

Outcome of early versus delayed spica cast treatment of closed femoral shaft fracture in children of age 6 months to 10 years

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Abstract

Background: Femoral shaft fractures are among the commonest fractures of the lower extremity in children and commonly require hospital admission. There are various modalities of treatments both operative and non-operative. The aim of treatment is to secure union, in good alignment with length restored and early rehabilitation

Objective: To compare the results of early spica cast and skin traction followed by spica cast in the treatment of femoral shaft fractures in children (6 months to 10 years).

Method: A total of 64 patients with fracture shaft femur of either sex aged 6 months-10 years with closed, isolated diaphyseal femur fracture were included in the study. Cases with clinical evidence of infection, pathological fractures, and multiple injuries including neurovascular injuries were excluded from the study. The patients were randomly assigned into two groups; Group-I (n-32) patients who underwent early spica application while Group-II (n-32) patients underwent skin traction in followed by spica cast.

Results: Mean age in group A was 5.06 years and 5.12 years in group B (range 6 months to 10 years). Ratio of males and female in Group A and Group B was 19:13 and 20:12 respectively. Average duration of hospital stay was 1.65 days and 11.65 days in group A and Group B respectively. Average total time of spica cast application was 45.13 days and 49.41 days in group A and group B patients respectively.

Conclusion: There were no significant differences between early and delayed spica regarding the complications of treatment and functional outcome. But immediate spica decreased the hospitalization time and the cost of treatment significantly with increased availability of beds while having similar result as achieved by delayed spica application.

Keywords: Femur, Fracture, Hip spica, Traction.

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*Article History:

Received: 31/01/2019
Revised: 02/02/2019
Accepted: 13/02/2019
DOI: <https://doi.org/10.7439/ijbr.v10i2.5072>

QR Code



How to cite: Salam A and Anjum R. Outcome of early versus delayed spica cast treatment of closed femoral shaft fracture in children of age 6 months to 10 years. *International Journal of Biomedical Research* 2019; 10(02): e5072. DOI: 10.7439/ijbr.v10i2.5072
Available from: <https://ssjournals.com/index.php/ijbr/article/view/5072>

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1. Introduction

Femoral shaft fractures can occur in children of all ages. They account for 1.6% of all childhood fractures, and they lead to significant impact on the child and family [1]. Direct or indirect loading of diaphysis of a femur may result in fractures. Direct hit on the thigh by an automobile results in direct violence leading to fracture which is transverse or with butterfly fragment, whereas indirect violence or rotational force results in spiral or oblique fracture of diaphysis of femur [2,3]. The etiology of the femoral shaft fractures varies with the age of the child with the fall from the height and road traffic accident being the most common cause [4, 5]. The diaphysis of femur has an excellent blood supply and therefore good healing potential and due to the

extensive musculature surrounding it causes displacement [6,7]. Hemorrhagic shock and secondary anemia are the most important early complications, whereas, the late complications include prolonged recumbency, joint stiffness, malunion, nonunion, leg length discrepancy and infection [8]. The aim of treatment is to secure union, in good alignment with length restored and early rehabilitation [9]. Various method for treating femur shaft fractures in children are Pelvic harness, padding, hip spica cast, skin traction (can be followed by hip cast), skeletal traction, elastic intramedullary nails and semi-rigid pediatric locking nail [10,11].

In children pica casting or Initial traction followed by spica casting is an effective treatment modality, largely

because they have a tremendous ability to remodel the deformities that remain after closed treatment in remodeling stage of fracture healing [12].

A number of variables including age and weight of the child, type of fracture, associated injuries or polytrauma and socioeconomic status of the family affect the decision to manage a femoral shaft fracture by conservative or operative means [13].

2. Methods and Materials

A comparative study was conducted at Govt District Hospital Rajouri, Jammu and Kashmir from January 2017 to December 2018. This study consists of thirty (64) patients of either sex with fresh (upto one week from time of injury) isolated closed diaphyseal fractures of femur from 06 months to the age to ten years. Children less than 6 months of age and older than 10 years of age, Open fractures, Infected cases, Poly trauma cases, Pathological fractures, Multiple and segmental fractures were excluded from study. The patients were randomly divided in to two groups.

1. **Group A:** It consisted of 32 patients who were treated by immediate spica cast. Hematoma infiltration with 2% xylocain with 22 Guage needle and midazolam sedation was given for muscle relaxation. Fracture was assessed by telescopic method for the alignment and angulation correction. Traction and counter traction was applied by two assistants.

