

Original Research Article

To compare the functional outcome of patient treated with flexible intramedullary nailing and hip spica cast.

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Abstract:

Background & Method: The aim of present study is to compare the functional outcome of patient treated with flexible intramedullary nailing and hip spica cast. Intervention was done as per availability of operation theatre as soon as possible. After pre-anaesthetic workup patients those selected for flexible nailing were shifted to OT. After proper effect of anaesthesia, patient was transferred to traction table, then parts preparation, cleaning, painting and draping was done. Then reduction was achieved under C-arm guidance and two flexible nail were passed in retrograde manner. I/V antibiotic were given for 3 days.

Result: Range of Motion (Knee Joint - Flexion) in HIP Spica Cast group was 93.50 ± 9.33 , while in the Titanium Elastic Nail System (TENS) group it was 105 ± 7.60 . Range of Motion (Hip - Flexion) in HIP Spica Cast group was 95.75 ± 9.63 , while in the Titanium Elastic Nail System (TENS) group it was 104.25 ± 8.15 . The difference in mean knee joint and hip flexion at 3 months was significant ($P < 0.05$) was found to be better in Titanium Elastic Nail System (TENS) group in comparison to HIP Spica Cast group.

Conclusion: Based on our experience and result, elastic intramedullary nailing is simple, easy, effective method in treatment of managing pediatric diaphyseal femur fracture in children age group 4-10 years as compared to hip spica cast with shorter operative time, short hospital stay, reasonable time for fracture healing, early mobilisation making it ideal treatment of choice in pediatric diaphyseal femur fracture. Patient felt much comfortable after TENS application as compared to hip spica application. Parents of children treated with TENS were observed to be happier than other group. Problem relating to micturition and defecation in TENS group were less than hip spica treatment.

Keywords: functional, flexible, intramedullary nailing & hip spica cast.

Study Designed: Observational Study.

1. INTRODUCTION

The term orthopaedia is derived from greek words orthos, means "straight and free from deformity and paidios means child⁽¹⁾. As orthopedics literally means straight child, suggesting the importance of pediatric injuries and deformities in the development of this field. In early days most of the pediatric fractures were managed conservatively with splinting techniques which led to cumbersome disabilities^(2,3).

In paediatric age group femur shaft fractures represents 1.6% of all bony injuries in children more common in boys^(4,5). It occurs as a bimodal distribution with age groups peaking in toddlers (simple falls) and young adolescence (high energy trauma)^(6,7,8). With most of the femur fractures managed conservatively in early days it created substantial disability and deformity. Over the last two decades there has been a tremendous rise towards operative stabilization of paediatric diaphyseal fractures.

In paediatric age group remodeling of bone occurs from weak woven bone to strong lamellar bone⁽⁹⁾. Bone strength increases with increase in diameter and area of bone. In children bones are weaker and break under loading conditions⁽¹⁰⁾. But in adolescence high velocity trauma is needed to cause fracture.

Due to the evolution of orthopaedics, especially in orthopaedic trauma, a better understanding of biomechanics, variety and quality of implants, principles of internal fixation, antibiotics and asepsis have all contributed to tremendous change in the treatment of pediatric fractures. Till then recent conservative treatment with hip spica was preferred treatment in of fracture shaft femur in pediatric age group but treating with hip spica has various problems like angular deformity, knee stiffness, delayed union, hygiene issue, dermal infection, rarely nonunion. Open reduction and internal fixation has been advocated using various implants including flexible intra-medullary nails, sub-muscular plane fixation, intra-medullary nail fixation⁽¹¹⁾.

Thus, we have advanced from the conservative approach to internal fixation in fractures to avoid the co-morbidities associated with conservative management. Each method of fixation has its own advantages and disadvantages. Application of traditional plating methods in pediatric femur fractures has its own disadvantages like extensive amount of exposure needed to achieve anatomic reduction and the subsequent soft tissue damage and periosteal stripping. And also after removal of plates screw holes left in the femur create stress risers within it. In most centers diaphyseal fractures from 5-15 years have been managed with either stainless steel nails or titanium elastic nails. Flexible intramedullary nailing is popular now because of its safety, efficacy, ease of implant removal.

