



Management of Fracture Shaft Femur in 6-14 Years Old Children by Conservative and Titanium Elastic Nailing – A Cross Sectional Comparative Study

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Abstract

Objective: In this study our main goal is to compare functional outcome of TENS and conservative management in cases of fracture shaft femur in children ages of 6-14 years.

Method: This comparative cross-sectional study was carried out at Chattogram Medical College Hospital (CMCH), Chattogram and private hospitals in Chattogram from January 2014 to December 2015. A total of 72 children with fracture shaft femur were included in the study.

Results: During the study, in this study, maximum age incidence was found in 06-09 years age group. Both group had similar mean age distribution with p value 0.625^{ns}. Out of 72 patients, mean and standard deviation hospital stay in group-I was 10.222 ± 4.022 days and in group-II was 16.444 ± 3.783 days with highly significant p value. In both group minor complication is more frequently found with significant p value. According to patient's satisfaction, 69.44% excellent cases were noted in group-I where as in group-2 it was 38.88%.

Conclusion: Titanium elastic nailing led to better outcomes compared to hip spica casting in terms of earlier union, lower rates of malunion, shorter rehabilitation milestones, and better functional outcome scores.

Keywords: Titanium elastic nailing (TENS), fracture shaft femur, Orthopaedics.

Introduction

Femoral shaft fractures are among the most common major pediatric injuries treated by orthopedic surgeons and result in high direct and

indirect medical costs.¹ They represent approximately 1.6% of all bony injury in children. Male are more frequently affected than female. Fractures are mostly caused by trauma, low

velocity leads to transverse fracture, high speed comminuted or segmental fracture.² Orthopaedics Surgeons come across the diaphyseal femoral fractures in day to day life very frequently. These fractures are more common in rural children than in children of cities because of frequent playing and climbing on trees.³

Beside the usual mechanisms of injury, femoral fractures can occur at birth, can be caused by child abuse, or can be pathological. In children younger than 1 year of age, 70 % of femoral fractures are abuse related. Abuse should be suspected if any of the following are present: (1) unreasonable history, (2) inappropriate delay in coming to the hospital, (3) previous history of abuse (4) evidence of other fractures in various stages of healing, (5) multiple acute fractures, and (6) characteristic fracture patterns.⁴

Often other serious injuries that require treatment are also present. If a child sustains enough trauma to fracture the largest bone in his or her body, the child may have occult abdominal or other injuries. Examination of the ipsilateral knee is also mandatory because instability has been reported to occur in 4% of children with femoral fractures.⁴

Over the past two decades, the advantages of fixation and early mobilization have been increasingly recognized. Though the long-term results of the majority of children treated by surgical methods have been excellent, the risk of certain significant complications remain. A search for a solution to these intricacies led to the development of the elastic stable intramedullary nail in Nancy, France, by Metaizeau, Prevot, Ligier, and others in the 1980s. Thereafter, these elastic stable intramedullary nails (ESINs) have been refined in many ways.¹

An ideal device for treating pediatric femur fractures would be a simple load-sharing internal splint, allowing the mobilization and maintenance of alignment until bridging callus forms. The device would exploit the rapid healing and ability to remodel without risking the physes or blood supply to the femoral head. TENS fulfill this quality.⁴

In this study our main goal is to compare functional outcome of TENS and conservative management in cases of fracture shaft femur in children ages of 6-14 years.

Objective

To assess the functional outcome between TENS and conservative management in cases of fracture shaft femur in children ages of 6-14 years.

Methodology

Type of Study: This was a comparative cross-sectional study.

Place and period of study: This study carried out at Chattogram Medical College Hospital (CMCH), Chattogram and private hospitals in Chattogram from January 2014 to December 2015.

Study Population: 6-14 years old child admitted in Chattogram Medical College Hospitals, Department of Orthopaedics Surgery and private hospitals in Chattogram.

Sample Size

A total number of 72 children with fracture shaft femur were included in the study due to time and financial constraints (according to inclusion and exclusion criteria).

