



**Comparing Mean time to walk in Children having shaft  
of femur Fracture Treated with Titanium Elastic Nail  
Versus Hip Spica Cast**

Usama Ali Nawazish \*

**Corresponding Author: Usama Ali Nawazish,**

**Copy Right:** © 2023, Usama Ali Nawazish, This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Received Date: May 23, 2023**

**Published Date: June 01, 2023**

**Abstract**

**Objective:** To compare the mean time to walk in children having shaft of femur fracture treated with titanium elastic nail versus hip spica cast.

**Study Design:** Randomized controlled study

**Place and Duration of Study:** Department of Orthopedic and Spine Surgery, Ghurki Trust Teaching Hospital, Lahore from April 2021 to Nov 2021

**Material& Method:** 60 children of either gender, aged between 3-6 years presenting with femoral shaft fractures (Winquist I & II), who were randomly distributed in 2 treatment groups. Patients from Group E were treated with titanium elastic nail while a hip spica cast was applied in patients in Group S. The outcome variable was the mean time to walk independently, which was noted and compared among the groups.

**Results:** Patients had a mean age of  $4.42\pm 1.12$  years, while the mean weight was  $18.23\pm 2.09$  Kg. 39 (65.0%) of patients were male and 21 (35.0%) patients were female in study group. Male to female ratio was 1.9:1. The mean time to walk independently was significantly shorter in children had a treatment via titanium elastic nail vs hip spica cast ( $5.60\pm 1.28$  vs.  $8.93\pm 1.98$  weeks;  $p$ -value $<0.001$ ). A similar significant difference was noted between the groups among various subgroups of patients based on weight, age, and sex.

**Conclusion:** Internal fixation of pediatric shaft of femur fractures utilizing titanium elastic nail was superior to the conventional practice of hip spica cast in terms of significantly shorter mean time to walk independently which along with the minimally invasive nature of the procedure and better patient hygiene and cosmesis advocate the titanium elastic nailing for the management of such cases in orthopedic practice.

**Key words:** Children, Femoral Shaft Fracture, Titanium Elastic Nail, Hip Spica Cast

## Introduction

Childhood injuries are an important preventable cause of mortality and morbidity, which leads to approximately 2 million emergency department visits per year and 120 000 hospital admissions per year in pediatric and young adults aged between 1-14 years in the UK [1,2]. Shaft of femur fractures are usually a result of trauma. These are one of the most common injuries managed by orthopedic surgeons in ER. Approximately 70% of femur fractures are of Shaft.[3].

There are many treatment modalities for femur shaft fracture, which depends on the type and mechanism of injury to personal experience and choice of surgeon. These methods include hip spica cast, skin traction, external fixator, plating, and intramedullary nailing [4]. There is no consensus regarding the best treatment option for pediatric femoral shaft fracture. Each carries its advantages and disadvantages, and there are very few studies available that can determine the effects, of surgical and non-surgical treatment, in long term. [5].

Khan et al. in 2018 conducted a study and found that the mean time to bear weight in patients with shaft of femur fracture treated with titanium elastic nail vs. hip spica was  $6.78 \pm 1.14$  weeks vs.  $9.87 \pm 1.56$  weeks respectively;  $p < 0.001$  [6]. Shah et al. conducted a similar study in 2015 and found that to be  $8.77 \pm 1.88$  weeks in the spica cast group vs.  $11.99 \pm 2.30$  weeks in the titanium elastic nail group,  $p = 0.403$  [7]. There is a conflict in the mean time to heal and weight-bearing among the children with femoral shaft fracture treat by the two techniques ( $6.78 \pm 1.14$  elastic nailing vs.  $9.87 \pm 1.56$  spica cast weeks respectively;  $p < 0.001$  [6],  $8.77 \pm 1.88$  weeks in spica cast group vs.  $11.99 \pm 2.30$  weeks in titanium elastic nail group;  $p = 0.403$  [7]). As both the studies are performed in Pakistan, and there is a conflict in the outcome of the studies, there is a need to conduct this study in the local population so that the conflict can be resolved and the better treatment option could be opted which can provide early healing and weight-bearing to the children suffering from femur shaft fracture. The purpose of this study was to compare the mean time to walk in children having shaft of femur fracture treated with titanium elastic nail versus hip spica cast.

