

Treatment of Closed Diaphyseal Fractures of Femur in Children Comparative Study between Hip Spica & Initial Traction Followed By Hip Spica Cast

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Abstract

There are various methods of treatment of closed diaphyseal fractures of femur in children, but historically the vast majority of fractures of femur in children have been treated with hip spica casting alone or with initial traction followed by hip spica cast and each method has particular indications, contraindications and complications that must be considered in choosing the optimal treatment for a particular child and his/her fracture. Whatever the treatment method used we report a comparative study of thirty children aged from 6 months to ten years of age presenting with diaphyseal fractures of femur. Out of these thirty children, fifteen were treated with hip spica cast application and other fifteen children were treated with initial skin traction followed by hip spica cast. Hip spica cast has the additional advantages of being economical to the patients and the hospital services. It spares number of available beds in the hospital and is more convenient and comfortable for parents and children. Whereas initial traction followed by hip spica cast is better method of treatment in cases when there is a risk of excessive shortening. This study showed almost comparable results in the above mentioned two methods of treatment and final outcome in most of the cases was satisfactory.

Keywords: Femur in children; Comparative study; Hip spica; Treatment

Introduction

Diaphyseal fractures of femur in children are relatively most common major injuries due to their peculiar activities, anatomical configuration and bio-mechanical difference in their skeleton as compared to adults. These may be isolated injuries or associated with poly trauma [1]. The diaphysis of femur has an excellent blood supply and therefore good healing potential and due to the extensive musculature surrounding it causes displacement [2,3]. The fractures may result from direct or indirect loading of diaphysis of a femur. Direct violence occurs if the thigh is hit by automobile or run over by a vehicle and produces a fracture, which is transverse or with butterfly fragment, whereas after indirect violence or rotational force, spiral or oblique fracture of diaphysis of femur produces [4,5]. Diaphysis of femur may be divided according to location in to proximal, middle and distal third. AO (Arbeitsgemeinschaft fur Osteosynthesefragen) classified closed diaphyseal fractures of femur in to simple, wedge and complex fractures [6]. 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 [7]. Diaphyseal fractures of femur can be diagnosed by a history, clinical examination and radiological assessment. The treatment of closed diaphyseal fractures of femur in children requires a simple method of immobilization. The aim of treatment is to secure union, in good alignment with length restored and early rehabilitation [8]. Diaphyseal fractures of femur can be treated with different modalities include:

- Immediate hip spica castin,
- Initial traction followed by hip spica casting,
- External fixation,
- Intramedullary nailing,
- Plating.

But keeping in view the above treatment modalities, complications

of surgical techniques are more serious than those of conservative treatment [9]. Thus the closed treatment remains the option of choice for most skeletally immature children and depends upon the age of the child and amount of initial displacement at the fracture site [7]. Spica casting or initial traction followed by spica casting is an effective treatment modality which is used with great success, largely because children have a tremendous ability to remodel the deformities that remain after closed treatment [10]. Immediate close reduction and placement of well molded hip spica is a reliable option for isolated closed diaphyseal fractures of femur in children from 6 months to 10 years of age whose weigh less than 80 pounds [11]. This method of treatment is simple, safe, effective, and economical and has low mal-union rate as compared to traction. It also dramatically decreases the hospital stay, cost of treatment and allows rapid return of patients to their family environment [12,13]. Traditionally, the diaphyseal fractures of femur in children are treated by some form of initial traction for a period of 1-3 weeks followed by the application of hip spica cast till the union occurs [14]. This form of treatment involves prolonged hospitalization which increases the cost of treatment and occupancy of hospital beds. It also leads to prolonged separation of children from their family and environment. The use of any type of traction itself is not without any complication [15]. The idea is to conduct this study and to identify a satisfactory method of treatment in closed diaphyseal fractures of femur in growing children and to detect acceptable way of treatment

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Received April 06, 2016; **Accepted** March 23, 2016; **Published** March 30, 2016

Citation: Memon FA, Soomro H, Baloch S, Devrajani BR (2016) Treatment of Closed Diaphyseal Fractures of Femur in Children Comparative Study between Hip Spica & Initial Traction Followed By Hip Spica Cast. Orthop Muscular Syst 5: 214. doi:[10.4172/2161-0533.1000214](https://doi.org/10.4172/2161-0533.1000214)

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with minimum complications, so that we can practice a method which reduces our health expenditure, which is already overburdened.