Inclusion Criteria

- i) Age 6-14 years old.
- ii) Both sex group.
- iii) Close fracture or Gustilo type 1.
- iv) Those presented early within ten days after injury.
- v) Weight less than 49 kg.
- vi) Transverse fracture.
- vii) Minimally comminuted (Winquist 1)
- viii) Short oblique fracture¹

Exclusion Criteria

- i) Pathological fracture.
- ii) Segmental fracture.
- iii) Previous fracture in the same limb
- iv) Patients presented after ten days.
- v) Subtrochanteric fracture.¹

Detailed Procedure

Data collection was done after taking informed written consent from each patient or from legal guardian who fulfilled the criteria. Initial evaluation by meticulous history and detailed clinical examination was done and recorded in a pre-designed structured form.

Data Analysis

Collected data were analysed using software SPSS (Statistical Package for Social Sciences) version

23 for windows. Descriptive and inferential statistics were used to analyse the data. Analysed data were presented in the form of tables and charts with due interpretation.

Results

In figure-1 shows age distribution. In this study, maximum age incidence was found in 06-09 years age group. Both group had similar mean age distribution with p value 0.625^{ns}. The following figure is given below in detail:

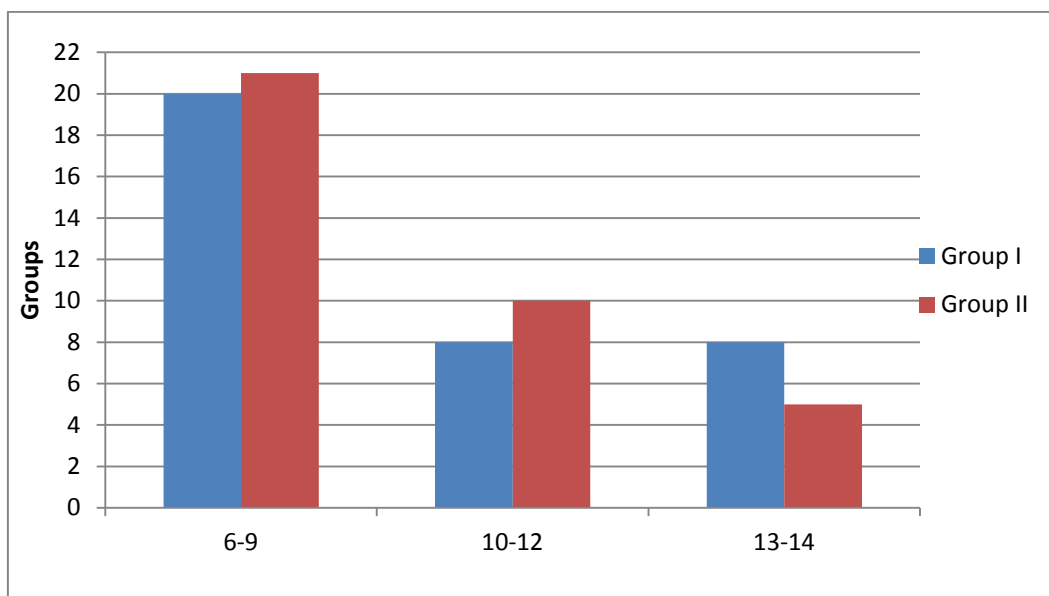


Fig. 1: Age distribution (n. 36)

In figure-2 shows gender distribution. Out of 72 patient's male were more sufferer than female but

non-significant. The following figure is given below in detail:

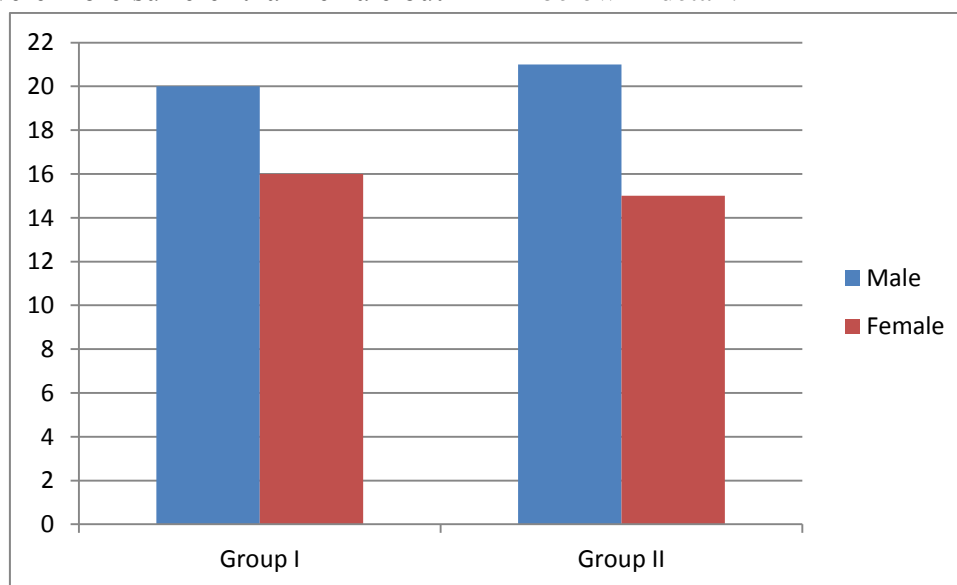


Fig.-2: Gender distribution (n. 36)

In figure-3 shows fracture types of distribution. Study showed that transverse fracture was more

than the other three with non-significant p value. The following figure is given below in detail:

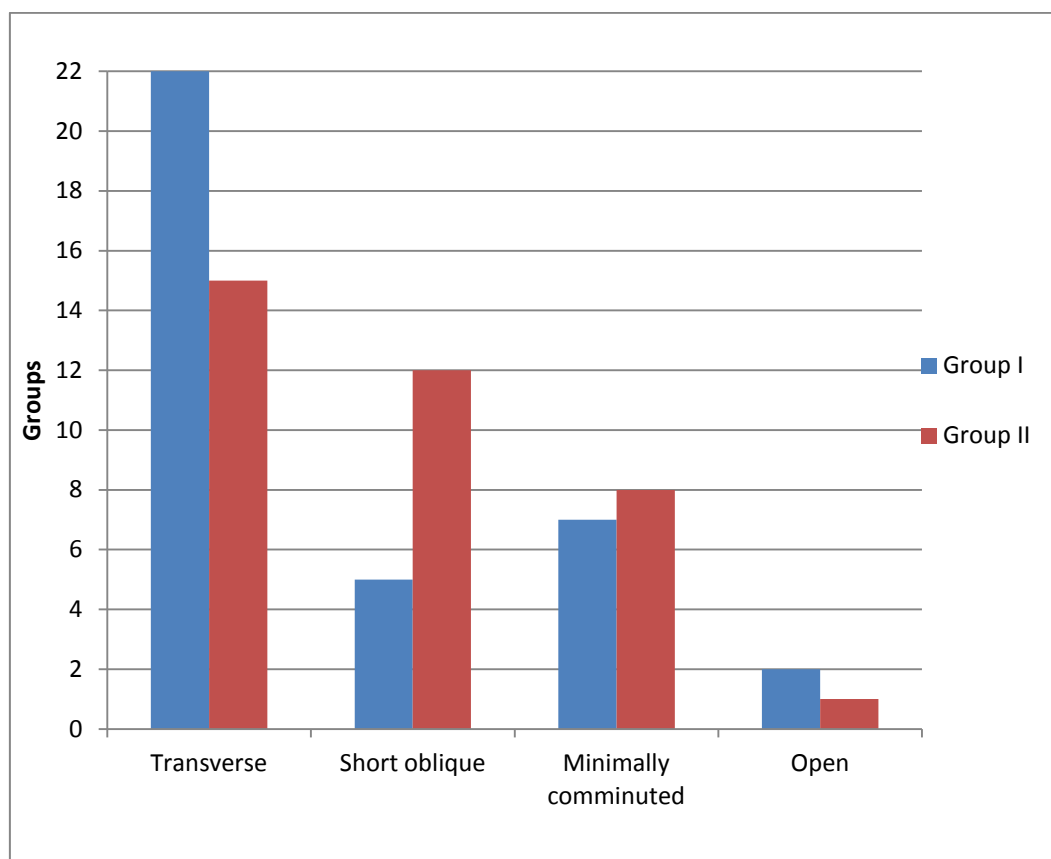


Fig.-3: Fracture type distribution (n. 36)

