ORIGINAL RESEARCH PAPER

Orthopaedics

OUTCOMES OF TITANIUM ELASTIC NAILING IN FEMORAL DIAPHYSEAL FRACTURES OF CHILDREN IN 6-16 YEARS OF AGE

KEY WORDS: Elastic titanium nailing, intramedullary nail, pediatric femoral fractures

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ABSTRACT

Introduction: Management of femoral diaphyseal fractures in the age group of 6-16 years is controversial.Conservative management leads to Prolonged hospitalization, difficulty in maintaining child with traction for 3 weeks, then hip spica makes toileting and personal hygiene difficult. This may cause malunion/limb length discrepancies, rotational deformities, and sometimes psychological problems.

Materials and Methods: A total of 32 children in the age group of 6-16years,25 boys and 7 girls having diaphyseal femoral fractures were stabilized with two stainless steel/titanium elastic nail retrograde way under fracture table.the results were evaluated using criteria of Flynn et al

Results: The average duration of appearance of bridging callus was 6 weeks. Radiological union in all cases was achieved in a mean time of 8.7 weeks. All children showed sound union at an average 8 weeks without significant complications. Return to school was early with an average 10–12 weeks. Result assessed for range of motion (ROM), irritation at the distal end of the nail, pain, deformity, limb length discrepancies, union, and malunion. Overall results observed were excellent in 24, satisfactory in 5 and poor in 3 patients.

Conclusion: Intramedullary fixation titanium elastic nailing is an effective treatment of diaphyseal fractures of the femur in properly selected patients of the 6-16 years age group.

INTRODUCTION

Femoral diaphyseal fracture is the most common orthopedic injury of the children.[1] The treatment has conventionally been age-related, influenced by the type of injury, associated injuries and the location and the type of the fracture. To a larger extent, the treatment options vary according to the surgeon's preference.[2] Due to the rapid healing and spontaneous correction of angulation, most of the diaphyseal femoral fractures in children younger than 4 years of age can be treated conservatively.[3] Above the age of 4 years, all such fractures when treated conservatively by traction followed by hip spica could have prolonged hospitalization, loss of reduction, malunion, intolerance, and complications associated with plaster-like toileting and personal hygiene difficulties as well as mental trouble to the parents. Near the end of the skeletal maturity, accurate reduction is necessary as angular deformity is no longer correctable by the growth.[4] However, the best treatment between 4 and 16 years of age is a matter of debate.[5] Since the last two decades, there has been a growing tendency toward a more operative approaches such as compressive plating, external fixation, and intramedullary nailing in children over 4 years of age.[6,7] Enders nails or Rush nails have also been used, but these have poor rotational stability and require multiple nails to achieve fracture stability.[8] Elastic either titanium/stainless nailing has become the choice of stabilization in diaphyseal femoral fractures in children.[9] The advantages of this technique include early union due to micromotion at the fracture site, respect for the epiphysis, early mobilization and weight bearing, scar acceptance, easy implant removal, unnecessary child care, finally leading to high patient satisfaction rate.[10,11] We report a prospective study of fixation of diaphyseal fractures of the femur in age group 4–16 years of children.