2. **Group B:** It also consisted of 32 patients which were treated with initial skin traction followed by hip spica cast. The injured limb was put on skin traction using weight appropriate for age; limb position was adjusted with sand bags. X-rays were taken after 4-5 days of skin traction to check fracture alignment. After 7-21 days of traction, when fracture had become sticky, well moulded one and half spica was applied under GA.

Parents were given instructions regarding spica care before discharging the patients. Regular follow up at 1, 4, 6, 10 and 12 weeks. At each visit spica was checked for cracks and skin of child was examined. X-rays were taken at 6, 10 and 12 weeks. Clinical examination was performed after removing the cast to evaluate gait, limb length discrepancy and malalignment.

2.1 Statistical analysis

For data entry and analysis Statistical software SPSS 20.0 was used. Statistical comparison between Group A and Group B was performed by using Chi square/fisher exact test for qualitative variables and student test for quantitative variables.

3. Results

A total of 64 children were included in the study with 32 children in each group. Mean age in group A was 5.06 years (range 6 months to 10 yrs) and 5.12 years (range 6 months to 10 yrs) in group B (table 1) Ratio of males and female in Group A and Group B was 19:13 and 20:12 respectively. Right side was involved in 15 and 14 patients in group A and B respectively whereas 17 and 18 patients had left side involvement in group A and B respectively.

The mechanism of injury was fall from height in 14 (43.75%), RTA in 5 (15.62%), fall of object in 8, (25%) sports injury in 3 (9.37%) and hit by animals in 2 (6.25%) in Group A patients whereas in Group B patients fall from height, RTA, fall of object, sports injury and hit by animals was seen in (15, 5, 7, 3 and 2 patients respectively. Proximal, Middle third and distal third fracture was seen in 9, 12 and 11 patients in Group A and 11, 11, and 10 patients in group B.

Level of fracture: Spiral, oblique and transverse fracture was seen in 12, 10, 10 in group A children and 13, 10 and 9 in group B children respectively.

Table 1: Demographic characteristic according to treatment group

Demographic characteristic		Group A Hip spica cast (n=32)	Group B Initial traction followed by hip spica cast (n=32)
Number of patients		32(50%)	32(50%)
Average age(years)		5.06	5.12
Age (years)	0-3	6 (18.75%)	7 (21.87%)
	3-5	11 (34.37%)	10 (31.25%)
	5-7	7 (21.87%)	7 (21.87%)
	7-8	5 (15.62%)	5 (15.62%)
	8-10	3 (9.37%)	3 (9.37%)
Gender M/F (% of patients)		19:13	20:12
Side (L/R) (% of patients)		15:17	14:18
Types of fracture (% of patients)	Spiral	12 (37.5%)	13 (40.62%)
	Oblique	10 (31.25%)	10 (31.25%)
	Transverse	10 (31.25%)	9 (28.12%)
Mechanism of injury (% of patients)	RTA	5 (15.625%)	5 (15.62%)
	Fall from height	14(43.75%)	15 (46.87%)
	Fall of object	8 (25%)	7 (21.87%)
	Sports injury	3 (9.37%)	3 (9.37%)
	Hit by animals	2 (6.25%)	2 (6.25%)
Level of fracture (% of patients)	Proximal	9(28.12%)	11(34.37%)
	Middle third	12 (37.5%)	11 (34.37%)
	Distal third	11 (34.37%)	10 (31.25%)

Limb length discrepancy:

Among children in group A no discrepancy was seen in 27 (84.37%), and discrepancy of 2-3 cm was seen in 5 children (15.62%). Whereas among children in group B

no discrepancy was seen in 30 (93.75%), and discrepancy of 2-3 cm was seen in 2 children (6.25%). None of the children in either had discrepancy of more than 3 cm.

Table 2: Limb length discrepancy

Limb length discrepancy	Group A (n= 32) Hip spica cast	Group B (n= 32) Initial traction followed by hip spica cast	P value
No discrepancy	27(84.37%)	30 (93.75%)	0.236
2-3 cm	5 (15.62%)	2 (6.25%)	
3-4 cm	0	0	
>4 cm	0	0	

Angulation:

Among children in group A angulation of 10-15 ° was seen in 24 (75%), angulation of 15-20 ° was seen in 6 children (18.75%) and angulation of more than 20 ° was

seen in 2 (6.25%) . Whereas among children in group B angulation of 10-15 ° was seen in 22 (68.75%), angulation of 15-20 ° was seen in 8 children (25%) and angulation of more than 20 ° was seen in 2 (6.25%) .

