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FUNCTIONAL RESULTS OF ELASTIC NAIL FIXATION ON THE SHAFT OF FEMUR FRACTURE IN CHILDREN AGES 05 TO 12

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Abstract

Introduction: One of the most prevalent conditions affecting youngsters is femur fractures. There isn't much consensus regarding the preferred therapy for children aged 6 to 16. Over the past 20 years, the treatment of pediatric femur fractures has gradually shifted to a more surgical approach. This is due to the fact that healthcare standards call for more quick mobilization, an early release, and a return to regular family activities. Compared to conservative treatment, operative treatment provides advantages in the areas of psychology, social work, education, and economics since it leads to shorter hospital stays and early mobilization.

Aims & Objectives: The purpose of this study is to ascertain the frequency of a functional result using Flynn's criteria in pediatric patients who present to a tertiary care hospital between the ages of 5 and 12 for the stabilization of a femur fracture using elastic nails. Place and Duration of Study: From January 01, 2023, to December 31, 2023, we performed a "Descriptive case series" in the Orthopedic Surgery unit of Gujranwala teaching hospital Gujranwala.

Materials and Methods: Following informed permission, sixty patients who met the eligibility requirements and were between the ages of five and ten were included in the study through the orthopedic surgery department of Services Hospital in Lahore. Under general anesthesia, a lone surgical team assisted by the researcher operated on these individuals to repair femur fractures. The kids were checked on every one, two, three, and six months. Following a 6-month period, patients underwent evaluation in accordance with Flynn's criteria for nailing femur fracture outcomes. Three categories of outcomes were identified: excellent, satisfactory, and bad. Every piece of data was documented using proforma. With SPSS version, data was input and examined. The P-value of ¦0.05 was considered significant for 25.

Results: Of the 50 patients, 32% (n=16) belonged to the 5-8 year age group, and 68% (n=34) to the 8–10 year age group. The mean age of the patients was 8.17±1.01 years. There were 64% (n=22) females and 36% (n=18) males. Of the 50 patients, 18 had been in a car accident,26) had experienced a fall, and 6 had sustained an injury from another source. In 80% of cases (n=40), the functional outcome frequency met Flynn's criterion for excellence.

Conclusion :Applying Flynn's criteria for functional outcome, we came to the conclusion that elastic nail is a reasonably easy therapy for femur shaft fractures in children who were duly selected. It may also be compared to other treatment techniques.

INTRODUCTION

Children's lower extremity fractures that occur more frequently are femoral shaft fractures1. 1.6% of all fractures in children are femur fractures in pediatrics. Male to female ratios of 2:6:1 characterize the bimodal distribution of femoral fracture rates. There is the initial peak in early childhood and the second peak in late adolescence2. A titanium elastic nail (TENs), often referred to as elastic intramedullary nailing, is an additional treatment option for some pediatric long bone fractures. For children over the age of six, titanium nails are preferred over plaster cast and stainless steel nails3,4. For the treatment of teenage femur-shaft fractures, there are several options. The pillars of peritonitis have always been examination, treatment of the underlying cause, and thorough surgical peritoneal lavage. For a variety of reasons, elastic stable intramedullary nailing has become the standard therapy for fractures of diaphysis of the femur in children. According to Govindasamy et al., 83% of children who presented with a femoral shaft fracture6 and 81.25% of children who presented with a femoral shaft fracture7 could achieve outstanding results when using elastic nails (n=48). However, Kawalkar and Badole also noted that in 54.5% of children who presented with a femoral shaft fracture8, great results could be attained using elastic nails (n=11). The purpose of this study is to evaluate the functional result of using an elastic nail to treat a femur shaft fracture in children aged five to ten. It has been noted in the literature that elastic nails have a success rate of more than 80% for treating femur fractures. However, other research have found contradictory success rates. Furthermore, earlier research used a tiny sample size. Another study in this area was done previously, however it only included 16 participants, thus the findings cannot be trusted. Therefore, a study assessing the effectiveness of elastic nails (TENs) for femoral shaft fractures in the pediatric population in our area is desperately needed. Therefore, our goal was to ascertain the frequency of excellent functional result following femur shaft fracture repair with elastic nail in children who report to a tertiary care hospital between the ages of 5 and 12.

MATERIAL AND METHODS

Study Design: Series of descriptive cases.