Methods and Materials

A comparative study was conducted at the Department of Orthopedic Surgery and Traumatology at Liaquat University Hospital Hyderabad/Jamshoro. This study consists of thirty (30) patients of either sex with closed diaphyseal fractures of femur from 06 months to the age of ten years. The patients were divided in to two groups.

1. **Group A:** It consisted of 15 patients treated by hip spica cast.
2. **Group B:** It also consisted of 15 patients which were treated with initial skin traction followed by hip spica cast.

Sample technique

The patients were collected randomly from Orthopedic OPD and emergency department of LUH Hyderabad/Jamshoro. All the patients of closed diaphyseal fractures of femur were evaluated by taking complete history, thorough clinical examination and radiological assessment. The data was entered in preformed proforma prepared for the study purpose.

Inclusion criteria:

1. Children from 06 months to 10 years of age.
2. Closed isolated fractures.
3. Fresh fractures (up to one week from time of injury).
4. Displaced fractures.
5. Stable and unstable fractures.
6. Non comminuted fractures.

Exclusion criteria:

1. Children older than 10 years of age.
2. Open fractures.
3. Infected cases.
4. Malunited fractures.
5. Poly trauma cases.
6. Pathological fractures.
7. Multiple and segmental fractures.
8. Comminuted fractures

Data collection procedure

Initial and follow up record of every patient and their assessment in review clinics till last checkup of the patient was collected and recorded on case study proforma.

Statistical analysis

Statistical software SPSS 11.0 was used for data entry and analysis. In the results average/median reported for quantitative variables (age, hospital stay and time of hip spica cast) and number/percentage for qualitative variables (gender, age groups, mode of injury, pattern, level, side of fracture, etc.). 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.

Ethical consideration

Purpose and procedure of this study was explained to patient's attendants and consent was obtained to include their cases in the study.

Treatment methods and follow-up

Group A: Hip spica cast: In co-operative children oral sedation was administered half an hour before the hip spica cast application. In un-co operative children, the hip spica cast was applied under general anesthesia. Initially short leg cast was applied over the injured side, and then patient was shifted gently from bed to spica table. The distal fragment was aligned with the proximal fragment and the alignment was maintained by steady manual traction. For proximal third fracture limb was positioned in 45° flexion, 30° abduction and 20° lateral rotation, for middle third fracture, 30° flexion, 20° abduction and 15° lateral rotation and for distal third fracture, limb was positioned in 20° flexion, 20° abduction and 15° lateral rotation. Leg cast was extended to one and half spica cast. Proximally hip spica cast was extended up to nipple line; distally it was extended over the uninjured side just above the knee. Circular window was made over the lower chest and upper abdomen to care the respiration and abdomen. A bar was applied between the limb portion of the spica cast and another bar was applied on the lateral aspect of the injured side extending from knee to chest to avoid the breakage of spica at the hip. After application of hip spica cast check radiographs were taken and patients were retained in the ward under observation for post spica, anesthesia and for other complications, then the patients were discharged after 24 hours with spica cast care instructions and called for follow up after 2 weeks in outpatient department with biplanar radiographs to monitor cast condition, fracture alignment and renewal of cast till the union is complete. During the whole follow up, clinical examination was performed to evaluate limb length discrepancy, rotational malalignment and any significant deformity. If overriding was more than 2cm after cast application or during follow up, the treatment plan was changed. The spica cast was removed and the patient was put on traction. For unacceptable angulation wedging of the cast was done. If shortening and angulation remained within acceptable limit, the after completion of union, cast was removed after 49-63 days (average: 56 days) or according to the clinical condition of the patient for active mobilization of joints followed by walking with or without support and the children were returned to their original activities. A.P & Lateral radiographs were taken and both the limbs were measured for comparison.

Group B: Initial skin traction followed by hip spica: 15 patients from 6 months to 10 years of age were treated with initial skin traction followed by hip spica cast for a period of ranging from 7-14 days and traction weight was adjusted according to the weight of the child. Check radiographs were taken regularly after 48 hours in the first week and then once a week with the patient on initial traction to evaluate fracture alignment, when signs of fracture consolidation were confirmed by formation of callus, absence of tenderness at the site of fracture, the hip spica cast was applied and check radiographs were taken and patients were retained in the ward under observation for post spica, anesthesia and other complications, then patients were discharged after 24 hours and called for follow up as per instructions given in the hip spica cast. If shortening and angulation remained within acceptable limit, the spica cast of these patients were removed 42-56 days (average: 49 days) after the time of injury or according to the clinical condition of the patient and check radiographs of the concerned bone (A.P & Lateral Views) were taken. Length of both limbs was measured for comparison by spinomalleolar distance, by keeping both limbs in same position at hip and knee and overall results were satisfactory.