## Materials and Methods

This randomized controlled study was done at the Department of Orthopedic and Spine Surgery, Ghurki Trust Teaching Hospital Lahore, from April 2021 to Nov 2021. Approval from the Hospital Ethical Committee was taken before conducting the study. Total patients of femoral shaft fractures enrolled were 60 (30 in each group). Children with age between 3-6 years having femur shaft fracture (Winqvist types I and II) and presenting within 24 hours of injury were included in this study, informed

Citation: Usama Ali Nawazish "Comparing Mean time to walk in Children having shaft of femur Fracture Treated with Titanium Elastic Nail Versus Hip Spica Cast" MAR Orthopedics, Volume 5 Issue 2

[www.medicalandresearch.com](http://www.medicalandresearch.com) (pg. 3)

consent was taken from guardians while Exclusion Criteria was patients with bleeding disorder  $INR \geq 1.5$  as per clinical record of preoperative evaluation, patients with Winquist types 3 and 4 per clinical examination, patients with neuromuscular disorder or metabolic bone disease as per clinical record and Patients with other associated injuries like femur condylar fracture or tibial plateau fracture on x-ray. After approval from the ethical review committee of the hospital, 60 patients (30 patients in each group) who presented in the emergency department of Orthopaedic and Spine surgery, Ghurki Trust Teaching Hospital Lahore fulfilled the above criteria were included.

Informed consent and history were taken from the parents of patient. These patients were randomly divided into two groups. All the surgeries were performed under general anesthesia by experienced Orthopedic surgeon, and according to weight iv antibiotic(ceftriaxone) was given 30 minutes before incision after testing for sensitivity. Under aseptic measure (patients in group-E), a linear stab was given, fascia was opened, and the muscle fibers were moved aside, a opening was made in the cortex of bone and enlarged. Then retrograde titanium elastic nail was inserted through the distal part of the femur. Each nail was approximately 40% of diameter of canal at the narrowest site of the shaft of femur. Reduction and fixation were made under the image intensifier. All the patients were discharged after 48 hours of surgery and were called for regular follow-up.

Patients in S group were given traction on a spica table under General Anesthesia; the reduction was checked under image intensifier and then one and a half hip spica cast was applied. The cast lasted upto next 6-8 weeks. The mean time to walk was assessed. Patients were followed up two weeks after surgery for next 12 weeks to assess the mean time to walk independently. All the data was noted and recorded along with the demographic details of the patient. Same team performed all the procedures. All the collected data was entered and analyzed through SPSS version 22. Independent sample t-test was applied to compare mean post-operative duration taken to stand independently between the two groups taking  $p\text{-value} \leq 0.05$  as significant. Data has been stratified for age, gender, and body weight. The post-stratification t-test has been applied to take  $p\text{-value} \leq 0.05$  as significant.