In table-1 shows distribution of the patients according to hospital stay. Out of 72 patients, mean and standard deviation hospital stay in group-I was 10.222 ± 4.022 days and in group-II

was 16.444 ± 3.783 days with highly significant p value. The following table is given below in detail:

Table-I: Hospital stay (n=36)

Hospital stay (days)	Group-I (n=36)		Group-II (n=36)		P value
	No.	9.%	No.	%	
01 to 07	08	19.44	0	0	0.00001^{hs}
08 to 14	27	75	10	28	
15 to 21	01	03	24	67	
22 to 28	0	0	02	05	

Statistical analysis was done by Chi-square test.

Group-I = TENs.

Group-II = Hip Spica.

hs = highly significant.

n= number of patients in each group

In table-2 shows radiological Union in Weeks. Radiological union is highly significantly faster

than hip spica. The following table is given below in detail:

Table-2: Radiological Union in Weeks (n=36).

Radiological Union in Weeks	Group-I (n=36)		Group-II (n=36)		P value
	No.	%	No.	%	
<4wks	02	5.55	0	0	
4-6wks	18	50	02	5.55	
7-8wks	13	36.11	08	22.22	.00001 ^{hs}
9-10wks	02	5.55	20	55.55	
>10wks	01	2.77	06	16.66	
Total	36	100.0	36	100.0	

Statistical analysis was done by Chi-square test.

Group-I = TENs.

Group-II = Hip Spica.

HS= highly significant.

N= number of patients in each group.

In table-3 shows complication of the patients where in both group minor complication is more

frequently found with significant p value. The following table is given below in detail:

Table-3: Complications (n=36).

Complications	Group-I (n=36)		Group-II (n=36)		P value
	No.	%	No.	%	
No	26	72.22	16	44.44	
minor	10	27.77	19	52.77	0.04 ^s
major	0	0	01	2.77	
Total	36	100.0	36	100.0	

Statistical analysis was done by Chi-square test.

Group-I = TENs.

Group-II = Hip Spica

S= Significant.

N= number of patients in each group

In table-4 shows functional outcome of the study. In group-1 excellent cases were found 69.44%

where in group-2 it was 38.88%. The following table is given below in detail:

Table-4: Functional outcome (n=36).

Functional outcome	Group-I (n=36)		Group-II (n=36)		Total		P value
	No.	%	No.	%	No.	%	
Excellent	25	69.44	14	38.88	39	54.16	
Satisfactory	10	27.77	11	30.55	21	29.16	0.003 ^s
Poor	01	2.77	11	30.55	12	33.33	
Total	36	100.0	36	100.0			

Statistical analysis was done by Chi-square test.

Group-I = TENS cases.

Group-II = Hip Spica cases.

s = significant.

n= number of patients in each group

Discussion

In this study, maximum age incidence was found in 06-09 years age group. The mean age and standard deviation were 9.44 ± 2.53 in group-I and 9.22 ± 2.300 in group-II. Both group had similar mean age distribution. These figures were compared favorably with other workers. S. Saseendar, J. Menon. and D. K. Patro. (2010) showed mean age group I, 10 years and in group II, 9.25 years.¹

In this study, out of 72 patients, mean and standard deviation hospital stay in group-I was 10.222 ± 4.022 days and in group-II was 16.444 ± 3.783 days. So, most of the patients were discharged early postoperative period. Hamid Reza Shemshaki, Hamid Mousavi, Ghasem Salehi and Mohammad Amin Eshaghi (2011), had compared with children treated with spica cast, those treated with TEN had shorter hospital stay ($P < 0.001$) and took a shorter time to start walking with support or independently ($P < 0.001$).⁵

