

COMPARISON OF FUNCTIONAL OUTCOME BETWEEN TITANIUM ELASTIC NAILING AND HIP SPICA CAST IN TREATMENT OF FEMORAL SHAFT FRACTURES IN CHILDREN

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ABSTRACT

Background: The femur, also known as the thigh bone, holds several notable distinctions within the human body. It is the longest bone, exhibiting considerable strength and durability. Ongoing debate exists regarding the optimal management approach for femoral shaft fractures in children.

Objectives: To compare the frequency of functional outcome between titanium elastic nailing versus hip spica cast in treatment of femoral shaft fractures in children.

Methods: This randomized control trial was conducted at Sahiwal Teaching Hospital Sahiwal. Total 140(70 in each group) patients were enrolled after fulfilling the predetermined selection criteria. Patients were randomly assigned to two separate groups. Group A patients were managed with Titanium elastic nail (TEN) method and group B patients were managed with hip spica cast method. After 3rd month, functional outcome was noted in both groups.

Results: The mean age of the patients was 5.92±2.03 years, 65% patients were male. After 3rd month, in TEN group excellent outcome was seen in 59(84.3%) patients and in Spica Cast group it was seen in 7(10%) patients (p-value=<0.05).

Conclusion: This study concluded that titanium elastic nailing offers higher percentage of excellent functional outcomes compared to hip spica cast in treatment of femoral shaft fractures in children

Keywords: Femoral Shaft Fractures, Hip Spica Cast, Titanium Elastic Nailing, Functional Outcome

How to cite this article: Khan KR, Rasool A, Umair M, Rashid M, Lodhi TA, Iqbal S. Comparison of Functional Outcome between Titanium Elastic Nailing and Hip Spica Cast in Treatment of Femoral Shaft Fractures in Children. Pak Postgrad Med J 2023;34(3):131-134

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DOI: <https://doi.org/10.51642/ppmj.v34i03.622>

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INTRODUCTION

Femoral shaft fractures (FSF) in children refer to fractures that occur in the long bone of the thigh, called the femur, in pediatric patients. The occurrence of this fracture in children is estimated to range from 10 to 20 fractures per 100,000 children annually, varying according to the specific region.¹⁻³ It exhibit a bimodal distribution, with two distinct

peaks in different age groups. The first peak typically occurs in children aged 1-3 years, often resulting from low energy incidents. The second peak appears during early adolescence, involving high-energy incidents, and constitutes the majority of these fractures.⁴

These fractures can result from various causes, including trauma, falls, sports injuries, or underlying medical conditions that weaken the bones.⁵ Overall, FSFs in children are typically manageable with proper medical care, and most children recover well with minimal long-term complications.⁶

Treatment for FSFs in children depends on the severity of the fracture. Although many treatment options available, but there is still ongoing debate regarding the optimal method for a given situation.⁶ Prompt and appropriate management of pediatric FSF is crucial to achieve proper alignment, promote healing, and minimize complications. Regular follow-up visits and rehabilitation are important for monitoring the progress of healing, assessing functional outcomes, and facilitating the child's return to normal activities. In last two decades, a growing preference for the operative approach to FSF due to several factors.⁷ The use of a hip spica cast is one of the treatment options for such fractures in children. A hip spica cast is a specialized cast that extends from the chest or abdomen down to the thigh and includes the hip joint.⁸ Titanium elastic nail (TEN) is another surgical technique commonly used. TEN has gained popularity due to its minimally invasive nature, shorter operative times, and potentially faster recovery compared to traditional methods like traction or casting.⁸

There is a lack of available literature from our specific geographic region, highlighting the need for this study to contribute to the generation of evidence-based medicine within our population. With advancements in surgical techniques, implants, and rehabilitation protocols, the overall prognosis for children with FSF has significantly improved. Early recognition, appropriate management, and comprehensive multidisciplinary care contribute to successful outcomes, allowing children to regain their mobility, resume their daily activities, and return to an active and healthy lifestyle. So, the objective of this study was to compare the frequency of excellent functional outcome between titanium elastic nailing versus hip spica cast in treatment of femoral shaft fractures in children.

METHODS

This randomized controlled trial was conducted at Sahiwal Teaching Hospital Sahiwal between July 30th, 2021 and December 29th, 2021. The children having age between 5-15 years, and of either sex presented with closed fracture were included in this study. Patients having previously diagnosed neuromuscular disease, pathologic fractures, metabolic bone disorders and fractures involving the femoral condyles were not eligible for selection criteria. After taking permission of ethical review board from hospital total 140 cases (70 in each group) were enrolled. Written informed consent and demographic detail from parents was taken. After that patients were randomly divided into two groups by using random number table. In group A, patients were managed with TEN technique and in group B, patients were managed with hip spica method. Patients who were assigned to the TEN group, underwent a modified version of the standard technique. The surgical procedure was performed under general or spinal anesthesia and conducted on a radiolucent table. In Group B, the child was positioned in the supine position on a Spica cast table, and closed reduction of the fracture was accomplished under fluoroscopic guidance. Regular follow-up appointments were scheduled for all patients after the operation, and the functional outcome was assessed and recorded at the conclusion of the three-month period. The evaluation of the functional outcome was conducted using the Flynn criteria. The loss of carrying angle between 0°-5° was labeled as excellent functional outcome as per Flynn criteria.

RESULTS

In this study total 140 patients with femoral fracture were enrolled. The mean age, BMI and duration since fracture of the patients was 5.92±2.03 years, 25.60±3.53 kg/m² and 3.65±2.02 days respectively (Table 1). In TEN group the mean age of the patients was 5.91±1.90 while in Spica Cast group its mean value was 5.93±2.16 years (p-value=0.967).