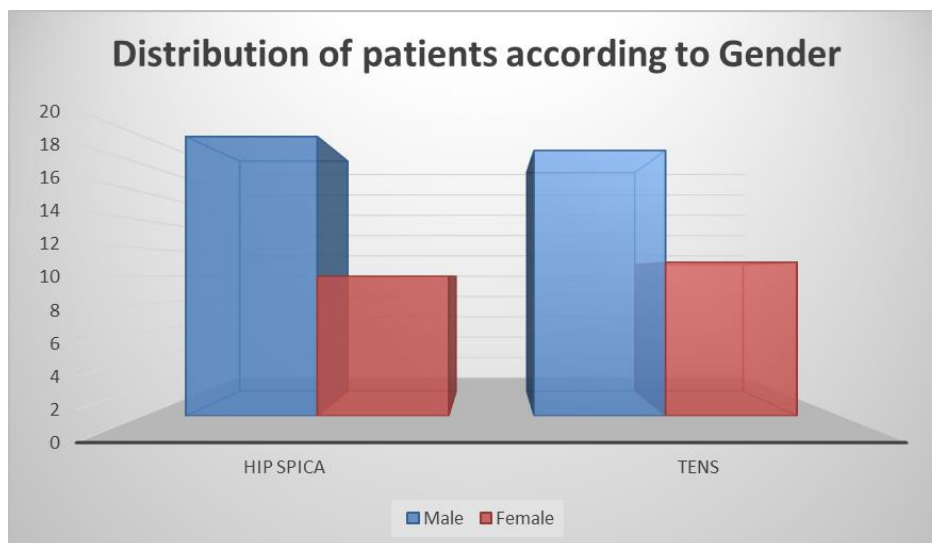
## **Results**

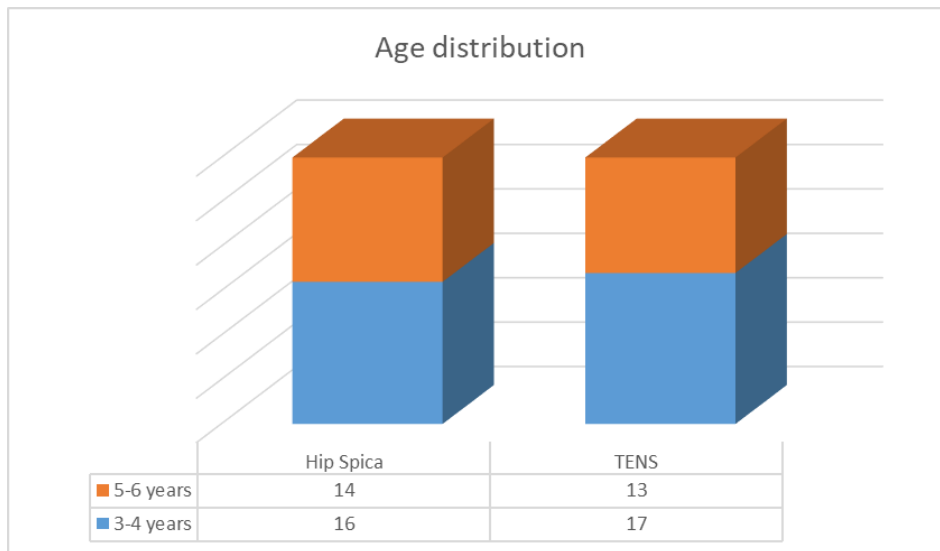
Age of the patients was between 3-6 years with a mean of  $4.42 \pm 1.12$  years, while the weight ranged from 14 Kg to 24 Kg with a mean of  $18.23 \pm 2.09$  Kg. 39 (65.0%) of patients were male and 21 (35.0%) patients were female in study group. Male to female ratio was 1.9:1, as shown in Table 1. Both groups were comparable in terms of mean age ( $p\text{-value}=0.910$ ), mean weight ( $p\text{-value}=0.714$ ) and age ( $p\text{-value}=0.795$ ), gender ( $p\text{-value}=0.787$ ) and weight ( $p\text{-value}=0.796$ ). The mean time to walk

independently was markedly shorter in children who were treated with titanium elastic nail than hip spica cast (5.60±1.28 vs. 8.93±1.98 weeks; p-value<0.001). A similar marked difference was observed among the groups across various subgroups of patients based on age, gender, and weight, as shown in Table 2.

