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Outcome of pediatric shaft femur (6 to 12 years) treated with intramedulary nailing

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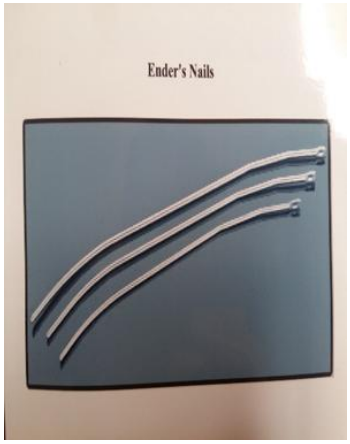
Abstract
Fracture of shaft femur is a common injury in young boys and girls. Many controversy present about treating them between conservative and operative. In our study, we have evaluated outcome of fracture shaft femur in pediatric patients between 6-12 years of age treated with intramedullary nailing had high rate of union. There were 5-22 weeks of duration which were required for achieving full range of movements. There were only 8% of patient with limb length discrepancy and only 2 patients had angular deformity. Evaluation of final outcome is done according to "scoring system for a study of case of fracture shaft femur in children treated operatively was 80% excellent, 0% were good, 16% were fair and 4% were poor. Evaluation according to Flynn Criteria were excellent in 80%, 12% were satisfactory and 8% were poor. Thus, intramedullary nailing in fracture femur in pediatric patients is effective and safe method for achieving union and movements also.

Keywords: fracture of shaft femur, intramedullary nailing, flynn criteria

1. Introduction
"Fracture of the shaft of femur" is a relatively frequent injury in children which occurs as a result of major injury, since normal femoral shaft can be broken only by a tremendous force. The controversy about treating these patients persists because most children with fractures of the femur have a satisfactory outcome with any reasonable form of treatment. In children healing is rapid and nonunion is almost non existent. The remodelling of bone that occurs in young children assists in realignment, and perfect anatomical reduction is less important than in an adult. Trying to resolve the controversy and to add our little contribution to the already existing knowledge, we are presenting this prospective study of 25 femoral shaft fracture in paediatric age group 6 to 12 years treated by intramedullary nailing, so that some progress can be made in nearing to a consensus.

2. Material and Methods
All 25 patients in the present series were admitted at Government Hospital and were treated as indoor patients. After admission the patients were examined thoroughly for the vital signs, head injury, thoraco-abdominal injury and other associated injury, as per the proforma, the distal neurovascular status was checked. The affected extremity was immobilized by skin traction / posterior plaster slab, the limb was put on bohler's splint or on the pillows and appropriate traction was applied. Posterior plaster slab was applied in children who were very small. Out of 25 patients 23 were operated on the same day of admission and all of the patients were operated within 2 days of admission. Patients with fractures of (mid-80%) diaphysis of femur were posted for intramedullary nailing.
After giving spinal anesthesia / general anesthesia patient was shifted to fracture table in supine position, traction was given to both limbs and normal limb placed in abduction for IITV placement. A.K. slab / Brace is given from immediate post-operative period, Quadriceps strengthening is begunon second / third day. At the time of discharge patients were given slab or brace, taught quadriceps strengthening exercise and knee bending. All the patients were kept non weight bearing at the time of discharge.



Patients were advised to come for subsequent follow up visits at 10th post-operative day (for stitch removal), at 6 weeks, 3 months and 6 months. Protected weight bearing was done after appearance of callus formation on X-ray. No specific physiotherapy programme was employed for knee mobilization. We have also utilized the "Flynn Criteria" to study the outcome of paediatric femur fracture which takes into consideration (i) Limb length discrepancy (ii) Malalignment in AP and lateral X-rays (iii) Pain and (iv) Complications.

