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Original Research Article

Evaluation of Safety and Effectiveness of Elastic Nailing as Treatment Option for Fracture of Femur in Children

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Abstract: The present retrospective study was undertaken to evaluate the safety and effectiveness of elastic nailing as treatment option for paediatric femur fracture below 12 year age with regard to mechanism of injury, fracture pattern, intra- operative complications, closed or open reduction, hospital stay and clinical and radiological union. 25 patients up to 12 years of age with a fracture of the diaphysis of femur who had been treated with the intramedullary elastic nails admitted in Adesh Institute of Medical Sciences And Research Bathinda were studied from July 2012 to June 2014. All had been followed up until the fracture had healed or the nails removed. A performa was completed for each patient using information from the central registration records, and by reviewing imaging studies. Internal fixation with elastic nails provide better results and is much safe and effective, at least in the short term than conservative treatment methods.
Keywords: elastic nailing, effectiveness, outcome, radiological union, children.

INTRODUCTION

With increase in speed and increasing mechanization, it becomes virtually impossible to escape accidents even in children. Fracture shaft of femur is one of the most common fractures in children. It usually occurs due to road traffic accidents, due to fall from height or while playing. The treatment options for paediatric femur fractures include immediate [1] or delayed spica cast immobilization [2], skin or skeletal traction on a splint [3], plating [4], elastic nail [2], and external fixators. The choice of treatment may be influenced by the child's age, location and pattern of fracture, and, to a great extent, by regional, institutional, or surgeons' preferences. In skeletally mature adolescents, antegrade solid intramedullary nailing is usually employed {5,6]. Elastic nailing has been commonly used for treating fracture femur in children for two decades [7,8,9]. It has more recently become a widely accepted option for orthopaedic surgeons over conservative methods like traction and spica casting. During the last ten years elastic nails have become the most widely-used treatment for fractures of the diaphysis of the femur in children of school age [10-12]. A number of previous studies have focused on the safety and efficacy of this method in patients between the ages of 6 to 16 years[7,13,14,15].This study will evaluate the safety and effectiveness of elastic nails in treating fractures shaft of femur in children below the age of 12 years.

MATERIAL AND METHODS

After obtaining approval from ethical committee of Institute, 25 patients up to 12 years of age with a fracture of the diaphysis of femur who had been treated with the intramedullary elastic nails admitted in Adesh Institute of Medical Sciences And Research, Bathinda were studied from July 2012 to June 2014. All had been followed up until the fracture had healed or the nails removed. A performa was completed for each patient using information from the central registration records, and by reviewing imaging studies. The age, sex, mechanism of injury, side, associated injuries, intra-operative complications [closed or open reduction], hospital stay, clinical union and radiological union were recorded. The pre-operative radiographs were evaluated to determine the location and pattern of the fracture. The inclusion criteria will be: (1) age below 12 years; (2) closed or grade I open fractures according to the Gustilo classification. Exclusion criteria will be: (1) segmental or type II–IV comminuted fractures according to the Winquist classification; (2) pathological fractures; (3) grades II or III open fractures; (4) fractures involving femoral condyles or

cervicotrochanteric area; and (5) solid malunion requiring open correction.

We included 25 cases after fulfilling above mentioned criteria include 17 males (68%), 8 females (32%) with 14 right (56%) and 11 (44%) left side. The mean age at time of fracture was 6.4 years (2-12 years). The information collected at visits after operation included the range of movement in the hip and knee, rotational alignment, time to weight bearing and nail removal. The leg length was evaluated clinically using either tape measurement or a block test. Post-operative radiological evaluation included an assessment of the position of the nail, frontal and sagittal alignment, callus formation, disturbance of trochanteric growth, osteonecrosis of the femoral head and femoral length. Varus and valgus angulation was measured from the anatomical axis. Flexion and extension was measured directly with the understanding that the normal bow of the femur contributes to anterior angulation of fractures of the midshaft by a few degrees. Circumferential callus formation, the visibility of the fracture line, and leg length discrepancy and malalignment were recorded at each post-operative visit in order to monitor remodelling and detect delayed union or deformity.

After initial management in emergency, fracture was immobilized with skin traction or with plaster of Paris slab depending upon child age. Routine investigations ordered along with relevant x-rays. X-rays were evaluated for type and site of fracture. Children were taken in operation theatre. Under appropriate anaesthesia two equal sized elastic nails were inserted through two small incisions on medial and lateral side. Entry point was made 2 cm proximal to the distal femoral epiphysis.

RESULTS

The most common mechanism of injury was a motor vehicle accident in 13 patients (52%) followed by fall while playing in 8 patients (32%) and a fall from height in 4 patients (16%). Multiple injuries were present in 4 patients including 2 with head injury, 1 with abdominal injury and 1 with associated other fractures. Average hospital stay was 3.5 days (2-9 days). Intra operative closed reduction was achieved in 22 patients while 3 patients required open reduction. Anatomical site of fracture was middle third in 18 patients (72%), lower third in 4 patients (16%) and upper third in 3 patients (12%). There were 6 (24%) transverse, 14(56%) oblique and 5(20%) spiral fractures. Post operative immobilization in a Pop slab was given in 3(12%) and knee immobilizer in 4(16%) fractures. Immobilization was not given in 18(72%) fractures. Each patient's follow up record was collected until their fracture had healed or the nails removed. Mean length of follow up was 8 months (2-12 months). Time to removal of the nail varied from 1.5 month to 11 months (mean 7 months). Average time for fracture union was clinically 8 weeks (6-10 weeks) and radiologically 12 weeks (8-14 weeks). Mean time between fixation and full weight bearing was 10 weeks (8-14weeks). Angulation at fracture site upto 5 is seen in 6(24%) cases, angulation of 5-10 is seen in 2(8%) cases and angulation of more than 10 is seen in 1(4%) case is mostly observed in children above 10 years age.

Age was a strong predictor of outcome. The outcome was poor in elder children (age above 10 years) as compared to young children (age below 10 years). Because remodelling is better in younger children, conventional guidelines recommend accepting greater amounts of angulation and shortening of the fracture if the child is less than 10 years(15).Other clinical and radiological aspects of injury, fixation and post operative care had not effected outcome as much as effected by age factor. Ideally the final outcome would be based on radiological and clinical data obtained once the patient had reached skeletal maturity, but it is difficult to arrange such an assessment.

Elastic nailing is currently the most popular method for treating fractures of the shaft of the femur in children of school age. Our results show that children older than 10 years had slightly more complications and poor outcome as compared to younger children. However, our study has confirmed that the outcome after treatment with elastic nailing is excellent or satisfactory in most patients in terms of radiological and clinical union. Our study has also shown that elastic nailing has fewer complications like shortening, angulation and malrotation as compare to conservative methods (skin, skeletal traction and hip spica) of treating fracture shaft of femur in children. Different studies concluded that elastic nailing led to better outcomes as compared to hip spica casting in terms of lower rates of malunion, shortening, malrotation and shorter rehabilitation phase, and better functional outcome scores [16,17,18,19].

CONCLUSION

Internal fixation with elastic nails provide better results and is much safe and effective, at least in the short term than conservative treatment methods. Long-term follow-up was not done; hence, commenting on the final outcome would be inappropriate keeping in mind the remodelling potential in the patients of the study group.

Ideally the final outcome would be based on radiological and clinical data obtained once the patient had reached skeletal maturity, but it is difficult to arrange such an assessment.

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