Location of study: Gujranwala Teaching Hospital's Department of Orthopedic Surgery. Study duration: twelve months, starting on January 01, 2023, and ending on December 31, 2023. **Number of Samples**: With a 95% confidence level, a 14% margin of error, and the anticipated percentage of good outcome—that is, 54.5% with elastic nails in children with femur shaft fractures—the sample size (n) of 50 cases has been calculated.

Consecutive, non-probability sampling was used as the sample technique.

Inclusion criteria:

Patients between the ages of 5 and 12 who arrive with a femoral shaft fracture (according to the operational definition) meet the inclusion criteria.

Exclusion criteria:
a) Patients who require debridement or who arrive after 14 days with an infection;
b) Patients who require repeat surgery due to a previous unsuccessful surgery.
c) Patients with muscular or skeletal dystrophy, osteomalacia, or malignant bone disease (based on medical history and record.

After giving their informed consent and meeting the requirements for enrollment, sixty patients in the 5–10 age range were included to the study by the Emergency Department of Orthopedic Surgery at Services Hospital in Lahore. Then, with the help of a researcher, a lone surgical team arranged general anesthesia for the patients' fractures. The child was placed faceup on an operating table, with the afflicted leg 100 degrees adducted.
After that, in order to stabilize the fractures, elastic nails (TENs) were inserted through the femur's distal metaphyseal end. The eleventh day saw the removal of the sutures. At one, two, three, and six months, the children had check-ins. Patients were assessed using Flynn's criteria after six months, with results classified as excellent, good, or poor. Patients who showed no improvement received standard care. We utilized SPSS version 25 to examine the information. The mean ± standard deviation of several numerical parameters, including age, body weight, and length of injury, was calculated. It was established how frequently and in what proportion each factor—gender, the cause of the damage, and the major functional outcome—occurred.

RESULTS

After dividing up the patients' ages, it was found that, of the fifty, 32% (n = 16) belonged to the age group of 5-8 years, and 68% (n = 34) to the age group of 8-12 years. The mean age was computed to be 7.07±1.011 years (Table-1).
Body weight and injury length were distributed, and the results were 17 kg and 2.5 days, respectively. Following the gender distribution analysis (Fig. 1), 36.0% (n = 22) were male and 64.0% (n = 18) of the 50 patients were female. (Table-2) . Following an analysis of the frequency of causes of injury, 21.7% (n = 23) had a traffic collision, 63.3% (n = 19) had a history of falling, and 15.0% (n = 7) had other causes of injury. For both age and gender, the frequency of a functional result that met the Flynn criterion for excellent was 80% (n = 40). (Tables 2 and 3, correspondingly). Every patient kept in touch for the follow-up, and none of them left within the allotted time for follow-up.

Age group	Frequency	Percentage
5—8 years	16	32
9---12	34	68
Total	50	100

Table 1

Age group	**Excellent functional Outcome** **Yes**	**No**	Total	P-value
5—8 years	13	3	16	
	81.25%	18.75%	32%	
9---12	27	7	34	
	79.4%	20.6%	68%	
Total	40	10	50	
	80%	20%	100%	

Table-2: Using the Chi square test, stratification for functional outcome according to age (N= 50)

Age group	**Excellent functional Outcome**		Total	P-value
	Yes	**No**		
Male	14	4	18	
	77.78%	22.22%	36%	
Female	16	6	22	
	72.72%	27.27%	64%	
Total	40	10	50	
	80%	20%	100%	

Table-3: Using the Chi square test, stratification for functional outcome according to gender (N= 50)

DISCUSSION

The orthopedic community is still faced with the challenge of determining the best course of action for treating shaft of femoral fractures. Antegrade nailing is used on children who are nearing skeletal maturity. For the most part, open fractures are treated using external fixators.5, 6. Elastic stable intramedullary nailing (ESIN) was first used for femur fractures in 1979 6 by the Nancy group. Due to their excellent biocompatibility and flexibility, titanium implants are being used more and more for ESIN. This reduces the degree of irreversible nail deformity during insertion and promotes the development of callus by reducing stress. TENS functions as an inner splinting tool that maintains alignment and length, facilitating rapid mobilization and sufficient fracture site motion for the development of calluses. It also has a possible low risk of osteonecrosis, bodily traumas, and re-fracture buffering. TENS is being used more often as its advantages become apparent and its drawbacks are outweighed in comparison to alternative methods of fixation. For these types of fractures, surgical stabilization has been introduced because conservative management causes problems like malunion, joint stiffness, and delayed functional recovery in older children. It also causes extended hospitalization, which is expensive for the family and raises the hospital bed utilisation ratio 9,10.

