

## 90-90 Hip Spica for Femur Shaft Fractures in Children

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### ABSTRACT

**Aim:** To evaluate the role of 90-90 hip spica in the treatment of femoral shaft fractures in children from 6 months to 6 six years of age.

**Place and duration of study:** This descriptive cross sectional study was conducted at Unit A Department of Orthopaedics and Traumatology, MTI Khyber Teaching Hospital KPK Peshawar Pakistan from April 2015 to April 2017.

**Methods:** Twenty three children of femur shaft fractures were included. Data including age, sex, fracture level, complications during treatment and final outcome with reference to radiology and functions were recorded.

**Results:** There were 8 (34.7%) females and 15 (64.28%) males were included in the study. Seventeen patients (73.91%) showed excellent and good results and 6 patients (26.08%) showed fair and poor results. Mean time of fracture healing was  $6.91 \pm 1.24$  weeks. Two patients ended up with skin breakage and excoriation around the groin. Six patients came up with leg length discrepancy which was less than 2 cm on last follow up. Mean leg length discrepancy was  $0.304 \pm 0.53$  cm. Mean angular deformity was  $9.22 \pm 5.62$  degrees and mean rotational deformity was  $5.17 \pm 5.69$  degrees.

**Conclusion:** 90-90 hip spica is for femoral shaft fractures in children below 6 years is simple, effective and technically easier and with excellent results. With perspective of discomfort and difficult care of straight spica and complications attached to surgical treatment 90-90 spica can be adopted as a first choice and index procedure for femoral shaft fractures in children.

**Keywords:** 90-90 hip spica, Femur shaft fractures, Children trauma

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### INTRODUCTION

Hip spica cast immobilization as a primary and definitive treatment has remained the treatment of choice in managing low-energy fractures of the femur in infants and young children for the last more than 130 years.<sup>1-3</sup> It is still an effective, efficient and commonly used method of treatment for femoral shaft fractures in young children.<sup>4-6</sup> The configuration of the hip spica has, however, evolved over time to provide better control over fracture alignment and prevent shortening.<sup>7</sup>

Conventionally the cast was applied with the hip and knee in extension. This used to work well for fractures of the distal third of the femur but the results were unacceptable for fractures of the proximal and middle third. To compensate for the pull of the muscles a different spica cast was applied with the femur positioned according to the level of the fracture.<sup>7</sup> In proximal shaft fractures the proximal fragment is in a position of flexion, abduction and external rotation because of the un-opposed pull of iliopsoas, abductors and short external rotators muscles. Such fractures require a hip spica with some 30 degree of abduction, 45 degree of flexion and 20 degrees of external rotation at the hip. In mid-shaft fractures the abductors and extensors are neutralized providing balance and requires about 30° of flexion at the hip and 10° of external rotation. On the other hand in supra-condylar fractures the distal fragment is in a position of hyperextension because of the over-pull of gasterocnemius<sup>8,9</sup>.

The "pontoon" 90-90 spica cast was introduced in the 1980's with the view that the same cast can accommodate all fractures types regardless of the level.<sup>6</sup> Moreover, it allowed ease of transporting the child but the 90-90 position was not tolerated well by children more than 3 years of age and a few cases of Volkmann contracture and compartment syndromes were also reported.<sup>10,11</sup>

The current trend in hip spica application is towards flexion attitude that is with the hip and knee flexed to 90 degrees. Flexion of more than 50 degrees helps prevent shortening and aids in transporting the child. To prevent compartment syndrome traction through the short-leg cast is avoided or the short-leg cast is not applied at all.<sup>12</sup>

The purpose of this study is to know the functional outcome of the hip spica cast in children aged 6 months to 6 years. As no study has so far been performed in Khyber Pukhtoon Khwa (KPK) and only a few in Pakistan. The study will also provide data which can be used as future guidelines and recommendation for management of these common fractures. The results will be shared to the local orthopaedicians and orthopaedic set ups both in public and private sector.

### PATIENTS AND METHODS

This descriptive cross sectional study was conducted at Department of Orthopaedics and Tramatology MTI Khyber Teaching Hospital Peshawar KPK Pakistan from April 2015 to April 2017. Patients with fresh femur fracture i.e., upto 3 days with no previous treatment, femur fracture from subtrochanteric area proximally to supracondylar area distally and age limit was from 6 months to six years were included. All patients who have polytrauma, neuromuscular

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and dermatological conditions, open fractures and intertrochanteric and neck fractures were excluded. All the patient were enrolled via OPD primarily and via referrals from lower orthopaedic centers and set ups. After admission informed consent was taken. Under general anaesthesia on spica table spica was applied. First a short leg cast was applied then traction and reduction of fracture in image intensifier then application of pelvic portion and finally femur shaft and a cross bar keeping hip and knee in flexion of 90 degree. Post operatively reduction was confirmed radiologically. After spica application abdominal distension, ileus and limb was observed for compartment syndrome. Patients were discharged after a period of 6 to 8 hours. Patients were followed two weekly for a period of 6 weeks to 8 weeks. Spica was removed after 6 weeks on clinical and radiological assessment. Partial weight bearing was allowed at removal of spica and full weight bearing two weeks after that. Patients with union from 6 to 8 weeks, LLD less than 1cm, angulation less than 10 and rotation less than 10 were taken as excellent (table 1). Patients with union within 6 to 8 weeks with angulation of less than 15 and rotation less 15 degree with LLD of less than 1 to 2 cm were taken as good. Patients with angulation and rotation more than 15 degree or patient with union after 8 weeks were noted. Hip spica cast is easy, cost effective and dependable modality of treatment. It can be taken as an index procedure in the treatment of femur shaft fractures in children age 6 months to six years. The data was entered and analyzed through SPSS-20.

