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"Outcome of Titanium Elastic Nails in Pediatric Femoral Fractures"

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Abstract
Background: *There are various methods to treat pediatric femoral fractures. Titanium elastic nailing (TEN) is one of the established and reliable methods for treating pediatric femoral fractures. But we have very few research-based information regarding the outcome of using titanium elastic nails in pediatric femoral fractures in Bangladesh.*
Aim of the study: *This study aimed to evaluate the outcome of using titanium elastic nails in pediatric femoral fractures.*
Methods: *This was a prospective observational study conducted in the Department of Orthopedics of TMSS Medical College, Bogura, Bangladesh and 3 associated private clinics during the period from January 2018 to December 2021. The study was approved by the ethical committee of the mentioned hospital and associated clinics. In total 18 children with femoral fractures selected to treat with titanium elastic nailing were recruited as the study population. All the information along with the outcomes of the participants were collected assessed and disseminated by several tables and charts of MS Office and SPSS version 23 programs.*
Result: *In this treatment technic we had noticed some complications. Among the total participants, in some cases we found superficial infection as complication respectively. As per the scoring criteria for TEN by Flynn et al. the results were found 'excellent' in 11 patients (61%), 'successful' in 6 (33%) and 'poor' in 1 patient (6%).*
Conclusion: *Surgical technique of titanium elastic nailing is simple and reproducible. Titanium elastic nailing may be considered as the method of choice for the simple pediatric femoral fractures as it is minimally invasive and shows good functional and cosmetic results.*
Key words: *Pediatric, Titanium elastic nails (TEN), Femoral fractures.*

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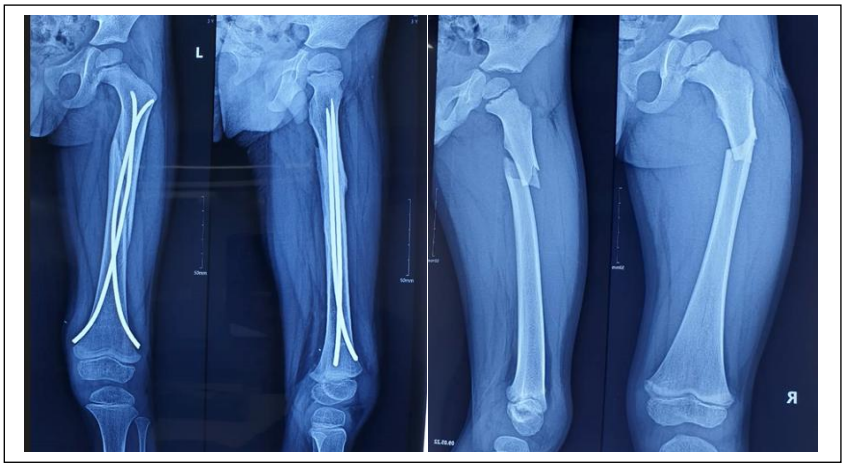
I. Introduction

The major objective of this study was to evaluate the outcome of using titanium elastic nails in pediatric femoral fractures. There are various methods to treat pediatric femoral fractures. Titanium elastic nailing is one of the established and reliable methods for treating pediatric femoral fractures. Among several fractures, femoral fractures are the most common and incapacitating fractures in children. Among all bony injuries in children, femoral shaft fractures are usually occurred in near about 2%. Low-velocity trauma leads to transverse fractures, whereas higher ones cause comminuted or segmental fractures.[1] Usually, the treatment of such cases has traditionally been age-related and influenced by the location and type of the fracture and associated injuries[2]. Because of rapid healing and spontaneous correction of angulation, most of the femoral shaft fractures among children younger than six years of age can be treated conservatively[3]. Some of the previous methods of operative stabilization of paediatric femoral shaft fractures included compression plating, external fixation and rigid intramedullary nailing[4]. Ender's nails and titanium elastic nails are the two types of flexible intramedullary nails that are used over the years[5]. The determination of ideal treatment of femoral shaft fracture in each child depends on the age of the child, the types and locations the fractures, the family environment, and the ability and preferences of the surgeon[6]. Below the age of 5 years, it is still a consensus to treat the child with fracture shaft femur conservatively as rapid healing and spontaneous correction of angulation takes place below this age group.[7,8] Near the end of skeletal maturity angular deformity is not correctable by growth, so, accurate reduction is necessary.[9] The best treatment between 5 and 14 years of age is a matter of

debate.[10] The biomechanical properties of titanium are often considered to be superior to those of stainless steel for intramedullary fracture fixation and in vitro mechanical studies have demonstrated equal or superior fixation of pediatric femoral fractures with use of titanium elastic nails as compared with stainless steel elastic nails.[11]

