

Original Research Article

## Complications of Elastic Nailing in Pediatric Femoral shaft Fractures

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**Abstract:** Despite several potential complications of elastic intramedullary nailing, it is currently the treatment of choice for femoral diaphyseal fractures in school aged children. The present study aimed to critically evaluate the complications of elastic nailing in femoral shaft fractures of children of age below 12 years. 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 complication rate was 32%, and the two main complications were nail prominence caused by long unbent distal ends of nails at the insertion site and fracture instability after surgery. Nail ends should be palpated to exclude nail prominence and to verify free movement of the knee after nail cutting and bending. Fracture instability was caused by inserting elastic nails that were too narrow. To avoid this complication, careful preoperative planning to select the proper-size elastic nails and intraoperative testing of fracture stability under continuous fluoroscopy after the operation is advised.

**Keywords:** children, elastic nailing, femoral fractures, complications

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### INTRODUCTION

During the past 20 years, elastic nailing has become the most widely used treatment for diaphyseal femoral fractures in school-aged children over 6 years of age [1-3]. The advantages of elastic nailing include its minimal invasiveness and the ability for direct mobilization to maintain joint movement and muscle tone as well as normal circulation [4-7]. Hospitalization is usually short term and reduces the treatment cost compared to traditional treatments with traction and spica cast [8, 9]. In addition, psychological recovery is accelerated by early resumption of functional activity, allowing for a rapid return to school and ordinary family life [8-11]. Despite the various advantages of elastic nailing, however, complication rates of up to 60% have been reported, mostly due to incorrect operative techniques and poor patient selection [12-19]. The most common reported complication is soft-tissue irritation at the nail entry site [12-19]. Nail prominence can lead to more serious complications such as skin breakdown; superficial or deep infection, such as osteomyelitis; early implant removal; and risk of re-fracture [2, 5, 6, 8, 17]. Other common complications

include the inability to achieve a stabile reduction or loss of reduction that can lead to delayed fracture union (up to 16% of reported complications), angular malunion, or uncommon rotational malunion [14,17]. This retrospective study aimed to critically evaluate the complications of elastic nailing in femoral shaft fractures in children upto 12 years of age.

### MATERIAL AND METHODS

After obtaining approval from ethical committee of Institute ,25 children upto 12 years of age admitted in Adesh Institute of Medical Sciences And Research Bathinda from July 2012 to June 2014 with fracture shaft of femur treated with elastic nails were included in this study. Complications of elastic nailing like pain and late knee mobilization due to nail end prominence, instability at fracture site that can lead to delayed union, angulation and rotational malalignment are evaluated in these children. All patients had been followed up until the fracture had healed or the nails were 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. Functional outcome was assessed clinically by comparing the operated side to the uninjured side.

## RESULTS

The most common mechanism of injury was a motor vehicle accident (52%) followed by fall while playing (32%) and a fall from height (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. Complications like entry site nail prominence was noted in 2 cases (8%), prominence with skin breakdown was noted in 1 cases(4%), skin breakdown with superficial infection was noted in 1 cases(4%) especially in cases where nail ends were not bent. 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. Fracture site instability was noted in 3 cases (12%) (In all upper third fractures where nail diameter (ND)/medullary canal diameter (MD) ratio was less than 80% at fracture site). Fracture was considered unstable if the fracture position was changed between intra- and postoperative x-rays and ND/MD ratio was below 80% at the same time. In these cases above knee slab/cast immobilization was given immediately after post operative x-rays. All fractures united well. Second surgery was not required in any case. Early nail removal with pop above knee slab immobilization was done in one case where there is skin breakdown along with superficial infection (at 1.5 months).

## DISCUSSION

The main aim of this retrospective study was to critically analyze postoperative complications associated with diaphyseal femoral fractures treated with elastic nails.

The complication rate was 32%, and the two main complications were nail prominence caused by long unbent distal ends of nails at the insertion site and fracture instability after surgery. In all patients with nail entry site prominence, pain and skin irritation delayed knee motion and overall mobilization until the nail removal. Nail end prominence at entry site can be avoided by bending the nail end toward femur and

palpating nail ends on knee movements. Fracture site instability can be prevented by analysing preoperative x-rays to determine the accurate size of elastic nails to be inserted. These complications are easy to manage and do not effect final outcome too much. Based on the literature, elastic nailing is currently the most popular operative method of fixation of femoral diaphyseal fractures in children, despite reported complication rates of up to 60% [1, 3, 6, 13]. Routine removal of elastic nails is controversial, a clear recommendations does not exist. Most authors still recommend nail removal within 1 year after the operation to prevent difficulties in future orthopaedic procedures, nail irritation or prominence problems, and so on [6]. We removed all elastic nails within one year of operation without complications.

Based on this study, the complication rate of elastic-nailing in femoral shaft fracture in children suitable for elastic nailing is low and is associated with implant application and selection of proper-size nails. To avoid these complications, we recommend first measuring the width of the intramedullary canal preoperatively from x-rays and then choosing two wide-enough, same-size nails. After positioning the chosen nails, fracture stability should be verified under continuous fluoroscopy and free knee movement without nail prominence confirmed.

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