	n(%)	Total	Hip Spica (n=30)	TENS (n=30)	p-value
<b>Gender</b>	<b>Male</b>	39	20	19	0.340
	<b>Female</b>	21	10	11	0.245
<b>Age</b>	<b>3-4 years</b>	33	16	17	0.639
	<b>5-6 years</b>	27	14	13	0.451
<b>Weight</b>	<b>14-18 kg</b>	29	14	15	0.543
	<b>19-24 kg</b>	31	16	15	0.852
<b>Age</b>	<b>Mean±S.D</b>		4.43±1.07	4.40±1.19	0.910
<b>Weight</b>	<b>Mean±S.D</b>		18.13±2.10	18.33±2.11	0.714
<b>Mean Duration to Walk Independently (weeks)</b>			8.93±1.98	5.60±1.28	<0.001

**Table 1:** Stratification of demographic characteristics of femoral shaft fracture in hip spica versus TENS (n=60)





	Mean±S.D	Hip Spica (n=30)	TENS (n=30)	p-value
<b>Gender</b>	<b>Male</b>	8.90±2.08	5.58±1.12	<0.001
	<b>Female</b>	9.00±1.89	5.64±1.57	<0.001
<b>Age</b>	<b>3-4 years</b>	8.94±2.02	5.59±1.37	<0.001
	<b>5-6 years</b>	8.93±2.02	5.62±1.19	<0.001
<b>Weight</b>	<b>14-18 kg</b>	8.86±2.21	5.60±1.30	<0.001
	<b>19-24 kg</b>	5.60±1.30	9.00±1.83	<0.001

**Table 2;** Comparison of Mean Duration to Walk Independently (weeks) between the Study Groups across various Subgroups (n=60 )

### Discussion

Shaft of femur fractures due to trauma are amongst the most common injuries managed by orthopedic surgeons in ER. They put quite a load on the health care system as they are the most common fractures in children that need hospitalization [8]. Shaft of femur fractures in children unite rapidly and have a good remodeling potential. That is why, many deformities of the initially healed bone are considered acceptable. There are many variables that affect the decision of conservative or operative treatment, including age and weight of the patient, the type of fracture, associated injuries/poly-trauma, and socioeconomic status of the family [9]. Among various treatment options, hip spica cast is a

conventional and most widely used treatment option [3,4]. However, prolonged immobilization, difficulty in nursing, poor hygiene, and social embarrassment are downsides of hip spica cast [4]. Recent studies claimed that internal stabilization of fracture through minimally invasive titanium elastic nail was superior to this conventional practice in terms of significantly shorter mean time to walk independently [6]. However, the available evidence was limited and contained controversy [6,7]. The purpose of this study was to compare mean time to walk in children having shaft of femur fracture treated with titanium elastic nail versus hip spica cast. In this study, mean age of the patients was  $4.42 \pm 1.12$  years. Shah et al. (2013) reported similar mean age of  $3.9 \pm 1.8$  years among children presenting with femoral shaft fractures at Mardan Medical Complex Teaching Hospital Mardan [10], while Saeed et al. (2019) reported  $5.7 \pm 2.8$  years at Allied and DHQ hospital Faisalabad [11]. Salam et al. (2019) and Kumar et al. (2017) reported comparable mean age of  $5.1 \pm 1.9$  years and  $5.4 \pm 1.8$  years, respectively, in Indian such children [12,13]. Amin et al. (2018) and Assaghir et al. (2012) reported similar mean age of  $4.7 \pm 1.8$  years and  $4.5 \pm 1.5$  years, respectively, among Egyptian children with femoral shaft fractures [14,15]. Ramo et al. (2016) observed it to be  $4.7 \pm 1.3$  years in the UK [79], while Sela et al. (2013) reported it to be  $3.5 \pm 1.1$  years in Israel [3].

