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Original Research

Humeral interlocking nail and compression plating in femoral shaft fracture- A comparative study

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ABSTRACT:

Background: Femoral shaft fracture incidence is approximatively 0.01% and results from high-energy trauma, often associated with polytrauma, comminuted fractures, and open fractures. The present study was conducted to compare elastic intramedullary nailing internal fixation and plate in the treatment of femoral shaft fracture in children. **Materials & Methods:**84 femoral shaft fractures in children of both genderswere divided into 2 groups of 42 each. Group I underwent internal fixation by minimally invasive elastic stable intramedullary nail and group IIunderwent open reduction based on internal fixation of plate. **Results:** The mean operation time was 68.1 minutes in group I and 142.4 minutes in group II, mean blood loss was 61.7 ml in group I and 143.1 ml in group II. Mean hospital stay was 6.8 days in group I and 15.7 days in group II, healing time was 62.4 days in group I and 80.3 days in group II and time of loaded off-bed activity was 82.7 days in group I and 125.7 days in group II. The difference was significant (P< 0.05). Fracture healing found to be excellent in 24 in group I and 9 in group II, good in 18 in group I and 10 in group II, moderate in 23 in group II. Common complications were ankylosis in 2 in group I, skin infection in 1 in group I and 2 in group II and angulation deformity 1 in group I and 3 in group II. The difference was significant (P< 0.05). **Conclusion:** Femoral shaft fractures in pediatric patients can be treated with internal fixation of minimally invasive elastic intramedullary nail with less complications and better treatment outcome.

Key words: Femur shaft, intramedullary nail, Plate

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INTRODUCTION

Femoral shaft fracture incidence is approximatively 0.01% and results from high-energy trauma, often associated with polytrauma, comminuted fractures, and open fractures. The femoral shaft and femoral neck fracture are mostly caused by trauma.[1] When the hip is in the flexion abduction position, and the knee is in the flexion position, the assault from the front and the inertia of the body result in an axial force.[2] If the femoral shaft fracture cannot absorb all the energy, the residual force is transmitted to the femoral neck, resulting in femoral neck fracture. If the hip is in the adduction position when it is injured, the posterior dislocation of the hip often occurs in addition to the fracture of the femoral head.[3]

Pediatric femoral fracture is a common type of pediatric fracture, and statistics showed that the prevalence of pediatric femoral fracture was about 10% to 15%.In the last four decades, several treatment options have been used to treat femoral shaft fractures. Initially, the treatment was represented by various types of trans-skeletal traction; then, the use of plates and screws was introduced, still indicated in special conditions.[4]Pediatric femoral shaft fracture is usually closed injuries; previously they were often treated with traction and reduction, plaster immobilization and so on, but the course of the treatment was long, which might have a more serious negative impact on quality of life and growth of children.[5] The present study was conducted to compare elastic intramedullary nailing internal fixation and plate in the treatment of femoral shaft fracture in children.

MATERIALS & METHODS

The present study comprised of 84femoral shaft fractures in childrenof both genders. The written consent was obtained from their parent.

Data of each patient such as name, age, gender etc. was recorded. A thorough physical examination was conducted. Patients were divided into 2 groups of 42 each. Group I underwent internal fixation by minimally invasive elastic stable intramedullary nailand group IIunderwent open reduction based on internal fixation of plate. All underwent routine history taking, clinical examination and radiographic examinations. Kolmert knee function scoring criteria was used for assessment of surgical effect and healing was recorded as excellent, good, moderate and poor. Parameters such as operation time, blood loss, healing period etc. was noted down. Complications in both groups were recorded. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II
Method	Minimally invasive elastic stable intramedullary nail	Dynamic plating
M:F	30:12	22:20

Table I shows that group I had 30 males and 12 females and group II had 22 males and 20 females.

Table IIComparison of parameters

Parameters	Group I	Group II	P value
Operation time (mins)	68.1	142.4	0.01
Mean blood loss (ml)	61.7	143.1	0.01
Mean hospital stay (Days)	6.8	15.7	0.05
Healing time (Days)	62.4	80.3	0.02
Time of loaded off-bed activity (days)	82.7	125.7	0.04

Table II shows that mean operation time was 68.1 minutes in group I and 142.4 minutes in group II, mean blood loss was 61.7 ml in group I and 143.1 ml in group II. Mean hospital stay was 6.8 days in group I and 15.7 days in group II, healing time was 62.4 days in group I and 80.3 days in group II and time of loaded off-bed activity was 82.7 days in group I and 125.7 days in group II. The difference was significant ($P< 0.05$).