The TENS intra-medullary nail is a durable and elastic device that utilizes the symmetric support action of two intramedullary elastic nails with an equivalent elasticity coefficient to provide three-point fixation, rotation, axial, transitional, and bending balance at the fracture site by opposing disengagement and compression loads11,12 . Out of 50 patients in the current study, 23.3% (n=14) belonged to the age group of 5-7 years, and 76.7% (n=46) to the age group of 8-10 years. The mean age of the patients was 8.17±1.011 years. The body weight distribution and injury duration were 15.13+2.189 kg and 1.783+0.825 days, respectively. 35.0% (n=21) of the 50 patients were female, and 65.0% (n=39) were male. Of the 60 patients, 21.7% (n = 13) had been in a car accident, 63.3% (n = 38) had experienced a fall, and 15.0% (n = 9) had sustained an injury from another source. 51.7% of femur fracture repair cases had an excellent functional result (n = 31). In a research by Govindasamy R. et al., all fractures were reunited without any delayed union/nonunion within 12 weeks of stabilization. Youngsters who had fractures with a transverse fracture geometry united their bones more quickly than those who did not. Compared to girls, men experienced a greater fracture reunion rate. All 31 of the fractures in Santosha and colleagues' study healed within 12 weeks, with no healing delay13. Kocher et al. discovered that in 42 patients receiving ESIN14 treatment, all fractures healed at a mean of 88 days following injury. Prior to casting, the average hospital stay was reported to be 20.6 days by Newton and Mubarak15. By using flexible nails of the titanium variety, and Hospitalization durations of 4.5 to 8 days were noted by Ligier and Heinrich 15,16,17, while Fabiano et al.revealed that the average stay in the hospital was 9.4 days18.

The majority of data suggests that TENs are effective in healing almost all femoral bone breaks (16, 17). Abbot et al. reported that whereas 30% of patients had mild issues, 17.5% of patients had major problems19. Research analyzed 234 femur fracture cases and found that TENS performed well in 65% of cases, satisfactorily in 25%, and poorly in 10%19, 20. Nishant Kumar21 reports that TENS therapy was effective in all 20 of the pediatric femur shaft fracture cases. In kids between the ages of

six and sixteen The ideal inner brace distributes weight, maintains reduction, minimizes morbidity and consequences, and is unlikely to jeopardize the blood supply or growth areas of the femoral head. Firm fixation is achieved with plating, however scarring, further blood loss during contact, and additional surgery to remove the implant are all required. Re-fracture is a possibility because this is a load-bearing device. The main advantages are their affordability and ease of accessibility in a range of diameters. The risk of infection spreading is very low because TENS, when used as a closed treatment, does not rupture the hematoma at the fracture site and we only included children in our study who had intact periosteal layers. There is minimal chance of femoral head avascular necrosis when applied retrogradely22,23, 24. Malalignment is the most common issue, per Kong et al. 23. This means that issues are rare. Cage et colleagues evaluated 79 femur fractures with titanium elastic stable intramedullary nailing over a 5-year period. Specific challenges were noted to offer advice on how to prevent these issues. There were 41 cases of pain or irritation at the site of the incision, along with radiographic malunion, re-fracture, temporary neurologic impairment, and superficial wound infection24.When it comes to deciding between conservative and surgical treatment, four years old and fifteen kilos of weight seem to be the cutoff points. Most surgeons will consider using TENs for children who weigh between fifteen and fifty kilograms.25 In our investigation, we reached 51.7% exceptional outcome26. Using Flynn's scoring technique, the functional outcome in Sinha et al.'s population study was outstanding in 75.5% of our instances, good in 17% of cases, and negative in 7.5% of situations. Ten patients had resurgeries before to unification25.

CONCLUSION

Applying Flynn's criteria for functional outcome, we concluded that elastic nail is a reasonably straightforward therapy for fractures of diaphysis of the femur in children who were properly chosen. It may also be compared with other treatment techniques.

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