



Outcome and Comparison of Conservative, Ten Nail And Enders Nail Fixation in Management of Shaft of Lower Limb Bones Fracures in Children Of 5- 14 Years Age

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ABSTRACT

AIM: 1.To evaluate the long term results of internal fixation of paediatric femoral shaft fractures and tibial shaft fractures with flexible intramedullary nailing. 2. To compare the results of flexible nail internal fixation with conservative management (closed reduction and spica cast /Long leg cast)..

MATERIALS AND METHODS: 250 patients including 193 femoral shaft fractures and 57 tibial shaft fractures were operated with closed TEN nails fixation. 150 patients including 105 femoral and 45 tibial fractures were operated with enders nails. The results were compared with another group of 100 patients including 60 femoral shaft fractures and 40 tibial shaft fractures treated with conservative method of closed reduction and casting. All patients were 5 to 14 years old.

RESULTS: According to Flynn criteria, Group I -TEN nail fixation: Excellent results = 163 cases (65.2%) Satisfactory results = 87 cases (34.8%) Poor result = 0 Group II Enders nail fixation : Excellent results = 100 cases (66.6%) Satisfactory results = 50 cases (33.4%) Poor result = 0. Group III Conservative method: Excellent results = 60 patients (60%) Satisfactory results = 36 patients (36%) Poor result = 4 patients (4%).

CONCLUSION: To correct angulation in diaphyseal fractures in childhood, intramedullary nailing with flexible nails is an easy and safe method. avoiding the prolonged immobilization and complications of traction and spica casting

KEYWORDS

flexible intramedullary nailing, TEN nail, tibial fractures

INTRODUCTION

Fractures of femur and tibial shaft in children have been traditionally treated by immobilization in cast and surgical treatment was limited in open fractures or patients with head injury or multiple injuries¹, but with the advent of new implants and improved operative techniques, early mobilization and early discharge from hospital are now favored. More recently there has been a growing trend towards surgical treatment with widening of the indication to include isolated tibial fractures. To some extent this reflects a more interventionist attitude among orthopaedic surgeons but is also due to technical development, notably that of flexible intramedullary nailing². Operative treatment results in shorter hospitalization and early mobilization, which have psychological, social, educational and economic advantages over conservative treatment. A variety of therapeutic alternatives such as external fixator, compression plating, rigid intramedullary nailing and elastic stable intramedullary nailing are being used for femoral shaft fractures in children. The ideal device would be simple, load sharing internal splint allowing mobilization and maintenance of alignment for a few weeks until bridging callus forms. The device would also assist in rapid healing and ability to remodel without risking the physis or blood supply to femoral head. Flexible nails meets the requirement of this ideal device.^{3,4} Moreover flexible intramedullary requires less exposure than plate fixation and avoid the complication of femoral trochanter epiphysiodesis associated with rigid intramedullary devices. Flexible nail is simple, safe, minimal invasive appears to have few complications does not interface with growth and is associated with shorter hospital stay and rapid return to daily activities and school. It avoids long and uncomfortable immo-

bilization. Cosmetic damage is minimal being limited to small scars are the sites of introduction of nails.

MATERIALS AND METHODS:

This study included patients from march 2007 to December 2015 of both sex and age group 5 to 14 years old .Fracture of femoral shaft or tibial shaft fractures treated with TEN/Ender's nail and conservative method (spica or Long legcast) divided into three group as Group I GroupII & Group III respectively. All patients were followed up for minimum period of 6 months to maximum period of 3 years. Patients with osteogenesis imperfecta, congenital pseudoarthrosis of the tibia, or other skeletal dysplasias were excluded. Diaphyseal fracture of Transverse, short oblique, minimally comminuted type were included. After administering appropriate anaesthesia patient was placed supine on a radiolucent fracture table. Closed reduction done with foot traction. In Group I & II two nails were used one from medial and one from lateral side. Each nail diameter measured 40% of the narrowest diameter of diaphysis according to location of fracture. Group III patients (conservative method) were applied one and one half hip spica in case of fracture of femoral shaft and long leg cast in tibial shaft fracture under general anaesthesia after closed reduction under fluoroscopy. Hip spica applied with the hips at 20° to 30° of flexion and the limb in neutral rotation. Long leg cast applied with knee in 10-15° of flexion and ankle in neutral position. Cast continued until union. Full weight bearing was started 1 to 2 weeks following cast removal. Postoperative data collected was postoperative immobilization, period of hospital stay, period of radiological union , return to normal work, any complication , time to nail children removal. Radi-

ographs were evaluated for alignment, nail size, nail shape (C or S), callus formation, nail position, and measurement of fracture location . All cases were assessed by Flynn criteria (Table 1). To be judged an excellent result, the case had to meet all criteria.