Regarding union at fracture site (radiologically), out of 72 patients, union had taken place more in group-I, 02 (5.55%) in <4wks, 18 (50%) in 4-6wks, 13 (36.11%) in 7-8wks, 02 (5.55%) in 9-10wks, and 01 (2.77%) in >10wks. In group-II, radiological union was 0 (0%) in <4wks, 02 (5.55%) in 4-6wks, 08 (22.22%) in 7-8wks, 20 (55.55%) in 9-10wks, and 06 (16.66%) in >10wks. In Ghulam Rasool, Zafar Malik, M. Naeem Ashraf, and Azhar's study, radiological union had taken place similarly more in group-I, 06 (12.2%) in <4wks, 20 (40.8%) in 4-6wks, 16 (32.7%) in 7-8wks, 06 (12.2%) in 9-10wks, and 01 (2.0%) in >10wks. In group-II, union was 02 (3.9%) in 4-6wks, 08 (15.7%) in 7-8wks, 31 (60.8%) in 9-10wks, and 10 (19.6%) in >10wks.⁶

Regarding complication in group-I, 26 (72.22%) had no complication, 10 (27.77%) were minor. Pain or irritation in nail entry site is the most common 5 in number, three (3) had superficial wound infection, and bursa formation 1, no major complication occurs. In group-II, 16 (44.44%) had no complication, 19 (52.77%) were minor, 01

(2.77%) were major. In minor complication, knee stiffness and muscle wasting are found frequently, recovery patient from these is a bit difficult for both patient and parents. Pressure ulcer also present less frequently, but broken or loosen spica is a matter of concern for maintenance of reduction. P-value result in my study is (.04⁵). On the other hand, Saikat Sarkar, Ranadeb Bandyopadhyay and Arindam Mukherjee (2013), studied the most common complication which was pain at nail entry site (60%). 5.71% had local inflammatory reaction due to nails. Superficial infection occurred in 2.85%.⁷

According to Flynn et al. criteria, patients were categorized into 03 subdivision- excellent, good, and poor. In this study after 14 weeks of final follow up done, for group-I, 25 (69.44%) were excellent, 10 (27.77%) were satisfactory, 01 (2.77%) were poor outcome. In group-II, 14 (38.88%) were excellent, 21 (29.16%) good and 12 (33.33%) were fair outcome. In Ghulam Rasool, Zafar Malik, M. Naeem Ashraf, and Azhar's study, after 24 weeks of final follow up done, for group-I, 39 (79.6%) were excellent, 08 (16.3%) were satisfactory, 02 (4.1%) were poor outcome. In group-II, 26 (51.0%) were excellent, 14 (27.5%) in good and 11 (21.6%) were poor outcome.³² Also, in Patil Siddaram, Ramanna Roa, Venkaiah, Vamsi, and Pranavi V's study, 73.33% were excellent, 26.67% were satisfactory, and 0.0 were poor.⁸ S. Saseendar, J. Menon, and D. K. Patro's. (2010) stated in the surgical group, the Flynn score was 'excellent' in 12 (75%), 'satisfactory' in 1 (6.2%), and 'poor' in 3 (18.8%), while the scores for the spica group were 'excellent' in 1 (6.2%), 'satisfactory' in 2 (12.5%), and 'poor' in 13 (81.3%).¹

Though we cannot evaluate the difference regarding cost of treatment in femoral shaft fractures, Clinkscales and Peterson showed the cost \$16,273 in traction spica and \$16,056 in TENs. Again, in case of Stans et al. \$15,980 traction spica and \$15,495 TENs.³ in both studies, cost is not significantly difference.

Conclusion

Titanium elastic nailing led to better outcomes compared to hip spica casting in terms of earlier union, lower rates of malunion, shorter rehabilitation milestones, and better functional outcome scores.

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