# Early Hip Spica Cast Application in Treatment of Femoral Shaft Fracture in Children

Amjad Maqsood, Kanwar Wasif Ali, Talal Ahmad Lodhi

## ABSTRACT

**Objective:** To determine the efficacy of early hip spica cast application for the management of femur shaft fractures in children.

**Material and Methods:** This descriptive study was carried out in the Department of Orthopaedic Surgery, Nishtar Hospital, Multan from April 2008 to October 2008. Children with closed non-comminuted fracture of the shaft of femur, presenting in emergency orthopaedic department within 24-48 hours of injury were selected in the study.

**Results:** Mean age of the children was 5.4±1.76 years. Male to female ratio was 2.6:1. There was no complication of angular deformity or LLD in children of age 2–5 years. While in 6–10 years age group, angular deformity was observed in 3 cases and shortening was observed in 3 cases. Outcome after removal of spica cast was satisfactory in 100% children of 2–5 years and 78.3% satisfactory results achieved in children between 6–10 years of age.

**Conclusion:** Early hip spica cast immobilization is effective easy method for stabilization femur shaft fractures in children.

**Key Words:** Femur, Fracture, traction, Spica cast.

## INTRODUCTION

Femur shaft fractures are the commonest diaphyseal fractures in children.[1] Although femoral shaft fractures are a temporarily disabling injury in children yet if these fractures occur as the result of high energy trauma can be both life-threatening injuries and cause of severe permanent disability.[2] These fractures represent 1.6 % of all bony injuries in children.[3] The incidence of femur shaft fractures in children is supposed to have 2 peaks, first at the age of 2 to 3 years and additional during adolescent.[4]

Leg-length discrepancy, angular deformity, rotational deformity, and non union are commonly reported complications following paediatric femoral shaft fracture. Other complications include muscle weakness, neurovascular injury, refracture, compartment syndrome, infection, and knee subluxation (with skeletal traction).[5]

Fractures of the femur shaft are classified into proximal, middle and distal third of shaft. Fracture most commonly involves middle third of femoral shaft.[6] Fractures are also classified on the basis of pattern of fracture, degree of comminution and associated wound. Most common pattern of fracture in children is simple transverse, closed, non-comminuted injury.

Femur is the major weight bearing bone and its fracture can present formidable management problems.[7] Similar to the adult, the child's femur can fracture at the level of the hip, more distally at the knee, or throughout the length of the femoral shaft.

Young children have traditionally been treated conservatively with good results. The major complications faced by the family caring for a child in spica cast was moving, cast intolerance by the child and keeping the child cleaning.[8,9] The major advantage of early spica cast without preliminary traction is a short hospital stay allowing cost containment and rapid return to the child's everyday environment.[16] An international study has reported successful results in 86% of the cases.[11]

### OBJECTIVE

To determine the efficacy of early hip spica cast application for the management of femur shaft fractures in children.

## MATERIAL AND METHODS

This descriptive study was carried out in the Department of Orthopaedic Surgery, Nishtar Hospital Multan from April 2008 to October 2008.

*Department of Orthopadic, Nishtar Medical College/Hospital, Multan*
*Correspondence: Amjad Maqsood,*
*Email: dramjad@yahoo.com*

Children with closed non-comminuted fracture of the shaft of femur, presenting in emergency orthopaedic department within 24-48 hours of injury were selected in the study.

## RESULTS

Present study included 40 cases of femoral shaft fracture in children between 2–10 years of age. There were two main age groups i.e. 2–5 years having 17 children and 6–10 years having 23 children. Majority of the children (57.5%) in our study belonged to the age group 6–10 years, while rest 42.5% children were between 2–5 years of age. Mean age of the children was 5.4±1.76 years. There were 29(72%) male and 11(28%) female cases. Male to female ratio was 2.6:1. Regarding the side affected, left side was more common and 52.5% children had fracture of femur on the left side whereas the rest 47.5% had right side affected. Mean weight of the children between the two groups were quite different i.e. in age group 2–5 years the Mean±S.E. weight of the children was 36.29±2.06 lbs and in age group 6–10 years the Mean±S.E. weight of the children was 50.70±3.11 lbs. Results were evaluated according to Rockwood and Green's criteria for assessment. Outcome after removal of spica cast was satisfactory in 35(87.5%) children and unsatisfactory in 5(12.5%) cases. All these 5 cases belonged to the age group 6–10 years. Results were satisfactory in 25(86.2%) males and unsatisfactory in 4(13.8%) males out of the total 29 males. While 10 females (90.9%) showed satisfactory results and 1 female with spica cast application is shown in Table-1. There was no complication of angular deformity or LLD in children of age 2–5 years. While in 6–10 years age group, varus angulation was noted > 10º in two cases and valgus angulation was more than 10º in one child. Anterior/posterior angulation was satisfactory but there was shortening of > 15 mm in three cases. (9.1%) had unsatisfactory results out of the total 11 females.