**RESULTS**

A total of 23 patients 8 (34.7%) females and 15 (64.28%) males were enrolled in the study. Mean age o the patients was 49±12.87(2SD) months in the range of 24-66 months. Mean follow up was 7.57±1.59( 2SD) weeks with a range of 6 to 10 weeks. None of the patients was lost to follow up. Mechanism of injury was fall in 12 patients 9 males and 3 females, road traffic accident in 9 patients 7 males and 2 females and two patients were with object fall (Table 1). Functional outcome was assessed via knee hip range of motion, leg length discrepancy and parents satisfaction (Tables 2-3). Radiological outcome was assessed during follow up mean duration of union was 6.91±1.24 ( 2SD) weeks with range of 6 to 10 weeks. 73.91% (17 patients) showed excellent and good results and 26.08% (6 patients) patients showed poor results. Mean time of fracture healing was 6.91±1.24 (2 SD) weeks.

Table 1: Frequency of mechanism of injury (n=23)

Mechanism of injury	n	%age
Fall	12	52.2
RTA	9	39.2
Object fall	2	8.6

Table 2: Parents satisfaction

No. of patients	Parents satisfaction	Results	Union (weeks)
17	Very satisfied and satisfied	Excellent and good	6 to 8
6	Not satisfied	Poor	More than 8

Two patients ended up with skin breakage and excoriation around the groin. Six patients came up with leg length discrepancy which was less than 2 cm on last follow up. Mean leg length discrepancy was 0.304±0.53 (2SD) cm. Mean angular deformity was 9.22±5.62(2SD) degrees and mean rotational deformity was 5.17±5.69(SD) degrees. Among these six patients 4 were delayed union i.e. after six weeks and 2 ended up with treatment failure i.e. loss of reduction and no union in one patient and the other malunion i.e. after 8 weeks, angulation more than 15 and rotation more than 10. Both of these underwent intramedullary nailing under general anaesthesia. Four patients showed spica cast soakage and loosening which were dealt with reinforcing the cast with gypsona without anaesthesia as day care cases.

Table 3: Frequency of functional outcome

No. of pts	Angulation (degrees)	Rotation (degrees)	Limb length discrepancy (cm)	Results
17	< 15	< 10	< 2	Excellent & good
6	> 15	> 10	> 2	Poor

**DISCUSSION**

Femur fractures are common comprising of 15.15% of all children trauma.<sup>7,12,13</sup> Various treatments modalities have been in practice i.e. skin traction straight spica cast, femoral nails, titanium elastic nails, plating and external fixators.<sup>2,3,8</sup> Each of these methods have its merits and demerits. It is still a problem for orthopaeditions especially in children above five years. 90-90 hip spica is technically easier, cost effective modality with good functional results in femur fractures in children.

Our study is aimed to determine the outcome of 90-90 hip spica in femur fractures in children. 90-90 hip spica with a potential to address femur fractures at all levels effectively with excellent results as compared to straight spica. These facts make 90-90 spica the procedure of choice in femur shaft fractures in children. Many studies coin the same.<sup>1,2,3</sup> A locally prospective study in Pakistan done by Shah et al<sup>2</sup> enrolling 25 patients of which 22 patients were followed. Seven patients (31%) of their patients showed shortening of 0.32 cm to 2cm and angulation was found in 3 patients (13%). No non-union and malunion were reported. Our results are comparable to this study.

73.91% (17 patients) showed excellent and good results and 26.08% (6 patients) patients showed fair and poor results. Two patients ended up with skin breakage and excoriation around the groin. Six patients came up with leg length discrepancy which was less than 2cm on last follow up. Among these six patients 4 were delayed union i.e., after six weeks and 2 ended up with treatment failure i.e. loss of reduction and no union in one patient and the other malunion i.e., after 8 weeks, angulation more than 15 and rotation more than 10. Both of these underwent intramedullary nailing under general anaesthesia. No entity of infection or osteomyelitis was detected.

Few obstacles observed during the study like most patients were not strictly observing the two weekly follow up. This was because most of the patients comes from forplung areas of KPK where facilities for transportation and locomotion are scarce. We too observed few problems like perineal skin breakage and excoriation these were managed by topical ointment and emollients. Few patients showed softening of cast because of soiling of urine that were handled by cast augmentation.

Catena et al<sup>1</sup> and Shah et al<sup>2</sup> two of the Asian studies done on straight spica showing good results. By contrasting our study with those local papers our results are better. This is may be because diversity of 90-90 pantoon spica to address all types of femur fractures. Also our results may be better because of selection criteria of patients.

Although our study is showing good results in comparison to local and international studies. This may because our sample may not be truly representing our population being small sample size. Because of poverty and scarcity of resources follow up and exact guidelines cannot be practiced in its true sense. It is advised that further large, multicentric and polyvariant studies should be performed on 90-90 hip spica for femur fractures in children.

## CONCLUSION

90-90 hip spica is effective, technically easy and reproducible modality of treatment for femur shaft fractures in children less than 6 years of age.

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