

Skin Traction and Spica Casting for Treatment of Femoral Shaft Fractures in Children

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ABSTRACT

Aim: To determine the outcome of skin traction and spica casting for treatment of femoral shaft fractures amongst children.

Study Design: Cross-sectional study

Place and duration of study: Department of Orthopaedic Surgeries, Civil Hospital Bahawalpur and Nishtar Hospital Multan from 1st July 2018 to 30th June 2019.

Methods: Seventy three children, aged 6 to 10 years, with closed femoral shaft fractures, who came to emergency department of orthopaedics within 24 to 48 hours following injury were enrolled. Skin traction was applied immediately after admission for 2-3 weeks, after confirmation of signs of fracture consolidation by the nonappearance of tenderness at the fracture site hip spica cast was applied. Follow up examination was scheduled fortnightly and cast integrity was checked. After removal of cast, final results were assessed.

Results: Mean age of the children was 8.1±2.4 years. There were 54(73.9%) male and 19(26%) females. Angular deformity was not noted in any of the cases. In 6–10 years age group, shortening was noted in 6(8.2%). Outcome after removing spica cast, outcome was recorded as satisfactory in 67 (91.7%) of the cases.

Conclusion: Skin traction and spica casting is simple, effective and definitive method of most femoral shaft fracture in children age 6-10 years.

Keywords: Skin traction, Spica casting, Femoral shaft fractures

INTRODUCTION

Femoral shaft fractures (FSFs) are known as the commonest diaphyseal fractures in children after radial, ulnar and the tibial shaft.¹ Femoral shaft fractures are considered to be temporarily disabling injuries amongst children but chances of fatal injuries and lasting disabilities may occur following high energy trauma.² Child abuse, neuromuscular disorders as well as metabolic diseases of the bone are also the cause of FSFs. Amongst children, FSFs form about 1.6% of all kind of bony injuries. More than 2 folds are reported to be males.^{3,4} Incidence of FSFs ranges between 15.7 to 45.5 per 100,000 people per year in low and middle income countries⁵.

Muscle weakness, neurovascular injuries, re-fracture, compartment syndrome and infection are some of the complications related with FSFs⁶. In terms of classifications FSFs are proximal, middle and distal 3rd of shaft. Most frequently, middle 3rd of femoral shaft are involved.⁷ Classification is according to fracture's pattern, degree of comminution as well as associated wound. A thorough understanding of aetiology, methods of treatment and its response are essential for handling FSFs⁶.

Traction, spica casting, internal, external or intramedullary fixation are some of the treatment methods for FSFs. Controversy exist about opting the best method while the choice is influenced by age, associated injury, level as well as pattern of fracture and surgeon's own preferences.⁸ It is also observed that psychological and financial outcomes are considered more commonly related

with the methods of treatment for FSFs.⁹ While searching for the evidence, no consensus exist upon best choice of treatment¹⁰.

Non-operative management is considered to be best choice for closed FSFs amongst children¹¹. Surgical methods accompany risk of complications like infection, re-fracture, neurological injury, shortening of limb or overgrowth and osteonecrosis related to femoral head are also reported. Limb length discrepancy of 22% was recorded in an international study¹² in cases managed with traction and casting whereas in another study of 207 cases treated by the same method, no major residual angular deformities were noted. With the planning of current study, we planned skin traction and spica casting for managing FSFs amongst children, conservatively without any surgical intervention, as this will be tested as an ideal modality with lesser complications.

MATERIALS AND METHODS

This hospital based cross sectional study was carried out in the Department of Orthopaedic Surgeries, Civil Hospital Bahawalpur and Nishtar Hospital Multan from 1st July 2018 to 30th June 2019. A total of 73 children, aged 6-10 years, having closed FSFs and reporting within 24-48 hours of injury in emergency orthopaedic department, were considered. Children with polytrauma, with pathological fractures, with open injuries or whose parents did not give consent were excluded. Patients were admitted in ward and skin traction was applied for 2-3 weeks. After

conformation of signs of consolidation that is the nonappearance of tenderness at the fracture site, hip spica cast was applied by the surgical team. Initially short leg cast was applied on the injured side with foot in neutral position and let it settled and dried. After this the child shifted lightly from bed to spica table. Knee was flexed to 90° and hip at 45° flexion, 30° abduction and 20° lateral rotation for proximal 3rd fractures. 30° flexion, 20° abduction and 15° lateral rotation for middle 3rd fractures and 20° flexion, 20° abduction and 15° lateral rotation for distal 3rd fractures. Hip spica cast was done with thigh of the other lower limb included in the cast. Proximal extent of cast was up to nipple line. Circular window was made over the lower chest and upper abdomen to ease the respiration. A side bar was applied on the injured side over lateral aspect of limb from knee to chest portion of spica cast. Antero-posterior as well as lateral radiographs were acquired after application of spica. The children were sent home the next day after application of spica. Follow up examination was scheduled fortnightly and cast integrity was checked. In cases <8 years, cast removed at 6th week. In cases of >8 years, cast removed at 8th week. Any shortening of the fractured limb compared with the normal limb was determined by measurement of distance between the anterior superior iliac spine and medial malleolus. Outcome was determined on the basis of limb length discrepancy (LLD). Shortening of <15 mm was labelled as satisfactory and >15 mm as unsatisfactory as recommended in Rockwood and Green's Fracture in Children". Data were analyzed by SPSS-20. Chi square test having p value ≤0.05 was taken statistically significant.

