1: Assessment as per Flynn criteria

	Excellent	Successful	Poor
Limb length discrepancy	<1 cm	<2 cm	>2 cm
Sequence disorder	5°	10°	>10°
Pain	Absent	Absent	Present
Complications	Absent	Mild	Major complication and/ or extended period for resolvable

The surgery was performed with the patients under general anaesthesia on a fracture table in supine position. Prophylactic antibiotic was administered as per body weight intravenously 1 hour before the procedure. C-arm was thus adjusted such that anteroposterior and lateral views of the thigh bone would be obtained preoperatively and intraoperatively. Fractures were reduced under the guidance of C-arm. Two titanium elastic nails were inserted to all the told cases. The diameter of the nails was assessed preoperatively on radiographs taking the nail diameter as 40% of the isthmus (narrowest part of the medullary canal). Once painting and draping of the concerned lower limb was done, incision was made 1-2cms in length on the medial and lateral side of the distal femur above the distal epiphysial plate. Two titanium nails of same size were inserted once correct contouring of the nail was done through exactly marked entry points under C-arm. The nails were inserted up to the fracture site and once the closed reduction

of the fracture was done under C-arm guidance, nails were inserted to the opposite site of the fracture by maintaining reduction throughout the procedure with the help of C-arm. The nails were driven proximally such that each nail was divergent and therefore the tips got anchored minimum 1 cm distal to the physis. Postoperatively patients were kept in supine position with the operated limb immobilized in a Thomas Splint with Tobruk application in all of the 20 patients. The Thomas Splint was removed at roughly 3-4 weeks post operatively and mobilization together with partial weight bearing was started with the help of crutches or support walking. Full weight bearing was started by 8-10 weeks post-operatively taking in view of the type of fracture and callus formation on follow up xray. The period of follow up was upto 24 months. Nail removal was typically done at 8-10 months post operatively once fracture union seen.

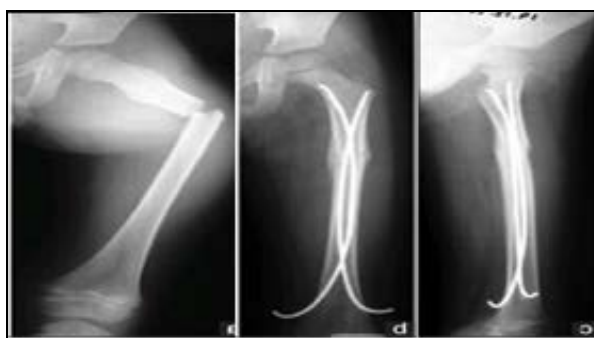


Fig 1: Preoperative radiograph of a 10 year old boy with fracture of the femur, proximal one third of the right femur post-operative follow up radiograph of his thigh (b) AP and lateral view at 12 weeks after surgery showing union and alignment.(c)

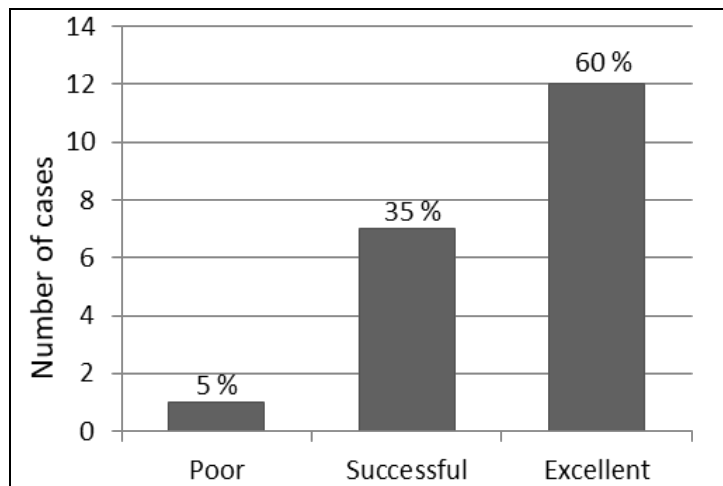


Fig 2: Preoperative radiograph of a 7 year old boy with oblique fracture of the femur middle one third of left thigh (a) Preoperative radiograph of the left thigh (b) Post-operative of the femur at 12 weeks showing radiological union and alignment

Results

Based on the preoperative radiographs, classification of fracture was done. There were 15 males and 5 females. Average duration of surgery was 40 minutes, the minimum operating and maximum operating time was 35 minutes and 50 minutes respectively. All 20 patients were accessible for analysis on follow up. Radiologically union in all told cases was achieved in an average time of 8 weeks. Full weight bearing was attainable in a meantime of 10.2 weeks. Average

day of hospital stay was 7 days post operatively. All the results were assessed using Flynn's criteria (Table 1). The results were wonderful in 12 patients (60%), excellent in 7 (35%) and poor in 1 patient (5%) (Figure 1). All patients had early come back to high school. Two patients had nail irritation because of slightly larger nail size, one patient had a varus angulation of 10 degrees. No patients of ours had post-operative infection. No implant failure was seen in the study.