2. MATERIAL & METHOD

The study was done prospectively in the Department of Orthopaedics and Trauma Centre in J. A. Group of Hospitals, Gwalior (M.P.). Cases was selected on the random basis, those having diaphyseal femur fracture in pediatrics (age group 4-10 years).

Sample Size

A Total number of 40 patients was selected. 20 were managed by spica cast and 20 were operated by intramedullary nailing. In this study intervention was started after approval of institutional ethics committee.

Inclusion criteria

- Closed diaphyseal femur fracture children of age between 4 to 10 years with open fracture up to compound GAI
- Parents of patients willing to give informed consent.

Exclusion criteria

- Compound fracture (GA II and above)
- Polytrauma
- Lack of complete follow-up
- Fracture of proximal most and distal most femur.
- Children age < 4 and > 10 years
- Pathological fracture

- Infection
- Refusal to give consent for any intervention

METHOD

Intervention was done as per availability of operation theatre as soon as possible. After pre-anaesthetic workup patients those selected for flexible nailing were shifted to OT. After proper effect of anaesthesia, patient was transferred to traction table, then parts preparation, cleaning, painting and draping was done. Then reduction was achieved under C-arm guidance and two flexible nail were passed in retrograde manner. I/V antibiotic were given for 3 days.

3. RESULTS

Table 1: Distribution of patients according to Mode of Injury

Mode of Injury	Group				Total	
	TENS		HIP Spica			
	No.	%	No.	%	No.	%
Accidental fall from height	10	50%	11	55%	21	52.5%
Accidental fall while playing	6	30%	3	15%	9	22.5%
Road traffic accidents	4	20%	6	30%	10	25.0%
Total	20	100%	20	100%	40	100%

Pearson Chi-Square = 1.448, DF = 2, P value = .485, Not Significant

The above table shows the Distribution of patients according to mode of injury in both the groups.

In **TENS group**, there were 10(50%) children who had fracture due to fall from height, 6(30%) were injured accidental fall while playing and 4(20%) were injured due to road traffic accidents (RTA).

In **Spica group**, there were 11(55%) children who had accidental fall from height, 3(15%) were injured due to Accidental fall while playing and 6(30%) had Road traffic accidents (RTA).

Fall from height was the most common mode of injury (52.5%) of both the groups followed by fall while playing (22.5%), road traffic accidents (25.0%).

The above association found to be statistically not significant ($p > 0.05$) which shows the mode of injury of children of both groups are comparable.

Table 2: Distribution of patients according to Side of Fracture

Side of Fracture	Group				Total	
	TENS		HIP Spica			
	No.	%	No.	%	No.	%
Left	7	35%	14	70%	21	52.5%
Right	13	65%	6	30%	19	47.5%
Total	20	100%	20	100%	40	100%

Pearson Chi-Square = 4.912, DF = 2, P value = .027, Significant

The above table shows the distribution of patients according to side of fracture in both the groups.

In **Titanium Elastic Nail System (TENS) group**, there were 7(35%) children who involved in left side fracture, 13(65%) were who involved in right side fracture.

In **HIP Spica Cast group**, there were 14(70%) children who involved in left side fracture, 6(30%) were who involved in right side fracture.

There was statistically significant association seen between the side of fracture and group ($P<0.05$), showing that, left side (52.5%) is more commonly involved than right side (47.5%).

Table 3: Mean Distribution of patients according to Range of Motion (at 3 months)

ROM	Groups	Mean±SD	P Value
Knee Joint	Titanium Elastic Nail System	105±7.60	.000*
	HIP Spica Cast	93.50±9.33	
Hip	Titanium Elastic Nail System	104.25±8.15	.005*
	HIP Spica Cast	95.75±9.63	

Unpaired 't' test applied. P value <0.05 was taken as statistically significant

The above table shows the Distribution of patients according to Range of Motion in both the groups.

Range of Motion (Knee Joint - Flexion) in HIP Spica Cast group was 93.50±9.33, while in the Titanium Elastic Nail System (TENS) group it was 105±7.60. Range of Motion (Hip - Flexion) in HIP Spica Cast group was 95.75±9.63, while in the Titanium Elastic Nail System (TENS) group it was 104.25±8.15.