We saw a male predominance in such children with a male to female ratio of 1.9:1. Several studies in the local population have also noted male predominance in such children; Hayat et al. in 2017 (2:1), Naseem et al. in 2015 (2.1:1), and Shah et al. in 2013 (1.8:1) [10,17,18]. Kumar et al. in 2017 (2:1) and Sahu et al. in 2012 (1.8:1) reported similar male predominance in India [13,19] while Wang et al. (2019) reported similar male predominance (m:f; 1.7:1) in Chinese such children [20]. Younger mean age and male predominance in patients with shaft of femur fractures are linked with the mechanism of injury behind these fractures, which is road traffic accidents and fall from the height, which frequently involves young boys.

In this study, mean time to walk independently was significantly shorter in children who were treated with titanium elastic nail versus hip spica cast ( $5.60 \pm 1.28$  vs.  $8.93 \pm 1.98$  weeks;  $p$ -value $<0.001$ ). A similar difference was seen between the groups across various subgroups of patients based on age, sex and weight.

Another local study where Khan et al. (2018) also reported similar significantly shorter mean time of independent mobilization between children who were treated with titanium elastic nail as compared to hip spica cast presenting at Lady Reading Hospital, Peshawar ( $6.78 \pm 1.14$  vs.  $9.87 \pm 1.56$ ;  $p$ -value $<0.001$ ) [6]. In a similar study in India, Kumar et al. also observed similar significantly shorter mean time to walk with titanium elastic nail as compared to hip spica cast amongst children with shaft

of femur fractures ( $5.9\pm 1.4$  vs.  $11.1\pm 2.0$  weeks;  $p$ -value $<0.001$ ) [21]. Saseendar et al. (2010), in another Indian study, also observed similar significant differences in the meantime to walk independently with elastic nail versus spica cast ( $5.3\pm 1.5$  vs.  $7.4\pm 1.0$  weeks;  $p$ -value $<0.001$ ) [22].

Assaghir et al. (2012) also observed early recovery and independent weight-bearing with nailing ( $5.0\pm 1.5$  vs.  $7.7\pm 1.5$  weeks;  $p$ -value=0.035) as compared to spica cast in Egyptian children with femoral shaft fractures [78]. A similar significant difference has also been reported by Ramo et al. ( $6.1$  vs.  $6.8$  weeks;  $p$ -value $<0.001$ ) in the UK [16].

This study adds to the limited, existing local research evidence on this topic. In this study, we found that internal fixation of pediatric shaft of femur fractures utilizing titanium elastic nail was superior to the conventional practice of hip spica cast in terms of significantly shorter mean time to walk independently which along with the minimally invasive nature of the procedure and better patient nursing and hygiene advocate use of titanium elastic nail in such fractures.

A strong limitation to the this study is comparison between two treatment options in terms of complications like skin necrosis and infection. There is a need for such a study to establish further the reign of titanium elastic nails over hip spica cast. It is highly recommended in any future study.

## **Conclusion**

Internal fixation of pediatric femoral shaft fractures utilizing titanium elastic nail was superior to the conventional practice of hip spica cast in terms of significantly shorter mean time to walk independently which along with the minimally invasive nature of the procedure and better patient hygiene advocate the preferred use of titanium elastic nail for the management of shaft of femur fractures in future orthopedic practice.

## **References**

1. Baker R, Orton E, Tata LJ, Kendrick D. Risk factors for long-bone fractures in children up to 5 years of age: a nested case-control study. Arch Dis Child 2015;100(5):432-7.
2. Moon RJ, Lim A, Farmer M, Segaran A, Clarke NMP, Harvey NC, et al. Validity of parental recall of children's fracture: implications for the investigation of childhood osteoporosis. OsteoporosInt 2016;27:809-13.



