Mean independent walking time for children with Femoral Shaft fractures using Titanium Elastic Nailing VS Hip Spica Cast treatment

Rizwan Shahid[1], Muhammad Haider[2], Amaar Talib[3], Noor Ul Sabah Butt[4], Asad Noor Mirza[5], Faizan Fazal[6]

ABSTRACT

Objective: To investigate the mean amount of time it took children with Hip spica casts versus titanium elastic nailing for the treatment of femoral shaft fractures to walk independently.
Design: Retrospective cohort study.
Place and Duration of Study: From 1st September 2021 to 31st September 2022 at Department of Orthopedic Surgery, Benazir Bhutto Hospital, Rawalpindi.
Methodology: A study on 60 pediatric patients suffering from femoral shaft fractures of both genders aged four till eight years of age using convenient sampling**.**
Results: The patients' average age was 5.58 ±1.24 years. There were 39 (65.0%) male and 21 (35.0%) female patients in the study group with a male to female ratio of 1.9:1. Compared to hip spica casts, children treated with titanium elastic nails had a considerably shorter mean time to walk independently (5.60±1.28 weeks vs. 8.93±1.98 weeks; p-Value = 0.001). Numerous patient subgroups based on age, gender, and weight showed similar statistically significant variations among the cohorts.
Conclusion: In terms of considerably reducing the mean time to walk freely, this study found that titanium elastic nailing is preferable to the traditional method of hip spice cast. Future orthopaedic practice should prioritise the titanium elastic nails to be used in the fractures of this kind because to their minimally invasive nature, improved patient hygiene, and aesthetic appearance.
Keywords: Shaft of femur, Fracture, Elastic Nailing, Hip Spica Cast, Walking time.

How to Cite This:
Shahid R, Haider M, Talib A, Butt NS, Mirza AN, Fazal F. Mean independent walking time for Children with Femoral Shaft fractures using Titanium Elastic Nailing VS Hip Spica Cast Treatment. Isra Med J. 2023; 15(2): 47-50. DOI: https://doi.org/10.55282/imj.oa1382

INTRODUCTION

One of the main avoidable causes of illness and death in children is injury, accounting for 20,000 hospital hospitalisations and 2 million ER visits annually in the UK among paediatric and young adult patients aged 1 to 14 years.[1] The most common severe injuries that orthopaedic surgeons treat in paediatric patients are femur shaft fractures, which are usually the result of blunt trauma. A shaft fracture accounts for 70% of femur fractures. [2] Treatment options for femur shaft fractures vary depending on the nature and mechanism of the injury, the patient's preferences, and the surgeon of choice. Among these are intramedullary nailing, skin traction, external fixators, hip spica casts, and plating. [3,4] When choosing the treatment modality in this age group, several factors ought to be considered including social ramifications, financial implications, psychological and developmental aspects. [5] Complications of hip spica cast include leg length discrepancy greater than 2 cm, valgus and rotational deformity, limp, nonunion, and malunion. [6]

Since each treatment method for paediatric femoral shaft fracture has pros and negatives, there is no agreement on the optimal course of action. Additionally, no research has been done to compare the long-term implications of surgery and non-surgical therapy. [4,7]

There is lack of evidence and individual advantages and disadvantages of each treatment option led to different clinical trials to find out the better treatment option for such kind of fractures. Therefore, the aim of this study was to determine how long it took children to walk freely after receiving treatment for

1. Consultant Orthopedic Surgeon, Government City Hospital, Talagang.
2. Consultant Orthopedic Surgeon, Holy Family Hospital, Rawalpindi.
3. Senior Registrar Orthopaedics, Rahbar Medical and Dental College, Lahore.
4. Post Graduate Trainee, Pediatric Surgery Holy Family Hospital, Rawalpindi.
5. Divisional Health Education Officer, Benazir Bhutto Hospital, Rawalpindi.
6. Final Year Medical Student, Rawalpindi Medical University, Pakistan.

Correspondence
Faizan Fazal
Final Year Medical Student,
Rawalpindi Medical University, Pakistan.
Email: abdalian459@gmail.com

femoral shaft fractures—titanium elastic nailing versus hip spica casts.