Results

Thirty (30) patients having diaphyseal fractures of femur were selected for this study and these were divided in to two groups, i.e Group A and Group B and each group consisted of fifteen (15) cases.

We observed following criteria for satisfaction as far as results are concerned.

1. Shortening within 2 cm at the time of cast removal.
2. Angulation within 20° in sagittal plane and within 15° in the coronal plane at the time of removal of cast.
3. No such complications observed due to which the method of treatment has to be changed.

Patients who do not fulfill these criteria, the results were considered as unsatisfactory. If we had to change the method of treatment due to excessive shortening during follow up, the results of hip spica cast were also considered unsatisfactory in that case.

Age distribution

The age distribution in both the groups ranged from 06 months to 10 years, the commonest age group was found 3-5 years in group A, where as in group B, the commonest age group was 3-7 years (Table 1).

Gender distribution

Out of fifteen (15) patients treated in group A, 11 (73%) were male and 4 (27%) were female, where as in group B, 9 (60%) were male and 6 (40%) were female (Table 2).

Mechanism of injury

In Group A, 15 patients treated with hip spica cast, 3 (20%) came with the history of road traffic accident, 8 (53.3%) patients came with the history of fall (most common) and 2 (13.3%) came with the history of fall of object on the patients, 1 (6.6%) came with the history of sports injuries and 1 (6.6%) came with the history of hit by animal. In Group B, 15 patients treated by initial traction followed by hip spica cast, 4 patients (26.67%) came with the history of road traffic accident, 7 patients (46.67%) came with the history of fall (most common), 1 patient (6.67%) came with the history of fall of object on patient, 2 patients (13.3%) came with the history of sports injuries and 1 patient (6.67%) came with the history of hit by the animal (Table 3).

Age (Years)	Group A (n = 15) Hip spica cast		Group B (n = 15) Initial traction followed by hip spica cast		P-Value
	No. of Patients	%	No. of Patients	%	
0 – 3	3	20.0	3	20.0	1.000
3 – 5	4	26.6	6	40.0	0.699
5 – 7	4	26.6	3	20.0	0.999
7 – 8	2	13.3	2	13.3	1.000
8 – 10	2	13.3	1	6.6	0.999
Mean ± S.D	5.3 ± 2.64		4.7 ± 2.38		0.518

Table 1: Age distribution (n=30).

Gender	Group A (n=15) Hip spica cast		Group B (n=15) Initial traction followed by hip spica cast		P-Value
	No. of Patients	%	No. of Patients	%	
Male	11	73	9	60	0.699
Female	4	27	6	40	

Table 2: Gender distribution (n=30).

MOI	Group A (n -15) Hip spica cast		Group B (n -15) Initial traction followed by hip spica cast		P-Value
	No. of Patients	%	No. of Patients	%	
RTA	3	20.0	4	26.6	0.999
Fall	8	53.3	7	46.7	0.999
Fall of object	2	13.3	1	6.7	0.999
Sports injury	1	6.7	2	13.3	0.999
Hit by animal	1	6.7	1	6.7	1.000

Table 3: Mechanism of injury (n=30).

Type of fracture

Out of 15 patients treated with hip spica cast in Group A, 8 patients (53.33%) were spiral, 4 patients (26.67%) were oblique and 3 patients (20%) were of transverse pattern. In Group B, 6 patients (40%) were spiral, 5 patients (33.33%) were oblique and 4 patients (26.67%) were of transverse pattern (Table 4).

In Group A patients, out of 15 treated with hip spica cast, 4 patients (26.67%) were proximal third, 8 patients (53.33%) were of middle third and 3 patients (20%) were of distal third. In this series of patients, most of the cases came with fractures of middle third. In Group B patients, treated with initial traction followed by spica cast, out of 15, 3 patients (20%) were proximal third, 7 patients (46.67%) were middle third and 5 patients (33.33%) were fractures at distal third. In both series of the patients, most of the cases came with the fractures of middle third (Table 5).