3. Results and Discussion

The present study is a prospective study of 25 cases of "Outcome of paediatric shaft femur (6 to 12 years) treated with intramedullary nailing. Average age was 8.28 years and average range is 6 to 12 years. Average sex incidence was 80% for males and 20% for females. The involvement of the side of the fractured femur in the present series was 60% for right and 40% for left. The site of fracture in the present series is 24% in upper 3rd, 60% in middle 3rd and 16% in lower third. The type of fracture in the present series is 52% in transeverse, 32% in oblique, 16% in spiral and 0% was comminuted. Nature of fracture in present series was 92% closed and 8% were open. . Fracture of shaft femur is usually a single entity and associated injuries are not common Average duration for union which was determined clinically and radiologically in present study was 6.84 weeks and average was 5-10 weeks. All the patients in present study achieved solid union. Union is not a problem in pediatric femur fracture. Out of 25 patients included in this study, total 21 patients had achieved full range of motion of knee (15 patients with nails in situ and 6 patients required nail removal following which they also achieved full range of motion). For the rest of 4 patients nail removal was done for impingement but did not have adequate follow up to study knee range of movement. Joint stiffness is usually not a problem with elastic nailing and if present it resolves most of the times by removal of long protruding nails. Average duration to achieve full range of motion of knee was 9.3 weeks and range was 5-22 weeks. Incidence of significant limb shortening (>10 mm) in present study was in 4% of patients and average shortening was 12 mm which was might be due to damage to growth plate. Incidence of significant limb lengthening (>10 mm) in present study was seen in 4% of patients and average lengthening was 12 mm which was might be due to increased blood supply after fracture. Incidence of Anterior angulation was seen in only 1 patient and posterior angulation was seen in none of patients. Varus angulation was seen in nne of patients and valgus angu;ation was seen in only 1 patient. . Fracture shaft femur in children when fixed with intramedullary nails has minimal chances of developing angular deformities, they can occur in comminuted fractures, in obese patients and in premature weight bearers. Angular deformities in children tend to correct with age and deformities which are close to growth plate have more potential for correction with age. Average duration to resume daily routine activity (sitting crossed leg, squatting, standind, running, climbing stairs was 6.8 weeks.

Evaluation of final outcome is done according to "scoring system for a study of case of fracture shaft femur in children treated operatively". Patients are evaluated objectively using this system and result was 80% excellent, 0% were good, 16% were fair and 4% were poor. Evaluation according to Flynn Criteria were excellent in 80%, 12% were satisfactory and 8% were poor. Relation between fracture morphology and

outcome according to Flynn Criteria in (A) Transeverse fracture were 76.92% excellent, 23.08% satisfactory and 0% poor, (B) Spiral fracture were 75% excellent, 0% satisfactory and 25% poor, (C) Oblique fracture were 87.5% excellent, 0% satisfactory and 12.5% poor. Relation between fracture level and outcome according to Flynn criteria were (A) Upper 3rd:83.33% excellent, 0% satisfactory,16.67% poor, (B)Middle 3rd:87.5% excellent, 6.25% satisfactory and 6.25% poor, (C) Lower 3rd: 75% excellent, 25% satisfactory, 0% poor. Relation between nail material and outcome were (A) with Stainless steel enders nail: 83.33% excellent, 5.56% satisfactory, 11.11% poor, (B) with Titaneum enders nail: 7.42% excellent, 28.57% satisfactory and 0% poor. In present study, 6 patients had knee stiffness, 1 patient had superficial infection and nail exposure, 1 patient had intra-operative nail perforation and seconday procedures were required in 10 patients. None of patients in our study had deep infection, osteomyelitis or delayed union/non-union. Nail removal was done in 7 patients, for knee impingement. Debridement and nail removal was done in 3 patients with infection.

4. Summary and Conclusion

The present series includes study of outcome of pediatric shaft femur fracture treated by intramedullary nailing. Fracture shaft femur is more common in boys as compared with girls, average age in present study was 8.28 years. Fall from height is the commonest mode of injury followed by vehicular accident. The most common fracture morphology is transverse followed by oblique and most common level of fracture is middle third. The incidence of compound injury was 8 % in present study and both were Gustillo Anderson grade 1 injuries. Fracture shaft femur in children is usually closed injury. All the fractures were displaced fractures and all were operated by intramedullary nailing procedure. All fractures united well and delayed union or non union did not occur in any of the patients. Union is not a problem in paediatric femur fractures. Significant limb length discrepancy and angular deformities usually does not occur in fractures fixed with intramedullary nails. Complications of intramedullary nailing were (a) nail impingement causing knee stiffness which resolves after nail removal, no specific physiotherapy programme is required, (b) superficial infection and nail tip exposure which can be treated by debridement and antibiotics and usually resolves completely. Growth disturbance was not observed in any patient. No conclusion can be made regarding nail material versus outcome. 80% of patients achieved excellent results, 12% satisfactory and 8% poor results according to Flynn criteria. Thus, intramedullary nailing is effective and safe method to treat paediatric shaft femur fracture in age group of 6 to 12 years.

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