3. Sela Y, Hershkovich, O, Sher-Lurie N, Schindler A, Givon U. Pediatric femoral shaft fractures: treatment strategies according to age - 13 years of experience in one medical center. *J OrthopSurg Res* 2013;8:23.
4. Khoriaty AC, Jones C, Gelfer Y, Trompeter A. The management of paediatric diaphyseal femoral fractures: a modern approach. *Strategies Trauma Limb Reconstr* 2016;11(2):87-97.
5. Madhuri V, Dutt V, Gahukamble AD, Tharyan P. Interventions for treating femoral shaft fractures in children and adolescents. *Cochrane Database Syst Rev* 2014;(7):CD009076.
6. Khan UZ, Ali MA, Shah FA. Paediatric femur fracture; retrograde elastic intramedullary nails versus immediate hip spica cast in treatment of pediatric femur fracture: a prospective, randomized study. *Professional Med J* 2018;25(5):639-42.
7. Shah SHU, Muhammad E, Iqbal M. Comparison of titanium elastic nailing vs. hip spica cast in treating femoral shaft fractures in children. *J Pak Ortho Assoc* 2015;27(3):90-2.
8. Loder RT, O'Donnell PW, Feinberg JR. Epidemiology and mechanisms of femur fractures in children. *J Pediatr Orthop* 2006;26(5):561-6.
9. Kocher MS, Sink EL, Blasler RD, Luhmann SJ, Mehlman CT, Scher DM, et al. American Academy of Orthopaedic Surgeons clinical practice guideline on the treatment of pediatric diaphyseal femur fracture. *J Bone Joint Surg Am* 2010;92(8):1790-2.
10. Shah FA, Durrani ZA, Khan Z, Khan H. Outcome of femoral shaft fractures in children treated with immediate hip spica cast in an emergency. *Pak J Surg* 2013;29(1):52-6.
11. Saeed UB, Waseem M, Hassan AR. Functional outcome in primary hip spica in children under 5 years. *APMC* 2019;13(1):7-9.
12. Salam A, Anjum R. Outcome of early versus delayed spica cast treatment of closed femoral shaft fracture in children age 6 months to 10 years. *Int J Biomed Res* 2019;10(2):e5072.
13. Kumar I, Kumar R, Choudhry L. Management of isolated shaft femur fractures by traction and single-leg spica cast in children. *IntSurg J* 2017;4(7):2294-6.
14. Amin AH, Mohamed El-Sadek, Mohamed Sebai A, Mehrez I. Intramedullary nailing compared with spica casts for isolated femoral fractures in four and five-year-old children. *Orthop Sports Med* 2018;1(5):93-8.

15. Assaghir YM. Titanium elastic nail in femur fractures as an alternative to spica cast in preschoolers. *J Child Orthop* 2012;6(6):505-11.
16. Ramo BA, Martus JE, Tareen N, Hooe BS, Snoddy MC, Jo CH. Intramedullary nailing compared with spica casts for isolated femoral fractures in four and five-year-old children. *J Bone Joint Surg Am* 2016;98(4):267-75.
17. Hayat S, Alam W, Shah SDBA, Shah FA, Qayum A. Outcome of flexible intramedullary nails in fracture shaft of femur in children. *J Med Sci* 2017;25(2):222-6.
18. Naseem M, Moton RZ, Siddiqui MA. Comparison of titanium elastic nails versus Thomas splint traction for treatment of pediatric femur shaft fracture. *J Pak Med Assoc* 2015;65(Suppl-3):S160-2.
19. Sahu RL, Gupta P. A comparative study of surgical management of femur fractures in children. *Bangladesh J Med Sci* 2012;11(3):178-84.
20. Wang W, Zheng X, Sun Z. Comparison of efficacy between internal fixation of minimally invasive elastic stable intramedullary nail and plate in the treatment of pediatric femoral shaft fracture. *Pak J Med Sci* 2019;35(5):1417-21.
21. Kumar R, Kumari A, Pandit A. Evaluation of outcome of titanium elastic nailing (TEN) versus hip spica cast in the treatment of femoral shaft fractures in children. *Int J OrthopSci* 2018;4(4):149-54.
22. Saseendar S, Menon J, Patro DK. Treatment of femoral fractures in children: is titanium elastic nailing an improvement over hip spica casting? *J Child Orthop* 2010;4(3):245-51.