Side of fracture

In Group A, out of 15 cases, 10 patients (66.67%) were having fractures on right side, while 5 patients (33.33%) were having left sided fractures. In Group B, out of 15 cases, 9 patients (60%) were affected on right side and 6 patients (40%) were having left sided fractures (Table 6).

Follow up

During follow up, the patients were observed for the following:

1. Limb length discrepancy.

Type of fracture	Group A (n -15) Hip spica cast		Group B (n -15) Initial traction followed by hip spica cast		P-Value
	No. of patients	%	No. of patients	%	
Spiral	8	53.3	6	40.0	0.715
Oblique	4	26.7	5	33.3	0.999
Transverse	3	20.0	4	26.7	0.999

Level of Fracture

Table 4: Type of fracture (n=30).

Level of fracture	Group A (n -15) Hip spica cast		Group B (n -15) Initial traction followed by hip spica cast		P – Value
	No. of Patients	%	No. of Patients	%	
Proximal third	3	20.0	3	20.0	1.000
Middle third	9	60.0	8	53.3	0.999
Distal third	3	20.0	4	26.7	0.999

Table 5: Level of fracture (n=30).

Side of fracture	Group A (n = 15) Hip spica cast		Group B (n = 15) Initial traction followed by hip spica cast		P – Value
	No. of patients	%	No. of patients	%	
Right side	10	66.7	9	60.0	0.999
Left side	5	33.3	6	40.0	

Table 6: Side of fracture (n=30).

2. Angulation.
3. Shortening
4. Range of movements at hip and knee joints at 6 weeks.
5. Quadriceps wasting at 6 weeks.
6. Other complications.

Limb length discrepancy: In Group A patients (n=15) treated with hip spica cast. 13 (86.67%) patients had no limb length discrepancy and 2 (13.33%) patients had limb length discrepancy more than 2-3 cm. Where as in Group B patients (n=15) treated with initial traction followed by spica cast, 14 (93.33%) patients had no discrepancy, and 1 (6.67%) patient had more than 2-3 cm limb length discrepancy (Table 7).

Angulation: In Group A patients (n=15) treated with hip spica cast. 11 (73.33%) patients remained within 10° -15° angulation, 3 (20%) patients developed within 15° -20° angulation and 1 (6.67%) patient developed more than 20° angulation, which is unacceptable and this was a male patient aged 8 years with proximal third fracture who presented at 8 weeks with breakage of cast. The fracture had united in 25° anterior angulation and this was corrected by wedging the cast. Where as in Group B patients (n=15) treated with initial traction followed by spica cast, 10 (66.67%) patients remained within the

Limb length discrepancy	Group A (n = 15) Hip spica cast		Group B (n = 15) Initial traction followed by hip spica cast		P-Value
	No. of Patients	%	No. of Patients	%	
No Discrepancy	13	86.7	14	93.3	0.999
2 – 3 cm	2	13.3	1	6.7	0.999
3 – 4 cm	0	0	0	0	-
> 4 cm	0	0	0	0	-

Table 7: Limb length discrepancy (n=30).

angulation of 10-15°, 4 (26.66%) patients developed an angulation of 15° -20° and 1 (6.67%) patient had more than 20° of angulation which is unacceptable and this was a male patient aged 6 years with proximal third fracture who presented at final check up. The fracture had united in 25° lateral angulation (Table 8).

Shortening: In Group A, 1 (6.66%) patient developed more than 2 cm of shortening. This was a 7 years old girl with mid diaphyseal fracture of femur, who developed 2.6 cm shortening observed at 1st week of follow up. This patient was put on skin traction after the removal of spica.

In Group B, 1 (6.66%) 2.2cm of shortening was observed when the patient came for removal of spica cast, it was a middle third fracture in a female of 8 years. The shortening properly developed due to displacement of fractured fragment in an immature callus, while the patient was in spica cast.

Range of movement at hip and knee at 6 weeks: In Group A, 2 (13.34%) patients out of 15 cases were having free range of movements at hip and knee at 6 weeks, while 12 patients (80%) have decreased range of movements by 20° and 1 (6.66%) patient developed decreased range of movements more than 20°.

Where as in patients of Group B, 3 (20%) patients were having free range of movements at hip and knee at 6 weeks, while 11 (73.34%) patients have decreased range of movements by 20° and 1 (6.66%) patient developed decrease in range of movements of more than 20° which improved by physiotherapy (Table 9).