Graph 1: Showing outcome according to Flynn's criteria

Discussion

Shaft of femur fractures constitute less than 2 % of all paediatric fractures and therefore the ideal alternative of treatment has remained a continuing challenge to the orthopaedics surgeon. Conservative treatment for pediatric long bone leg bone fractures was most well-liked in children and young adolescents till recently. However, to avoid the consequences of prolonged immobilization, to cut back the loss of education in school days and better care for the patients, the operative approach has been gaining quality for the last 20 years^[1, 2, 5]

Flynn *et al.* found TEN advantageous over hip spica application in treatment of leg bone shaft fractures in children^[5]. Buechsenschuetz *et al.*, documented metallic element nail superior in terms of union, scar acceptance and overall patients satisfaction compared to traction and casting^[9]. The metallic titanium nail elastic system looks advantageous over alternative surgical strategies notably within the age bracket of 6-16 as a result of its straightforward, a load-sharing internal splint that does not violate the physis, permits early mobilization and maintains alignment^[1, 2]. Micromotion presented by the physical and elastic property of the fixation promotes quicker external bridging callus formation. The tissue layer isn't disturbed and being a closed procedure there's no disturbance of the fracture haematoma, thereby less risk of infection^[1, 2]. Ligier *et al.* treated 123 shaft of femur fractures with elastic stable intramedullary nail. All fractures united. 13 children developed entry website irritation^[10]. Similarly, Narayanan *et al.* found very good outcome in seventy nine shaft of femur fracture stabilized with titanium elastic nail^[4]. The geometry configuration and location of the fracture are important for deciding the selection of surgical techniques. Transverse, short oblique and minimally comminuted fractures are appropriate for TEN as expressed by Flynn *et al*^[1]. Narayanan *et al*^[4] expressed that transverse, short oblique, short spiral fractures with minimum comminution within the 5-12 years age bracket were the most

effective indications for titanium elastic nail. The foremost common complication of titanium elastic nail is entry site irritation by the nail and pain^[4, 11]. Alternative complications include limb length discrepancy, angulation of fracture, re-fractures and infection. Entry site irritation in our series was seen in 4 cases. In our study we found that nail entry site irritation was considerably related to long and those nails which have prominent end (>2 cm).

Conclusion

Titanium nail elastic system in diphyseal femoral fracture is a very safe, minimally invasive and cost effective. It hastens fracture union, reduces the rate of malunion and angular deformity. It results in less hospital stay, early recovery and minimal to negligible joint stiffness and early ambulation with very little complications.

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References

1. Flynn JM, Skaggs DL, Sponseller PD, Ganley TJ, Kay RM, Kellie Leitch KK. The operative management of pediatric fractures of the lower extremity. *J Bone Joint Surg Am.* 2002;84:2288–300.
2. Titanium elastic nailing in femoral diaphyseal fractures of children in 6-16 years of age (KC Saikia, SK Bhuyan, TD Bhattacharya, and SP Saikia). *Indian Journal of Orthopaedics.* 2007 Oct-Dec;41(4):381-385.
3. Metaizeau JP. Stable elastic nailing for fractures of the femur in children. *J Bone Joint Surg Br.* 2004;86:954–7.
4. 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.

5. Flynn JM, Luedtke LM, Theodore J, Ganley TJ, Dawson J, Davidson RS *et al.* Comparison of titanium elastic nails with traction and a spica cast to treat femoral fractures in children. *J Bone Joint Surg Am.* 2004;86:770-7.
6. Bhaskar A. Treatment of long bone fractures in children by flexible titanium nails. *Indian J Orthop.* 2005;39:166-8.
7. Anglen J, Choi L. Treatment options in pediatric femoral shaft fractures. *J Orthop Trauma.* 2005;19:724-733.
8. Barry M, Paterson JM. A flexible intramedullary nails for fractures in children. *J Bone Joint Surg Br.* 2004 Sep;86(7):947-53.
9. 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.
10. Ligier JN, Metaizeau JP, Prevot J, Lascombes P. Elastic stable intramedullary nailing of femoral shaft fractures in children. *J Bone Joint Surg Br.* 1988;70:74-7
11. Flynn JM, Hresko T, Reynolds RA, Blasler RD, Davidson R, Kasser J. Titanium elastic nails for pediatric femur fractures: A multicenter study of early results with analysis of complications. *J Pediatr Orthop.* 2001;21:4-28.