Table III Comparison of fracture healing

Parameters	Group I	Group II	P value
Excellent	24	9	0.01
Good	18	10	0.05
Moderate	0	23	0.001
Poor	0	0	0

Table III, graph I shows that fracture healing found to be excellent in 24 in group I and 9 in group II, good in 18 in group I and 10 in group II, moderate in 23 in group II. The difference was significant ($P< 0.05$).

Graph IComparison of fracture healing

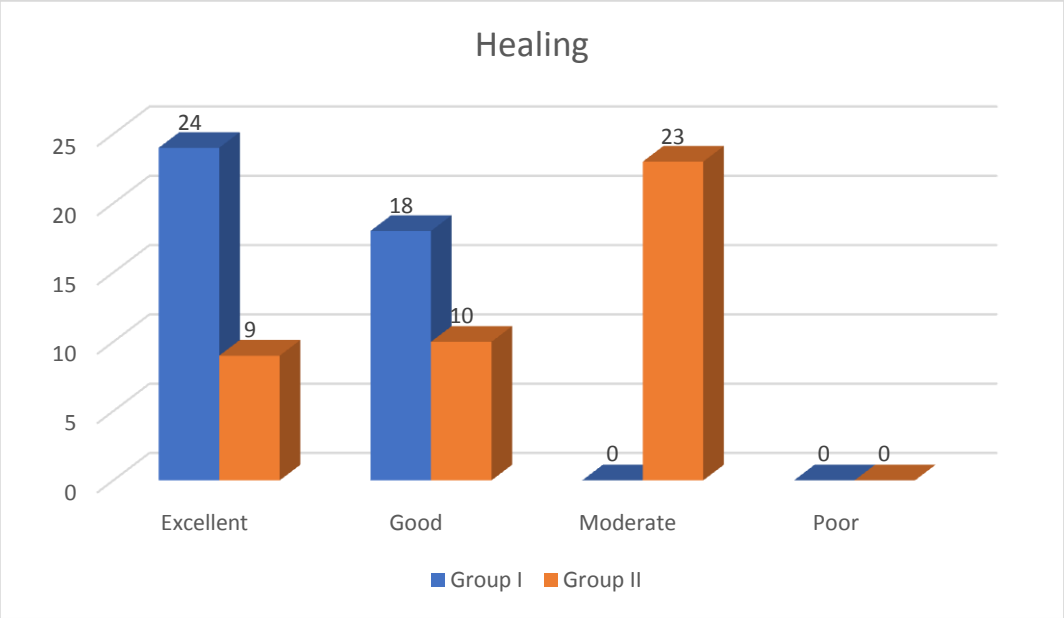
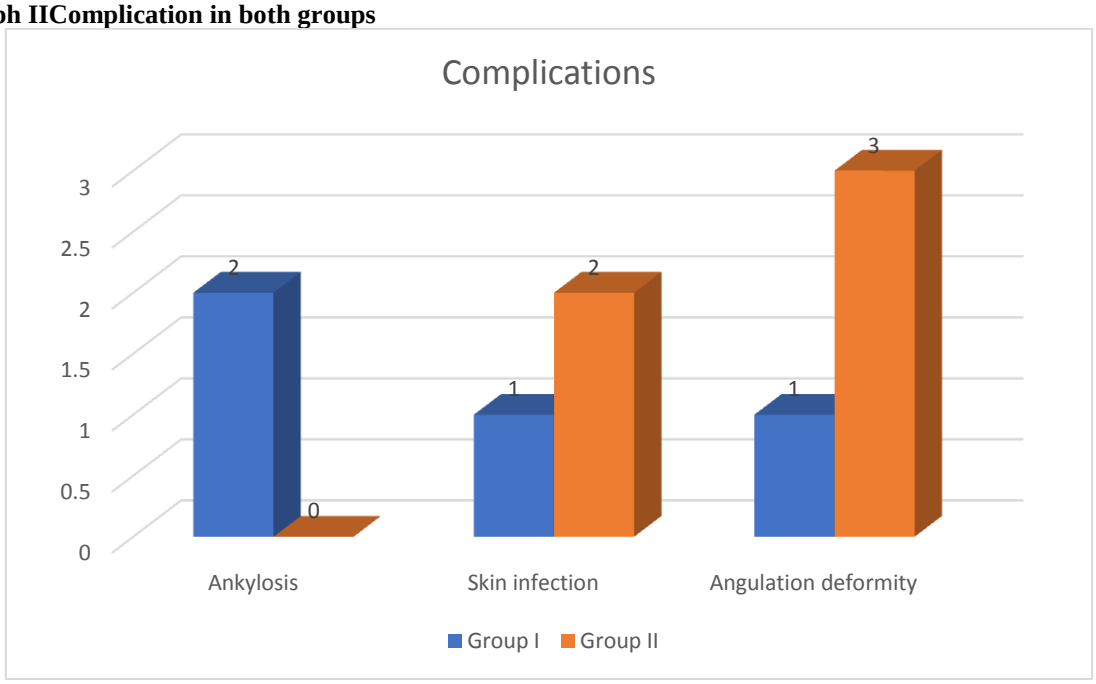


Table IV Complication in both groups

Complications	Group I	Group II	P value
Ankylosis	2	0	0.03
Skin infection	1	2	0.08
Angulation deformity	1	3	0.01

Table IV, graph II shows that common complications were ankylosis in 2 in group I, skin infection in 1 in group I and 2 in group II and angulation deformity 1 in group I and 3 in group II. The difference was significant (P< 0.05).