Quadriceps wasting at 6 weeks: In Group A, 10 (66.67%) patients out of 15 cases developed no quadriceps wasting, 4 (26.67%) patients developed mild to moderate quadriceps wasting and 1 (6.66%) patient developed severe quadriceps wasting.

Where as in patients of Group B, 9 (60%) patients developed no quadriceps wasting, 5 (33.34%) patients developed mild to moderate quadriceps wasting and 1 (6.66%) patient developed severe quadriceps wasting, which were improved by instruction to the patients about quadriceps exercise (Table 10).

Other complications: In Group A, 2 (13.33%) patients out of 15 cases developed wound, one of them on the normal side due to distal edge of the cast over the thigh and the other developed wound over the fractured limb due to proximal edge of the cast on the upper part of thigh, while 13 (86.67%) patients had no such complication or neurovascular compromise. Where as in Group B, 3 (20%) patients developed skin abrasions /blisters, 1 (6.66%) patient developed deep skin ulcer which healed with regular antiseptic dressings while in 11 (73.34%) patients no such complication or neurovascular compromise was observed (Table 11). At the time of spica cast removal, parents

Angulation	Group A (n -15) Hip spica cast		Group B (n -15) Initial traction followed by hip spica cast		P - Value
	No. of patients	%	No. of patients	%	
10 – 15°	11	73.3	10	66.7	0.999
15 - 20°	3	20.0	4	26.6	0.999
>20°	1	6.7	1	6.7	1.000

Table 8: Angulation (n=30).

ROM at 6 weeks (Hip & knee)	Group A (n -15) Hip spica cast		Group B (n -15) Initial traction followed by hip spica cast		P – Value
	No. of patients	%	No. of patients	%	
Free	2	13.4	3	20.0	0.999
Decrease by 20°	12	80.0	11	73.4	0.999
Decrease > 20°	1	6.6	1	6.6	1.000

Table 9: Range of movements (n=30).

Quadriceps wasting at 6 weeks	Group A (n -15) Hip spica cast		Group B (n -15) Initial traction followed by hip spica cast		P-value
	No. of patients	%	No. of patients	%	
No wasting	10	66.7	9	60.0	0.705
Mild to moderate	4	26.7	5	33.4	0.999
Severe	1	6.6	1	6.6	1.000

Table 10: Quadriceps wasting at 6 weeks (n=30).

were instructed to bring their children for follow up after 6 months with fresh x-rays. After six months, parents were contacted on telephone but only six children could be followed for longer duration. One 04 years old female child presented with lengthening of fractured limb, on examination, fractured limb was found 1 cm long. One child had 0.5 cm shortening of fractured limb, while rest of children had equal limbs. One child had 30° of anterior and 10° of lateral angulation, same as observed at the time of fracture healing. There was no limping and functional problem.

Average hospital stay: In this study, the hospital stay of patients in Group A, treated by hip spica cast was 1-3 days (median 2 days). Whereas, the patients of Group B, treated with initial traction followed by spica cast stayed in the hospital for the period of 7-21 days followed by spica cast (median 14 days) (Table 12).

Total time of spica cast application: In this study, Group A patients treated with hip spica cast was applied for the period 7- 9 weeks, till the union occurred. In Group B patients, initial traction was applied for the period of 6-8 weeks followed by spica cast till the fracture becomes sticky (Table 13).

Discussion

The diaphyseal fractures of femur in children are the most common injury comprising 1.6% of all skeleton in this group of population [16].

Complication	Group A (n -15) Hip spica cast		Group B (n -15) Initial traction followed by hip spica cast		P – Value
	No. of Patients	%	No. of Patients	%	
No complication	13	86.7	11	73.4	0.651
Skin abrasion / Blister	2	13.3	3	20.0	1.000
Deep skin ulcer	0	0	1	6.6	-
Peroneal nerve palsy	0	0	0	0	-

Table 11: Other complications (n=30).

Group	Hospital Stay	Median
A	1 – 3 Days	2 Days
B	7 – 21 Days	14 Days

Table 12: Average hospital stay.

Group	Total time of Hip Spica Cast	Median
A	49 – 63Days	56 Days
B	42 – 56 Days	49 Days

Table 13: Total time of spica cast application.