II. Methodology & Materials

This was a prospective observational study conducted in the Department of Orthopedics of TMSS Medical College, Bogura, Bangladesh and 3 associated private clinics during the period from January 2018 to December 2021. The study was approved by the ethical committee of the mentioned hospital and associated clinics. In total 18 children with femoral fractures selected to treat with titanium elastic nailing were recruited as the study population. The proper informed consents were taken in favor of all the participants before collecting patient data. In this study, the age of the patients was 5 to 15 years. Winquist types III and IV comminuted fractures, segmental, metabolic bone disorders (Osteomalacia), previously diagnosed neuromuscular disease or pathological fractures, history of previous fracture or deformity in either limb were considered as the exclusion criteria for this study. After a linear incision of about 2 cm, opening the fascia, and splitting the muscle fibers, a hole was opened in the distal femoral metaphysis about 2 cm proximal to distal femoral physis plate with a curved owl and enlarged. Then, each prebent titanium elastic nail was placed in retrograde through the distal part of the femur. All the patients received second-generation cephalosporin as their prophylaxis.



Follow-up visits were made at two weeks when sutures were removed, six weeks when wound infection and progress of union was observed in x ray. Nails were removed when union was achieved radiologically and clinically. Clinical union was considered when patient can walk comfortably without support. Limb alignment and limb length discrepancy were assessed immediate post operatively and at the final follow up when nails were removed. In our study, the major complications were defined as conditions leading to unscheduled nail removal or operative treatment, including deep infection, implant irritation, or pain and superficial infection. All were collected assessed and disseminated by using MS Office and SPSS version 23 programs.

III. Result

In this current study finally 18 subjects were finalized as study population. Among them 11 were male which was 61% and 7 were female which was 39%. In age distribution of the study we found, the highest 57% (n=31) patients were from 11 to 15 years' age group whereas 43% (n=23) were from 5-10 years' age group. In our study we found, in the highest number of cases the mechanism of injury was road traffic accident and it was 56%. Then in 39% it was 'fall from height' and in 5% cases it was 'sport injury'. On the other hand, among the highest number of cases the side of injury was 'right' and it was 61% (n=11) whereas in 39% (n=7) cases it was 'left'. All the patients were available for evaluation after a period of 6 months follow up. Radiological union and full weight bearing was achieved in all cases in a meantime of 8 weeks (6week -12 weeks). As per the scoring criteria for TEN by Flynn et al. the results were found 'excellent' in 11 patients (61%), 'successful' in 6 (33%) and 'poor' in 1 patient (6%).

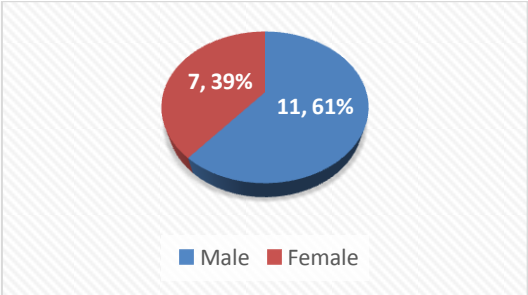


Figure I: Gender distribution of participants (N=18)

Table I: Age distribution of participants (N=18)

Age	n	%
5-10 Years	8	44%
11-15 Years	10	56%
Total	18	100%

Table II: Mechanism of injury among participants (N=18)

Mechanism of injury	n	%
Fall from height	7	39%
RTA	10	56%
Sport injury	1	5%

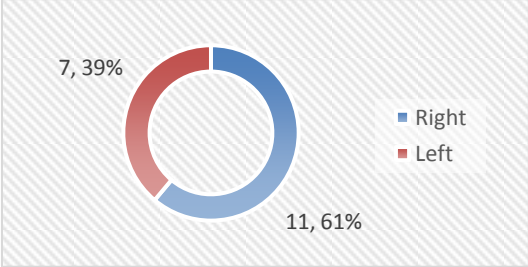


Figure II: Side of injury among participants (N=18)

Table III: Final outcomes among participants (N=18)