RESULTS & DISCUSSION:

The present study consists of 250 cases in Group I and 150 case in Group II who were treated with flexible intramedullary nailing (TENS/Ender's nail) (fig 1,2 and 3) and and 100 case in Group III who were treated in hip spica cast (early or after a period of traction) in cases of fracture of femoral shaft and long leg cast in cases of tibial shaft fractures.. The average age in Group I was 7.25 years, in Group II 11.25 years and 7 years in Group III. Femoral shaft fractures were 2.5 times more common in males than in females and tibial shaft fracture were 5 time more common in males than in females. In our series the most common site of fracture shaft femur was middle third (62%) followed by distal third (23.75%) and upper third (14.25%). Most of the tibial shaft fractures occurred at middle third (67%) and lower third (28.33%) followed by upper third (4.67%). The most common pattern of fracture was transverse fracture (67.25%) followed by oblique fractures (30.75%). The percentage of comminuted fracture in this series was 14%. The average duration of surgery was 42min. It was lesser than the study conducted by Mann et al⁵ (94 min.) and Bar-On et al.¹ (74 min). The average hospitalization time noted in Group I & Group II in this series was 7.95 days and 9.20 days respectively (9.4 days, Fabiano et al⁶). The Group III had a shorter duration of hospital stay of 5.89 days with most of them (78.67%) got discharged within the first week of admission. Newton and Mubarak⁷ reported a minimum hospitalization period for skin traction of 20.6 days prior to cast placement and for skeletal traction of 20.8 days and for early cast placement of 2.5 days. Our study results are almost similar to S. Saseender et al⁸, who reported that the duration of hospital stay was higher in flexible nailing group (range 12-41 days, mean 21.4 days) than the spica group (range 5-36 days, mean 11.62 days). The average time for true weight bearing in Group I was 6.9 weeks, in Group II 7.5 weeks and in Group III it was 10.5 weeks which is very significant. The average was 19 months with minimum of 6 months and maximum of 4 years. In the present series callus was first noted on follow up radiographs at an average of 4 weeks in both Group I, II and III. The average time of union was 6 weeks in Group I and 6.5 weeks in group II. In the study conducted by Fabiano et al⁶, the average time of union was 7.7 weeks. In the study conducted by Cramer et al⁹. all fractures were healed within 12 weeks. The average time of union in Group II was 8.2 weeks. The shortest mean time to union in cases of tibial fractures was 7 weeks reported by Kubaik et al¹⁰, and the longest was 20.7 weeks reported by Srivastava et al¹¹. As in Flynn^{3,4}, Mann⁵, Cramer⁹ and other studies, in our study too there was no case of delayed union and non-union. In our study patient achieved full range of knee movement at average of 7.76 weeks in Group I and 8.15 weeks in Group III. And in Group III patient achieved at average of 11.28 weeks.

In Group I lengthening was seen in 62(24.8%) patients with an average lengthening of 2.5 mm In Group II lengthening was seen in 35(23.33%) patients with an average lengthening of 2 mm .In Group III lengthening of up to 1 cm was seen in 7 patients (7 %) but shortening was more significantly found up to 3 cm in 3 patients (3%) and 2cm in 12 patients (12%) up to 1 cm in 33 patients (33%). No patient in flexible nail group developed shortening. Ligier et al¹² found average lengthening of 1.2 mm while Cramer et al⁹. found the average lengthening of 7 mm. Angulation was seen in 63 (25.2%) patients in Group I and 30(20%) in Group II as compared to 64 patients (64%) in Group III. 6 patients of Group III were found to have external rotation deformity of 10°. No such deformities found in Group I and Group II. No patient had angulation more than 10°. Angulations of > 5° was seen in the study conducted by Ligier et al¹²., in 22.4%. In Mann et al⁵ in 31% cases. Skin irritation at the entry portal due to prominent nail was noted in 38 cases (15%) in Group I and 27 cases(18%) in Group II. In

two cases it resulted in skin ulceration. Comparable result was seen in the study conducted by Flynn et al^{3,4} who noted this complication in 6.8% of cases. 6 and 2 patients in group I & II were found to have infection at the entry portal of the nails, which subsided by 4 weeks after antibiotic therapy. Ligier et al¹² noted such infection in one case (0.8%). No such complications were seen in Group III. All cases were assessed by Flynn criteria (fig 4). We noted excellent results in 163 cases (62.2%) and satisfactory results in 87 cases (37.8%). No patient showed poor result in Group I. Excellent results in 100 cases (66.6%) and satisfactory results in 50 cases (33.4%). In Group III excellent results found in 60 patients (60%). Satisfactory results in 36 patients (36%) and poor result in 4 patients (4%). In the study conducted by Galvankar reported 15 excellent (71%), 5 satisfactory (24%) and 1 poor result (5%). In none of the other studies, results were evaluated using this criterion. Heinrich et al¹⁷ reported excellent results in all 78 cases treated with Enders nails without any significant complications. Bar-On et al¹ also reported excellent results with flexible nails and reports that the results were better than those with external fixators. Kissel et al¹⁸ reported results of Enders nailing to be superior to the conventional methods of treatment..



Table 1

Criteria for evaluation of result (Flynn et al., 2001)			
Parameter	excellent	Satisfactory	Poor
Limb length inequality	0 -1cm	1 - 2cms	> 2cms
<u>Malignment</u>	< 5°	5 - 10°	> 10°
Pain	None	None	Present
Complications	None	minor and resolved	major complication
			And
			Morbidity

SUMMARY AND CONCLUSION

Finally, we conclude that flexible nailing is an ideal device to treat pediatric femoral shaft and tibial shaft fractures. The study attempts to assess the long term outcome of the treat-

ment methods. In conclusion, the present study supports the treatment of femoral and tibial shaft fractures in children aged 5–9 years with TEN nails, age 9 to 14 years with ENDERS nails are superior to conservative treatment as it avoids long and uncomfortable immobilization hastens fracture union, reduces the rate of malunion and amount of shortening, and allows earlier rehabilitation and return to school.

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