**Table 1:** Fracture Union According to Criteria

| Age (years) | Varus angulation | | Valgus angulation | | Anterior angulation | | Posterior angulation | | Shortening (mm) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Range | No | Range | No. | Range | No. | Range | No. | Range | No. |
| 2–5 | <15º | 11 | < 15º | 6 | < 20º | 10 | < 20º | 5 | < 20 | 17 |
| | >15º | 0 | > 15º | 0 | > 20º | 0 | > 20º | 0 | > 20 | 0 |
| 6–10 | <10º | 12 | < 10º | 7 | < 15º | 9 | < 15º | 8 | < 15 | 18 |
| | >10º | 2 | > 10º | 1 | > 15º | 0 | > 15º | 0 | > 15 | 3 |

The final results were evaluated after fracture union using criteria recommended in Rockwood and Green's "Fracture in children" as given under.

| Age (years) | Varus angulation | Valgus angulation | Anterior angulation | Posterior angulation | Shortening (milimetre) | Outcome |
|---|---|---|---|---|---|---|
| 2–5 | < 15º | < 15º | < 20º | < 20º | < 20 mm | Satisfactory |
| | > 15º | > 15º | > 20º | > 20º | > 20 mm | Unsatisfactory |
| 6–10 | < 10º | < 10º | < 15º | < 15º | < 15 mm | Satisfactory |
| | > 10º | > 10º | > 15º | > 15º | > 15 mm | Unsatisfactory |

## DISCUSSION

Paediatric femoral fractures are common[12] and expensive.[13] numerous options are available for treatment. Non-operative treatment options include functional treatment for the adolescent, Pavlic harness, skin or skeletal traction, and spica casting. Operative treatment options include external and internal fixation, minimally invasive plate osteosynthesis (MIPO) and intramedullary nailing with flexible or inflexible nails.[14]

Conservative treatment of femur shaft fractures in children is skin traction followed by a hip spica and also early reduction and hip spica cast gaining popularity as an successful treatment modality.[15]

Present study dealt with hip spica application as a treatment option for the fracture of femur shaft. Regarding demographic data, in present study mean age of the children was 5.4±1.76 years with a male to female ratio of 2.6:1. Similar findings have been reported in National and International

literature.

Ali and Raza[14] have reported in their study that mean age was 5.48±2.67 years and male to female ratio was 1.6:1. In another study the mean age of the children with femoral shaft fracture was 6.5 years (range: 1.2 to 12).[15] Epps and associates[16] have reported average age 3.3 years and male to female ratio 2.75:1 in their study.

In our study the outcome after removal of spica cast and after final assessment revealed that 87.5% of the children had satisfactory results. While in 12.5% the results were unsatisfactory. In present study we divided the children in two age groups i.e. 2–5 years and 6–10 years for evaluation of results. The age group of children 2–5 years achieved 100% satisfactory results. While in the other group satisfactory results were 78.3%.

Out of the 5 children with unsatisfactory results, 3 children had angular deformity (2 children had varus angulation > 10º and 1 children had valgus angulation > 10º). Three children had limb length discrepancy > 15 mm. No other complications were noted. Results of our study regarding functional outcome of treatment with immediate spica cast are comparable with local and International studies.

In a recent Pakistani study, Sidiqui et al[17] compared the results of femur shaft fractures in children with skin traction followed by spica cast versus early spica cast. The results of their treatment were satisfactory in 81% and unsatisfactory in 19% cases. Three (14.3%) patients developed more than 2 cm shortening and two (9.5%) patients unacceptable angulation, the latter was corrected by wedging the cast. All the patients had a shortening between 8-18 mm (average 10.5 mm).

Although they found satisfactory results treated with early spica cast and good results in children treated with skin traction followed by spica cast and there were fewer complications in this group, but the hospital stay was prolonged making the treatment costly. However, they concluded that the latter method was better because of lesser length discrepancy, less deformity, less joint stiffness, lesser period of immobilization in spica cast, and fewer complications like ulceration, pressure sores and loss of reduction.

Singh and Associates[18] suggested that early closed reduction and placement of hip spica cast is a safe and reliable treatment option.

As per review literature many authors did not find much difference in the outcome between early spica cast and skin traction followed by spica cast in conservative treatment of femur shaft fracture in children.[19,20] However, Staheli and Sheridon found a length discrepancy less than 7 mm while following a group of children under nine years.[21] Sugi and Cole[22] in their long term series on femoral shaft fracture in children concluded that the leg length discrepancy was rare and clinically insignificant.

Buehler et al[23] have been reported an 18% unacceptable shortening (>2.5 cm) in patients treated with early spica casting. Martinez et al[24] found the commonest complication of early (within 7 days of injury) spica casting in 43% (22/51) of the patients with shortening of >2 cm.

Puttaswamaiah et al[15] found that non operative treatment often results in malunion at the fracture. In their study 30% children had rotational malunion of > 20 degrees compared to the uninjured side.

Al-Mohrij and colleagues[25] in their study conducted at Saudi Arabia concluded that hip spica casting without traction for femoral fracture in children aged 0-4 years produces excellent results and continues to be the treatment of choice.

Bopst and Colleagues[26] have reported that spica cast immobilization is the preferred treatment for closed femur fracture in preschool children.

Epps et al[16] claimed that immediate spica cast application is the standard of care for young children with isolated femur fractures. He suggested that single-leg spica can safely, effectively manage low-energy femur fractures in young children.

Lebel and Associates[27] suggested that immediate application of spica cast for paediatric femur fractures, achieves its goals of appropriate fracture-alignment and acceptable complication rates.

Infante et al[19] have reported that all of the children returned home within 24 hours of the procedure in their study. All 175 femur fractures united within 8 weeks.

Wright et al[28] however, disagreed and found that early application of hip spica has a small role in the treatment of paediatric femoral fractures.

Conservative treatment gives good results in children under 5 years of age. The major advantage of early spica is a short hospital stay allowing cost containment and rapid return to the child's everyday environment. However, frequent follow-up with repeated radiographs is required in the first 3 weeks to detect shortening and displacement of the fracture in the spica cast.

## CONCLUSIONS

Early hip spica cast immobilization is effective easy method for stabilization femur shaft fractures in children.

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