Clinical results	n	%
Excellent	11	61%
Successful	6	33%
Poor	1	6%

IV. Discussion

The aim of this study was to evaluate the outcome of using titanium elastic nails in pediatric femoral fractures. In fact, titanium elastic nail (TEN) is an elastic stable intramedullary nail. It works on the principle of symmetric bracing action of two elastic nails having same modulus of elasticity; which causes three-point fixation & gives rotational, transitional, axial as well as bending stability by counteracting the distraction and compression forces working on diaphysis of femur. Titanium Elastic Nail (TEN) does not provide adequate stability in comminuted, long oblique or spiral fractures or even if it is contemplated post-operative immobilization is essential[12]. The risk of complications of operative procedure is always there[13]. Studies have found that, Titanium Elastic Nail (TEN) is advantageous over hip spica in femoral shaft fracture in children as a treatment method[14]. Advantages of TEN are reduced hospitalization[15] and early mobilization. The result of Femoral Intramedullary Nail done in preschool children will achieve recovery milestones much faster than those treated with traction and spica cast study of 72 cases[16]. TEN is indicated in all femoral diaphyseal fractures of children above 6 years till physical closure [17]. Though drawbacks of this method over other methods of treatment are of cause the issue of just narration[18]. TEN as a retrograde technique of nailing have less chances of AVN of femoral head[19]. There are many reasons for this acceptance including absence of postoperative casting in most cases, primary bone union without growth plate injury, rapid recovery of joint motion and return to physical activities, minimally invasive surgery allowing small and aesthetic scars, low infection rate, and shortened hospital stays.[20] As per the scoring criteria for TEN by Flynn et al. the results were found as

'excellent' in 11 patients (61%), 'successful' in 6 (33%) and 'poor' in 1 patient (6%). These outcomes were considered as satisfactory.

V. Conclusion and recommendations

Surgical technique of titanium elastic nailing is simple and reproducible. Titanium elastic nailing may be considered as the method of choice for the simple pediatric femoral fractures as it is minimally invasive closed and shows good functional and cosmetic results.

References

[1]. Kasser Sheikh SI, Ullah M, Khan A, Iqbal J. Ender's nail for diaphyseal long bone lower limb fractures in children. J Rawalpindi Med Coll (JRMC) 2012; 16: 25-7.
[2]. 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.
[3]. 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.
[4]. Metaizeau JP. Stable elastic nailing for fractures of the femur in children. J Bone Joint Surg Br. 2004;86:954–7.
[5]. Barry M, Paterson JM. A flexible intramedullary nails for fractures in children. J Bone Joint Surg Br. 2004 Sep;86(7):947-53.
[6]. 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.
[7]. Buckley SL. Current trends in the treatment of femoral shaft fractures in children and adolescents. Clin Orthop Relat Res 1997; 338: 60-73.
[8]. Gwyn DT, Olney BW, Dart BR, Czuwala PJ. Rotational control of various pediatric femur fractures stabilized with Titanium Elastic Nails. J Pediatr Orthop 2004; 24: 172-7.
[9]. Metaizeau JP. Stable elastic nailing for fractures of the femur in children. J Bone Joint Surg Br 2004; 86: 954-7.
[10]. 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.
[11]. Eric J. Wall, Viral Jain, Vagmin Vora, Charles T. Mehlman, Alvin H. Crawford. Complications of Titanium and Stainless Steel Elastic Nail Fixation of Pediatric Femoral Fractures the Journal of Bone & Joint Surgery. 2008; 90: 1305-1313.
[12]. K.C.Saikia,S K Bhuyan, T.D. Bhattacharya, Titanium elastic nailing in femoral diaphyseal fractures of children in 6 -16 years of age. IJO 2007, vol.41, issue 4,381-385.
[13]. GOODSHIP A.E. The influence of induced micromovement upon the healing of experimental tibia fractures. JBJS 67B (4): 1985, 650-655.
[14]. Buechsenschuetz KE,Mehlman CT, Shaw KJ, Crawford AH, Immerman EB. Femoral shaft fractures in children: Traction & cast versus elastic stable intramedullary nailing. J Trauma 2002 :(53): 914-21.
[15]. Herndon WA, Mahnken RF,Yngve DA, Sullivan JA. Management of femoral shaft fractures in adolescents.J Peditr Orthop. 1989; 9:29-32.
[16]. Bopst.L.,Reinberg O.,Lutz N., Femur fracture in preschool children: experience with flexible intramedullary nailing in 72 children.,J. Pediatr Orthop,2007: (27): 299-303.
[17]. Lascombes P, Haumont T, Journeau P,Use and abuse of flexible intramedullary nailing in children and adolescents, J Pediaric Orthop, 2006 (26):827-34.
[18]. Luhmann SJ, Schootman M, Schoenecker PL, Dobbs MB,Gordon JE. Complications of titanium elastic nails for pediartric femoral shaft fractures. J Pediatr Orthop. 2003 Jul-Aug; 23(4): 443-447.
[19]. Vierhout B.P.,Sleeboom C.,Aronson D.C.,Van Walsum A.D.,Zilp G.,Heij H.A.,Long term outcome of elastic stable intramedullary fixation of femoral fractures in children. Eur J Pediatr Surg, 2006 (16): 432-437.
[20]. Lascombes P, Haumont T, Journeau P. Use and abuse of flexible intramedullary nailing in children and adolescents. J Pediatr Orthop. 2006; 26:827–834.

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