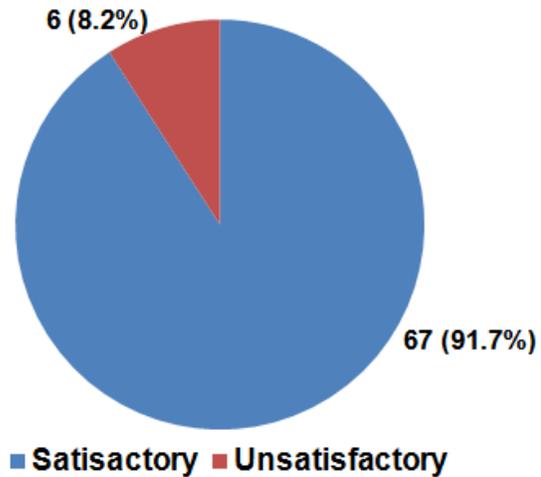
RESULTS

There were 43 (58.9%) were 6 to 8 years of age, and 30 (41.0%) between 8 to 10 years whereas mean age was 8.4 years with standard deviation of 2.2 years..There were 54 (73.9%) male and 19 (26.0%) female and male to female ratio of 2.6:1. Left side was more commonly affected 39 (53.4%) whereas right side was affected in 34(46.5%). Figure 1 showed satisfactory outcome in 67(91.7%) children and unsatisfactory in 6 (8.2%), of these 2 were 6 to 8 years and 4as 8 to 10 year age group. Amongst 54 males, 51(69.8%) had satisfactory outcome while out of 19 females, 16(21.9%) showed satisfactory outcome. Statistical no significant difference was noted in terms of outcome with regards to gender, age groups or side affected (p value >0.05)

Table 1: Comparison of outcome with age, gender and side affected

Variable	Outcome		P value
	Satisfactory	Unsatisfactory	
Age (years)			
6 - 8	41 (56.1%)	2 (2.7%)	0.274
>8- 10	26 (35.6%)	4 (5.4%)	
Gender			
Male	51 (69.8%)	3 (4.1%)	0.229
Female	16 (21.9%)	3 (4.1%)	
Side Affected			
Right	31 (42.4%)	3 (4.1%)	0.815
Left	36 (49.3%)	3 (4.1%)	

Fig. 1: Outcome in children with femoral shaft fracture after removal of spica cast



DISCUSSION

The treatment goal in FSF in children is to achieve union without discrepancy in limb length and deformity. To achieve this, many treatment options are available.² We noted outcome after removal of spica cast and we noted that 90.9% children had satisfactory outcome whereas no complications were seen. The results of this study in terms of outcome were very comparable with other national and international findings. Sidiqi and colleagues¹³ in a local study analyzed skin traction followed by spica cast in comparison to early spica cast in FSFs amongst children. The researchers noted a satisfactory outcome in 95% of the cases while only 5% of the cases had unsatisfactory outcome, showing desirable results like our findings. The researchers¹³ found satisfactory outcome in both early spica cast and with skin traction followed by spica cast while very few complications amongst cases but the authors concluded that skin traction followed by spica cast was better in terms of lesser length discrepancy, deformities, joint stiffness and less period of immobilization in spica cast while very few complications (ulceration, pressure sores and loss of reduction) noted.

Lee and colleagues¹² assessing outcome of skin traction followed by spica casting for closed FSFs amongst 63 children. The authors shared that they noted no case of malunion as well as nonunion while they also noted that no rotational deformity was recorded. The same study did not have any noteworthy LLDs or any other complications. No instances of loss or reapplication of spica cast aiming loss of fracture reduction was noted. At the time of last follow up, LLD was recorded in 22.2% cases however no case had >1.5cm discrepancy. Lee et al¹² also concluded that skin traction followed by spica casting for closed FSFs was seen as safe, cost effective with very little complication rate. Past research have shown good outcome analyzing studied method except in children who are older, having open or multiple fractures or those who have large stature^{14,15}.

Other surgical approaches cost much more as compared to traction and spica casting however traction

have been noted to have prolonged hospital stays. Cost handling complications needed for 2nd surgery are an obvious factor adding up in overall cost. It has also been documented that flexible intramedullary nailing was seen to cost 1.5 times more in comparison to traction and spica casting¹².

Resolution of FSFs has seen good results with conservative treatment. We noted excellent recovery in studied children that was without any events. Our results could be credited to cautious assessment of alignment related to fracture during traction while spica casting technique also requires proper handling. Right monitoring during healing period should also be practiced for better outcomes.

CONCLUSION

Skin traction and spica casting is simple, effective and definitive method of treatment for most FSFs amongst children. There are lesser complications with this mode of treatment while no risk of anaesthesia and surgical intervention. Less period of immobilization in spica cast as compared to patients managed with early spica cast. Loss of reduction is minimal as fracture is sticky when spica cast is applied.

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