Table 1: Demographic characteristics of the patients

Demographic Characteristics	
Age (Years)	5.92±2.03
BMI (Kg/m ²)	25.60±3.53
Duration since fracture 3.65±2.02	
Gender	n(%)
Male	91 (65.0%)
Female	49 (35.0%)

Table 2: Comparison of demographic characteristics of the patients between study groups

Baseline Characteristics	TEN Group	Spica Cast Group (n=70)	P-value
Age (Years)	25.70±3.37	5.93±2.16	0.967
BMI (Kg/m ²)	3.60±2.11	25.50±3.70	0.743
Duration since injury (days)	n (%)	3.70±1.94	0.771
Male	46 (65.7%)	45 (64.3%)	0.859
Female	24 (34.3%)	25 (35.7%)	

In TEN group the mean BMI of the patients was 25.70±3.37 kg/m² while in Spica Cast group its mean value was 25.50±3.70 kg/m² (p-value=0.743). In TEN group 65.7% patients were male and in Spica Cast group 64.3% were male (p-value=0.859) (Table 2). In this study the overall excellent function outcome was noted in 66(47.14%) patients (Fig 1). After 3rd month, in TEN group excellent functional outcome was seen in 59(84.3%) patients and in Spica Cast group it was seen in 7(10%) patients. TEN group showed significant higher rate of excellent outcome as compared to Spica Cast group. i.e. p-value=<0.05) (Table 3).

Table 3: Comparison of excellent functional outcome of the patients between study groups

Outcome	Excellent Functional Outcome			P- value
	TEN Group (n=70)	Spica Cast Group (n=70)	Spica Cast Group (n=140)	
Yes	59(84.3%)	7(10%)	66(47.14%)	
No	11(15.7%)	63(90.0%)	74(52.85%)	<0.001*
Total	70(100%)	70(100%)	140(100%)	

*=*Significant* NS=*Not significant*

DISCUSSION

Fractures occurring in the femoral shaft are among the frequently encountered injuries addressed by orthopedic surgeons. These fractures commonly coincide with polytrauma situations and have the potential to be life-threatening. Overall, the management options for FSF in children require a multidisciplinary approach involving orthopedic surgeons, pediatricians, anesthesiologists, and other healthcare professionals to provide optimal care and achieve the best possible outcomes for the child. The findings of the study provide valuable insights into the effectiveness of these treatment approaches and guide clinical decision-making for optimal management of FSF in children.⁹

In the present study, the mean age of the children with femoral shaft fracture was 5.92±2.03 years. Saeed et al.¹⁰ (2019) at Allied and DHQ Hospital Faisalabad

reported that the children presenting with FSF had a comparable mean age of 5.7±2.8 years. Whereas Shah et al.¹¹ (2013) found that among children presenting with FSF at Mardan Medical Complex Teaching Hospital Mardan, the mean age was reported to be 3.9±1.8 years. Amin et al.¹² (2018) and Assaghir et al.¹³ (2012) both reported a comparable mean age of 4.7±1.8 years and 4.5±1.5 years, respectively. In our study we observed male predominance among children with femoral diaphyseal fractures with male to female ratio of 1.9:1. Our findings align with several other local studies that have reported a similar male predominance among children with femoral shaft fractures. Hayat et al.¹⁴ in 2017 (2:1), Naseem et al.¹⁵ in 2015 (2.1:1), and Shah et al.¹¹ in 2013 (1.8:1) have also observed a comparable trend. In Chinese children with femoral shaft fractures, Wang et al.¹⁶ (2019) documented male predominance.

In our observations, we found a significantly higher frequency of excellent functional outcomes in children treated with titanium elastic nail compared to those treated with a hip spica cast (84.3% vs. 10.0%; p-value < 0.001). Similar to our study findings Hwaizi et al.¹⁷ (2018) conducted a study in Iraq that demonstrated a comparable higher frequency of excellent functional outcomes when utilizing titanium elastic nail instead of a hip spica cast for children with FSF (55.0% vs. 11.0%; p-value < 0.001). Our findings align with those of Shemshaki et al.¹⁸ (2011) who reported a significantly higher frequency of excellent functional outcomes with titanium elastic nail compared to a hip spica cast in Iranian children with femoral diaphyseal fractures (52.1% vs. 8.6%; p-value = 0.01). In an Indian study conducted by Saseendar et al.¹⁹ (2010), a similar superiority of titanium elastic nail over a hip spica cast was observed. The study reported a significantly higher frequency of excellent functional outcomes in children treated with titanium elastic nail compared to those treated with a hip spica cast (75.0% vs. 6.2%; p-value < 0.001).

Studies have consistently reported higher rates of excellent functional outcomes, including improved healing, mobility, and overall recovery, in children treated with titanium elastic nails. These findings highlight the advantages of internal stabilization with titanium elastic nails over external stabilization with a hip spica cast in achieving optimal functional outcomes for children with femoral shaft fractures. However, individual patient factors, fracture characteristics, and surgeon expertise should be considered when determining the most appropriate treatment approach.

CONCLUSION

The comparison of functional outcomes between titanium elastic nailing and hip spica cast in the treatment of femoral shaft fractures in children reveals notable differences. The available evidence suggests that titanium elastic nailing offers higher percentage of excellent functional outcomes compared to hip spica cast in treatment of femoral shaft fractures.

Conflict of Interest: Authors declare no conflict of interest.

Funding Source: None

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