Table 3: Angulation

Angulation	Group A (n=32) Hip spica cast	Group B (n=32) Initial traction followed by hip spica cast	P value
10-15	24(75%)	22(68.75%)	0.679
15-20	6(18.75%)	8 (25%)	
>20	2(6.25%)	2 (6.25%)	

Range of movements (Hip and Knee at 6 week):

In Group A, 4(12.5%) children were having free range of movements at hip and knee at 6 weeks, while 26 (81.25%) patients have decreased range of movements by 20° and 2 (6.25%) patient developed decreased range of movements more than 20°. Where as in patients of Group

B, 6 (18.75%) patients were having free range of movements at hip and knee at 6 weeks, while 24 (75%) patients have decreased range of movements by 20° and 2(6.25%) patient developed decrease in range of movements of more than 20°.

Table 4: Range of movements

ROM at 6 weeks (Hip & knee)	Group A (n=32) Hip spica cast	Group B (n=32) Initial traction followed by hip spica cast	P value
Free	4(12.5%)	6 (18.75%)	0.592
Decreased by 20 °	26 (81.25%)	24(75%)	
Decreased by >20 °	2 (6.25%)	2(6.25%)	

Quadriceps wasting at 6 weeks: Among children in group A 4 (12.5%) children had no wasting whereas 26 (81%) and 2 (6.25%) had mild to moderate and severe

wasting respectively. Among children in group B no wasting was seen in 6 (18.75%) cases, 24(75%) had mild to moderate wasting and 2(6.25%) had severe wasting.

Table 5: Quadriceps wasting at 6 weeks

Quadriceps wasting at 6 weeks	Group A (n= 32) Hip spica cast	Group B (n=32) Initial traction followed by hip spica cast	P value
No wasting	4(12.5%)	6(18.75%)	0.529
Mild to moderate	26(81.25%)	24(75%)	
severe	2(6.25%)	2(6.25%)	

Average duration of hospital stay was 1.65 days and 11.65 days in group A and Group B respectively.

Average total time of spica cast application was 45.13 days and 49.41 days in group A and group B patients respectively.

Table 6: Average hospital stay and Total time of Hip Spica Cast

Group	Hospital stay(Days)	P value
A(n=32)	1.65	0.01
B(n=32)	11.67	

Table 7: Total time of Hip Spica Cast

Group	Total time of Hip Spica Cast (Days)	P value
A(n=32)	45.13	0.01
B(n=32)	49.41	

4. Discussion

Femoral shaft fractures can occur in children of all ages. They account for 1.6% of all childhood fractures, and they lead to significant impact on the child and family [1]. Various method for treating femur shaft fractures in children are Pelvic harness, padding, hip spica cast, skin traction (can be followed by hip cast), skeletal traction, elastic intramedullary nails, semi-rigid pediatric locking nail, submuscular[10,11].

This study analyses the results of two different non-operative treatment of femoral shaft fracture in children 6 months to 10 years. The first one, consisting of immediate reduction and early hip spica casting and the second corresponds to Initial traction followed by hip spica cast.

Closed diaphyseal fractures of femur in children are usually treated by initial traction by 7-21 days followed by an additional period of immobilization in hip spica till the union occurs. However treatment like this would lead to prolonged hospital stay resulting in increasing cost and occupancy of hospital beds.

In addition, such treatment would also lead to an extended period of patient's separation from their families.

Immediate and early closed reduction and hip spica casting is an acceptable nonsurgical treatment for children with isolated femoral shaft fractures, especially those younger than 10 years of age[14,15].

In our study no significant difference in limb length discrepancy, angulation, range of movements and Quadriceps wasting at 6 weeks was seen among two groups, however a significant difference in hospital stay duration (p value 0.01) and total time of spica cast application (p value 0.01) was seen among two groups.

Hip spica cast is simple, safe, effective, cheap and definitive method of treatment and does not need prolonged hospital stay.

Results of our study are comparable with other studies. Studies by Faheem *et al* [16], Allen *et al.* [17], Staheli and Sheridan [18], Splain and Denno [19], Sugi and Cole [20], Henderson *et al* [21] did not find much difference in outcome between early spica cast and skin traction followed by spica cast.

With increasing number of patients, the availability of beds is a problem in our setup. There are encouraging results with spica cast from many years. Hip spica cast avoids prolonged hospitalization thus reducing cost of treatment and allows rapid return of a child to family environment

5. Conclusion

Hip spica cast is simple and effective method of treatment. A satisfactory outcome can be achieved by any of the two methods. Hip spica cast avoids prolonged hospitalization thus reducing cost of treatment and reduces

occupancy of hospital beds. Hip spica cast also avoids complications related to traction and operative treatment methods. The results achieved with both the non operative methods of treating the closed diaphyseal fractures of femur in children are nearly same, that is insignificant. So we feel that in our setup, hip spica cast is the best method for treating the closed diaphyseal fractures of femur in children.

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