METHODOLOGY

Following institutional research forum approval of University of Health Sciences, Lahore, retrospective cohort study of pediatric patients of both genders falling in age group four to eight years presenting to Department of Orthopedic Surgery, Benazir Bhutto Hospital was conducted from 1st September 2021 to 31st September 2022. The IRB approval number is MED-04-46-21 dated 20/02/2021.

A sample size of 60 cases (30 in each group) was determined using a 5% significance threshold and 80% study power while taking expected mean time to walk independently to be 35.2±13.2 days in titanium elastic nail group and 80.0±10.1 days in hip spica cast group. Sampling technique used was non - probability convenience sampling.

All the pediatric patients between age four till eight, whose guardians gave written informed consent, and who presented within 3-5 days of injury were included in the study. While patients with open femur fracture, bleeding disorder, metabolic disorder, neuromuscular disorder, poly trauma, and neurovascular injury were excluded from the study. Details were collected by the help of a questionnaire on the variables including age, gender, weight, and mean time to walk independently in patients belonging to each group.

For Titanium Elastic Nails, a bone hole was expanded in an aseptic setting using a reamer or an awl after a linear incision, fascia cutting, and muscle fibre retraction. The distal portion of the femur was then retrogradely threaded with each titanium elastic nail. At the point where the femoral shaft was the narrowest, each nail measured 40% of the canal's diameter. Under an image intensifier, reduction and fixing were carried out. After 48 hours following surgery, all patients were released and contacted for routine follow-up.

For the first three weeks, participants in the Hip Spica Cast group underwent skin traction. The difference in limb length was measured daily. According to operational definition, a one and a half hip spica cast was put under general anaesthesia after a sizable callus had formed on the skin. For the following four weeks, the cast was on. In hip spica, there was around 20 – 30 degrees of abduction, 10 – 15 degrees of external rotation and 45 degrees of flexion.

After surgery, the limbs in the titanium elastic nail group were placed on pillows for nine days, or, if more comfortable, a knee immobiliser was provided. Crutch-assisted weight-bearing was allowed as soon as the fracture stopped aching. Partial weight bearing was permitted beginning in the third week. Complete weight bearing was permitted once a calcified exterior callus had formed. The hip spica cast group wore the cast for about four to six weeks. Patients were recommended for additional physical therapy if an adequate range of motion was not attained once the cast was removed, as well as for first gait training. After discharge, follow-up visits took place 2, 4, 6, 12, and 24 weeks later. Union was assessed by X-rays and clinically. Callus density is checked from the X-ray film to assess the bone union. Clinically it was assessed by responses to weight bearing and by palpating the fracture site.

Data Analysis: The SPSS version 21 was used to enter and analyses all of the data that had been gathered by utilizing the standard deviation and mean, the numerical variables included age, weight, and the amount of time it required to walk independently after therapy. An independent sample t-test was used to compare the mean walking time between the groups; a p-Value of less than 0.05 was deemed statistically significant. Gender was evaluated using frequency and percentage as a categorical variable. Data have been categorized by body weight, gender, and age to take effect modifiers into consideration. The mean walking time for each group in each stratum was compared independently using a post-stratification t-test.

RESULTS

Total 60 cases were included in this study (30 in each group). The mean age of children was 5.58±1.24 years while the mean weight was 17±3.34 Kg. Children below 5 years were 33 (55%), while 27 (45%) children were aged above 5 years. There were 39 (65%) male and 21 (35%) female patients in the study group with a male to female ratio of 1.9:1. The demographic detail is provided in table I.

Table I. Demographic Features of Study Cohort

Characteristic	Study cohort 60
Age	5.58±1.24
≤5 years	33 (55.0%)
>5 years	27 (45.0%)
Gender	
Male	39 (65%)
Female	21 (35%)
Weight	22.17±3.34
16-22 kg	29(48.3%)
23-29 kg	31 (51.7%)

Both of the groups included in this study were comparable in terms of weight (p-Value=0.939), age (p-Value=0.795), and gender (p-Value=0.787).

Based on age, gender, and weight, children treated with titanium elastic nails had considerably shorter mean times to walk unassisted than those treated with hip spica casts (5.60±1.28 vs. 8.93±1.98 weeks) with a p-Value of 0.001 as shown in Table II.