Graph IIComplication in both groups



DISCUSSION

There are more and more clinical methods for treating femoral shaft fractures, but at present, there is no unified conclusion on how to treat pediatric femoral shaft fracture. Previously, it was often recommended to implement conservative treatment for children. However, clinical investigations have found that conservative treatment took longer time and longer hospitalization time.[6] Most of the children were immature and prone to poor treatment compliance.

Therefore, some scholars believed that surgery could be performed on children. The treatment of the femoral neck with femoral shaft fracture is difficult, several methods have been reported.[7]Femoral reconstruction nail fixation has the following advantages: (a) fixation of the two fractures, axis fixation, and control of the length in multiple femoral shaft fractures and (b) closure of the pin, avoid damaging to local blood circulation, avoid peeling off the local periosteum, and minimal trauma.[8]The advantages of the plate system in fixing the femoral shaft fracture and hollow nail in fixing the femoral neck fracture include simple operation, direct reduction, and control of the femoral shaft rotation. However, the disadvantages of large trauma, excessive bleeding, extensive peeling of periosteum, and high probability of non-union were reported.[9]The present study was conducted to compare elastic intramedullary nailing internal fixation and plate in the treatment of femoral shaft fracture in children.

In present study, group Ipatients underwent internal fixation by minimally invasive elastic stable intramedullary nail and group II underwent open reduction based on internal fixation of plate. group I had 30 males and 12 females and group II had 22 males and 20 females.Canavesse et al[10]assessed treatment outcomes in children weighing 50 kg (110 pounds) or more with displaced femur shaft fractures treated by elastic stable intramedullary nailing (ESIN) and to identify potential correlations between nail size/medullary canal diameter ratio and outcome.Twenty out of 117 consecutive children surgically treated by ESIN for displaced fractures of the femoral shaft with no associated neurovascular injury weighed 50 kg (110 pounds) or more. All patients underwent regular clinical and radiographic follow-up for at least one year after their index surgery.The average patient age at the time of injury was 13.1 years (25th and 75th interquartile range [IQR] = 11.7-14.5). The mean follow-up was 27.4 months (IQR = 18.4-36.8). Overall, nine (45 %) adverse events were observed. The rate of complications was higher among children weighting 55 kg and over (67 %) than in children weighing less than 55 kg (35 %) and among children aged 13 years old or older (72 %) than among children younger than 13 years old (11 %).

We observed that mean operation time was 68.1 minutes in group I and 142.4 minutes in group II, mean blood loss was 61.7 ml in group I and 143.1 ml in group II. Mean hospital stay was 6.8 days in group I and 15.7 days in group II, healing time was 62.4 days in group I and 80.3 days in group II and time of loaded off-bed activity was 82.7 days in group I and 125.7 days in group II. Gupta et al[11] compared outcome of management of length unstable femur fracture in children with titanium elastic nails. All consecutive cases of femoral shaft fractures in children from 6 years of age to 15 yearswere included and cases of length unstable femoral shaft fracture that were managed with titanium elastic nails and having at least six months of follow up. There were 19 cases fulfilling the inclusion criterion. The mean age was 9±2.357 years. Spiral fracture was seen in 9 cases(47.40%), long oblique fracture was seen in 7 cases(36.80%) and 3 cases (15.80%) were having communition. Fracture united at average 8.42 weeks with standard deviation of 1.26 weeks. The mean follow up was 12.11±3.36 months. There were 14 cases with excellent outcome and 5 cases with satisfactory outcome based on Flynn outcome scoring. Post-operative complications were few.

In this study we found that fracture healing found to be excellent in 24 in group I and 9 in group II, good in 18 in group I and 10 in group II, moderate in 23 in group II. Common complications were ankylosis in 2 in group I, skin infection in 1 in group I and 2 in group II and angulation deformity 1 in group I and 3 in group II.Internal fixation of minimally invasive elastic stable intramedullary nail has been widely used in the treatment of pediatric femoral shaft fracture over these years.[12]

CONCLUSION

Authors found that femoral shaft fractures in pediatric patients can be treated with internal fixation of minimally invasive elastic intramedullary nail with less complications and better treatment outcome.

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