MATERIALS AND METHODS

The diameter of the individual nail wasselected as per Flynn et al.'s formula[5] (Diameter of nail = width of the narrowest point of the medullary canal on AP and Lateral view × 0.4 mm) as well as the intra-operative assessment. y. The patient was positioned on the fracture table with access to the IITV. The bone was exposed in retrograde fashion with medial and lateral incision 2.5–3 cm above the epiphysis and the soft-tissue spread in the same direction with the blunt type scissors. The periosteum was also incised longitudinally and the cortex exposed. With the help of sharp awl, outer cortex was perforated and the awl angled to enter the medullary cavity in the middle of the width of the cortex. Nails were prebent sufficiently so that apex of the bowed nail rested at the same level on the fracture site to ensure a good recoil force. Two stainless steel/titanium elastic nails of identical diameter were manually pushed with the help of a "T" handle until resistance was met and then gently inserted with the curve tip sliding on the inner cortex.Once across the fracture site, the nails were inserted into the metaphysis with the tips facing opposite directionsto give three-point purchase in the Cancellous bone.The nails were cut 1–1.5 cm long and bent to lie along the bony cortex to prevent skin and soft-tissue impingement. The median duration of surgery was 45 min (30–75 min). The mean hospital stay was 4 days (3–7 days). Postoperatively, patients cared in the supine position and limb were kept elevated on a pillow. Slab/Brace were used in distal third fractures having inadequate fixation. Mobilization exercises without weight bearing started from the 5th postoperative day. Partial weight bearing was started from 4 to 6 weeks and full weight bearing by 6–8 weeks depending on the fracture chemistry. All patients were followed radiologically as well as clinically until fractures healed and for any complication. The results were evaluated using Flynn et al.'s scoring criteria for SEN12 [Table 1]. Routine removal of these implants were recommended 6–9 months after surgery when the fracture line was no longer visible radiologically

Fig 1

Fig 2

Fig 3

Fig 4

Table no 1(FLYNN Score)

Score	Excellent	Succesfull	Poor
Limb length discrepancy	<1	<2	>2
sequence	5	10	>10
pain	Absent	Absent	Present
Complication	Absent	Mild	Major complication

RESULTS

All the patients were evaluated after a mean of 24 months (12–36 months) follow-up. Radiological union was achieved in all cases in a mean time of 8 weeks (6–12 weeks). Full weight-bearing was possible in 8 weeks (6–12 weeks). The results were excellent in 24 patients (75%), good in 5 (16%), and poor in 3 cases (9%) as per the scoring criteria by Flynn et al. [12] Two patients had varus angulation (6°, 12°), whereas one had valgus angulation (15°). Entry site irritation, ultimately, skin breakdown occurred in 5 patients, which lead to superficial infection, later treated with antibiotics. Leaving nail end long (2 cm) and untrimmed was significantly associated more with the entry site irritation. One case required removal after 5 months due to entry site irritation.

DISCUSSION

Until recently, conservative treatment by skin traction followed by hip spica was the preferred method in children and adolescents. However, to avoid the effects of prolonged immobilization, to reduce the loss of school days and for better nursing care, the operative approach has been gaining popularity for the past two decades. Plate osteosynthesis is still widely used, but associated with big exposure, relatively longer duration of immobilization, infection, risks of delayed union and bigger dissection for plate removal.[13] The external fixator provides good stability and early mobilization but associated with risk of pin tract infection, and it takes longer time for weight bearing.[14].] The interlocking nail is ideal for skeletally matured children. Reports of AVN of the femoral head, coxa valga has been reported with interlocking nail in skeletally immature patients.[15]. Flexible elastic nail seems advantageous over other surgical methods particularly in this age group as it is simple, load bearing internal splint that does not violate open epiphysis, allows early mobilization, and maintains alignment.[16] Micro motion conferred by the elasticity of the fixation promotes faster external bridging callus formation. The periosteum is not disturbed and being a closed procedure there is no disturbance of the fracture hematoma, thereby lessening the risk of infection. Flynn et al. found TEN as more advantageous over hip spica in treatment of femoral shaft fractures in children.[5] Fracture geometry and location is an important determinant forselection ofsurgical techniques. Transverse,short oblique, and minimally comminuted fractures are suitable for elastic nail as stated by Flynn et al. Lascombes et al. [17] stated that Elastic nail could be indicated in all femoral diaphyseal fractures of children above 6 years of age until epiphysis closed except severe type III open fractures. Elastic nail does not provide adequate stability in comminuted, long oblique, or spiral fracturesNarayanan et al. found good outcome in 79 femoral stabilized with Elastic nail.[18] Narayanan et al. stated that transverse,short oblique,shortspiral fractures with minimum comminution in the age group 4–15 years were the best indications for Elastic nails.

CONCLUSIONS

The titanium elastic nailing is an effective and viable treatment option in selected cases of femoral diaphyseal fractures in the 6-16 years age group.

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