Table II. Comparison of Mean Duration to Walk Independently (in weeks) between the Study Groups

Characteristic	Titanium elastic nail	Hip spica	Independent sample T-test value	p-Value
Mean time to walk independently	5.60± 1.28	8.93± 1.98	2.71	<0.001

DOI: https://doi.org/10.55282/imj.oa1382

Identical substantial differences were seen between the groups in a number of patient subgroups based on age, gender, and weight as shown in Table III.

Table III. Comparison of Mean Duration to Walk Independently (weeks) between the Study Groups across various Subgroups

Characteristics		Titanium elastic nail	Hip spica	Independent sample T-test value	p-Value
Age	≤5 years	5.59± 1.37	8.94± 2.02	7.12	<0.001
	>5 years	5.62± 1.19	8.93± 2.02	6.54	<0.001
Gender	Male	5.58± 1.12	8.90± 2.08	12.24	<0.001
	Female	5.64± 1.57	9.00± 1.89	8.91	<0.001
Weight	16-22 kg	5.60± 1.30	8.86± 2.21	13.11	<0.001
	23-29 kg	5.60± 1.30	9.00± 1.83	7.48	<0.001

DISCUSSION

The mean patient age in the current study was 5.58±1.24 years. According to one study, children with femoral shaft fractures at Allied and DHQ Hospital in Faisalabad had a mean age of 5.7±2.8 years, whereas Mardan Medical Complex Teaching Hospital in Mardan having a 3.9±1.8 year mean age.[8,9] Another study reported comparable mean age of 4±1.8 years in Indian such children.[10]

With a male to female ratio of 1.9:1, we saw that these kids were overwhelmingly male. Similar male predominance among these children has also been documented by a number of national and international research.[11-14]

The mechanism of damage underlying femoral shaft fractures—road traffic accidents and falls from heights, which often involve young boys—is associated to a younger mean age and a predominance of male patients. In the current study, children treated with titanium elastic nails had a considerably shorter mean time to walk independently than those treated with hip spica casts. Comparable the mean age of the patients in this study was notable, and differences in the groups were observed in a variety of age, gender, and weight-based patient subgroups. In a related study conducted in India, children with femoral shaft fractures who had titanium elastic nail treatment had a substantially shorter mean time to walk than those who received hip spica cast treatment.[10] Another study found a comparable and noteworthy difference between using an elastic nail and a spica cast to walk freely in the interim.[15]

In another study, Egyptian children with femoral shaft fractures showed early healing and independent weight bearing with nailing as opposed to spica cast. [16] Another study has reported a noteworthy difference that is comparable to this one[17]

The current study broadens the corpus of earlier, regionally focused research on the topic. The results of this study, along with the procedure's minimally invasiveness and enhanced patient care in terms of cleanliness, cosmesis, and nursing, support titanium elastic nails as the treatment of choice for paediatric femur shaft fractures in orthopaedic practice going forward. Compared to the standard procedure of employing a hip spica cast, internal repair of these fractures with titanium elastic nails led to a noticeably reduced mean time to walk independently.

One limitation of the current study is that we did not evaluate the two treatment approaches for side effects, such as infection and skin necrosis. Such a study is necessary to confirm that titanium elastic nails are superior to hip spica casts. This kind of research is highly encouraged for the future.

CONCLUSION

In terms of considerably reducing the mean time to walk freely, this study found that titanium elastic nailing is preferable to the traditional method of hip spice cast. Future orthopaedic practice should prioritise the titanium elastic nails to be used in the fractures of this kind because to their minimally invasive nature, improved patient hygiene, and aesthetic appearance.

AUTHOR'S CONTRIBUTION

Shahid R: Design of work, drafting, analysis, final approval.
Haider M: Interpretation, analysis, final approval**.**
Talib A: Acquisition of data, final approval, concept of work.
Butt NS: Analysis, final draft writing, final approval.
Mirza AN: Critical review, interpretation, final approval**.**
Fazal F: Final approval, critical review, final draft writing.

Disclaimer: None.
Conflict of Interest: None.
Source of Funding: None.