The difference in mean knee joint and hip flexion at 3 months was significant ($P<0.05$) was found to be better in Titanium Elastic Nail System (TENS) group in comparison to HIP Spica Cast group.

Table 4: Distribution of patients according to Final Assessment after 6 months follow-up

Final Assessment		Group				Total	
		TENS		HIP Spica			
		No.	%	No.	%	No.	%
Limb length discrepancy	<1	16	80.0	4	20.0%	20	50.0%
	<2	4	20.0%	16	80.0%	20	50.0%
Malalignment	<5	13	65.0%	3	15.0%	16	40.0%
	0	1	5.0%	0	0.0%	1	2.5%
	5	2	10.0%	5	25.0%	7	17.5%
	5-10	4	20.0%	6	30.0%	10	25.0%
	10	0	0.0%	6	30.0%	6	15.0%
Pain	Yes	3	15.0%	7	35.0%	10	25.0%
	No	17	85.0%	13	65.0%	30	75.0%
Infection	Yes	0	0.0%	0	0.0%	0	0.0%
	No	20	100.0%	20	100.0%	40	100.0%
Pressure Sore	Yes	0	0.0%	2	10.0%	2	5.0%
	No	20	100.0%	18	90.0%	38	95.0%

4. DISCUSSION

In this study the mean age of patients was 6.23years, with the range of patients' age being 4-5 years which accounted for 50% of total patients followed by 8-10 years of age group which accounted for 27.5% of total patients. 22.5% of patients were in age group of 5-6 yrs.

In 2010, Sassendar S et al assessed the validity of surgical interference with elastic nailing in treating pediatric femur fractures in comparison with the traditional treatment method- hip spica casting.

Sixteen consecutive femur fracture in children 5-15 years of age were recruited prospectively over 13 months. An equal number of age matched children treated by spica casting were recruited retrospectively. Among the 16 patients managed with titanium elastic nails there were 12 boys and 4 girls. The mean age was 10 years and the median body weight was 26.5 kg (range,15-47 kg) of the 16 patients in the spica group, there were 13 boys and 3 girls with a mean of 9.25 years. Titanium elastic nailing led to better outcome compared to hip spica casting in terms of early union, lower rate of malunion, short rehabilitation milestone and better functional outcome score⁽¹¹⁾.

In 2014 Mohammadrahullah. et al. compare primary hip spica or traction followed by hip spica with closed reduction and fixation with retrogradely passed crossed rush pins for diaphyseal femur fracture in 25 children of age group -12years randomly distributed in each group. Fifty children (age 3-13 years, mean 9 years) with femoral fracture were evaluated 25 of them were underwent the conservative treatment using immediate hip spica and 25 underwent treatment with crossed retrograde rush pin mean duration of fracture union as within 15 weeks in group A and 12 week in group B. Mean duration of weight bearing was 14 week in group A and 7 weeks in group B. Mean hospital stay were 4 days in group A and 8 days in group B. Closed reduction and Internal fixation with crossed rush pin was a superior treatment method in term of early weight bearing and restoration of normal anatomy⁽¹²⁾.

In our study 34 patients had closed fracture of shaft femur and 6 had open fracture of shaft femur. Based on level of fracture 10 patients had fracture of proximal 3rd of shaft femur, 20 patients had fracture of middle 3rd and 10 had fracture of distal 3rd of shaft of femur. Based on pattern of injury, 10 had oblique fracture 5 had spiral fracture and 25 had transverse fracture pattern. 20 patients were treated with hip spica cast and 20 were treated with titanium elastic nailing system.

5. CONCLUSION

Based on our experience and result, elastic intramedullary nailing is simple, easy, effective method in treatment of managing pediatric diaphyseal femur fracture in children age group 4-10 years as compared to hip spica cast with shorter operative time, short hospital stay, reasonable time for fracture healing, early mobilisation making it ideal treatment of choice in pediatric diaphyseal femur fracture. Patient felt much comfortable after TENS application as compared to hip spica application. Parents of children treated with TENS were observed to be happier than other group. Problem relating to micturition and defecation in TENS group were less than hip spica treatment.

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