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. Archives Dis Childhood. 2015; 100(5):432-437. http://dx.doi.org/10.1136/archdischild-2013-305715
2. Alluri RK, Sabour A, Heckmann N, Hatch GF, Berg VC. Increasing rate of surgical fixation in four-and five-year-old children with femoral shaft fractures. JAAOS. 2019; 27(1):e24-32. DOI: 10.5435/JAAOS-D-17-00064
3. Liau GZ, Lin HY, Wang Y, Nistala KR, Cheong CK, Hui JH, *et al*. Pediatric femoral shaft fracture: an age-based treatment algorithm. Indian J Orthopaedics. 2021; 55:55-67. DOI: 10.1007/s43465-020-00281-6
4. Greenhill DA, Herman MJ. Treatment of pediatric femoral shaft fractures. JAAOS. 2022; 10: 5435. DOI: 10.5435/JAAOS-D-22-00415
5. Imam MA, Negida AS, Elgebaly A, Hussain AS, Ernstbrunner L, Javed S, etal. Titanium elastic nails versus spica cast in pediatric femoral shaft fractures: a systematic review and meta-analysis of 1012 patients. Arch Bone Joint Surg. 2018;

 DOI: https://doi.org/10.55282/imj.oa1382

6(3):176.
6. Tisherman RT, Hoellwarth JS, Mendelson SA. Systematic review of spica casting for the treatment of paediatric diaphyseal femur fractures. J Children's Orthopaedics. 2018; 12(2):136-44. https://doi.org/10.1302/1863-2548.12.170201
7. Shemshaki HR, Mousavi H, Salehi G, Eshaghi MA. Titanium elastic nailing versus hip spica cast in treatment of femoral-shaft fractures in children. J Orthopaedics Traumatol. 2011; 12:45-8. DOI: 10.1007%2Fs10195-011-0128-0
8. Saeed UB. Functional outcome in primary hip spica in children under 5 years. APMC. 2019; 13(1):7-9. DOI:10.29054/apmc/2019.32
9. Shah FA, Durrani ZA, Khan Z, Ismatullah K, Khan H, Ali W, etal. Outcome of femoral shaft fractures in children treated with immediate hip spica cast in emergency. Pak J Surg. 2013; 29(1):52-56.
10. 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 Orthopedics Sci. 2018; 4(4):149-154.
11. Hayat S, Alam W, Shah SD, Shah FA, Qayum A. Outcome of flexible intramedullary nails in fracture shaft of femur in children. J Med Sci. 2017; 25(2):222-226.
12. Mallik M, Gupta TS, Maharaj RC, Chand DK, Sahoo PK, Nanda DP, et al. Experience with Titanium Elastic Nails (TENS) for Femur Fracture and its Complications among 5-15 Years Age Group in Odisha: A Prospective Study. Int J Anatomy Radiol Surg. 2020; 9.2576. DOI: 10.7860/JCDR/2020/44751/2576
13. Chetia NP, Medhi H, Das M, Bidyananda A. Outcome of adult proximal humerus locking plate in the treatment of paediatric subtrochanteric fractures. Int J Res Orthopaedics. 2020; 6(1):63.
14. Khan KR, Rasool A, Umair M, Rashid M, Lodhi TA, Iqbal S, et al. 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(03):131-134.
15. Siddiq MZ, Baqer D, Umair M, Razzaqe M, Shafiq M. Does titanium elastic nail (ten) for femur shaft fracture in children have superior functional outcomes than spica cast application? An experience from tertiary care hospital. Biol Clin Sci Res J. 2023; 2023(1):362.
16. Hassan EA, Sebai MA, Salama AM, Mahmoud MH. Role of Elastic Stable Intramedullary Nailing in Diaphyseal Fractures in Children. Egyptian J Hosp Med. 2021; 85(2):3540-3544.
17. Cruchten VS, Warmerdam EC, Kempink DR, Ridder DVA. Treatment of closed femoral shaft fractures in children aged 2–10 years: a systematic review and meta-analysis. Eur J Trauma Emerg Surg. 2022; 48(5):3409-3427.

 DOI: https://doi.org/10.55282/imj.oa1382