There are different treatment options for isolated closed diaphyseal fractures of femur in children including immediate spica cast, traction for 7-21 days followed by spica cast, internal fixation with plating and intramedullary nailing and external fixation. However, there is controversy regarding treatment of these fractures. 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. Such treatment however, would involve prolonged hospital stay thereby 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. The use of traction itself is not without any complication. Skin traction including Bryant's traction may be complicated by blistering, loss of correction and even ischemia of lower limb. Skeletal traction meanwhile poses the danger of bone infection and accidental epiphyseal plate damage. Since then interest in use of spica cast in the treatment of these fractures has been increased. Allen et al. [17] compared the results of early spica cast with those obtained from initial traction followed by spica. Their results

were comparable for length and angulation. There was reduced hospital stay for those receiving early spica cast treatment. Staheli and Sheridan [18] in 1977 reviewed 20 patients less than 9 years of age treated with early spica cast. The re-evaluation after 2 years showed less than 7 mm length discrepancy. In 5 cases, rotational deformity was 10-20°. There was 12° of residual anterior bowing in 2 patients, clinically all patients were asymptomatic. As compared to the results obtained with traction, this method provides improved length control. There was comparable control of angulation and rotation. Splain and Denno [19] immobilized their patients with immediate double spica. Their study showed no advantages of traction over early spica immobilization. They recommended that traction should be abandoned except in unusual circumstances. Sugi and Cole [20] evaluated 191 children aged 10 years or less with early spica cast. They selected fractures only in the middle 3rd of bone. They concluded that the leg length discrepancy was rare and clinically insignificant. Cost of the care was reduced and there were increased number of available beds in the hospital. Martinez et al. [21] conducted a retrospective study of 51 children treated with early spica cast. In their study, shortening of more than 20 mm was the most common complication. The factors associated with this complication were more than 20 mm shortening at the time of spica cast application and advancing age. They recommended avoiding these factors and close follow up to achieve satisfactory results. Henderson et al. [22] compared the results of early spica cast with those achieved with traction. They concluded that most of the femoral shaft fractures in children can be treated with early spica cast. The results were as good as those achieved with conventional methods. There were advantages of saving the hospital cost with early spica cast method. Rasool et al. [23] made a comparative study to determine the benefits of early spica cast for femoral shaft fractures in children. They compared 85 children treated with early spica cast, with 85 children treated with 4 weeks of traction followed by spica cast. Their study revealed that femoral shaft fractures in children can be treated by hip spica cast with results compared to those achieved by traction. Saving in cost of treatment, early return to family environment and reunion of a child with parents and increased number of available beds were additional advantages. Early spica cast allows rapid return of a child to family environment [24]. Newton and Mubarak [25] have evaluated 58 children and adolescents with femoral shaft fractures treated with five different treatment methods, such as early spica casting, in hospital traction, in hospital skeletal traction, home Neufeld traction and intramedullary nailing. They have compared total charges for each group and found that total charges for early spica group were lowest. Many authors have reported overgrowth varying from 1-2.5 cm [26-30]. The post traumatic overgrowth phenomenon following fracture has allowed acceptance of shortening up to 2 cm at the time of fracture healing. Moreover, shortening up to 6-13 mm is not noticeable [31]. The main problem in the treatment with early spica cast is shortening and deformity of limb [15]. Following femoral shaft fractures in children, the affected limb grows at an increased rate compared with contra lateral side. Growing children also have ability to remodel mal-united fractures, spontaneous correction of up to 25° of angular deformity have been reported [32]. Though rotation deformity usually does not correct, but up to 25° of rotation are well tolerated [33]. Hip spica cast is simple, safe, effective, cheap and definitive method of treatment and does not need prolonged hospital stay. We have been treating these fractures with initial skin traction for 7-21 days followed by hip spica cast. The spica cast was applied when the fracture site was non tender and sticky that is the fracture was deformable but not displaceable. We have been getting satisfactory results with this method of treatment [34]. With increasing number of patients, the availability of beds is a problem in our setup.

This study of 30 cases was undertaken to determine the results and were compared between two methods that is hip spica cast and initial traction followed by spica cast. The parents of the children stated that, it was more convenient for them to look after their child in spica while at home. They were able to spare more time for other children and family members. The children were also happy and comfortable in the family environment [35,36]. Although we did not compare different treatment modalities, but we believe that early spica cast treatment is the cheapest of all. Although the cost of the treatment was not calculated, but all the parents stated that their daily expenses were more when their children were being treated at hospital. None of our patient had to pay hospital or physician's charges. The main concern in the treatment of closed diaphyseal fractures of femur in children is the problem of limb shortening and deformity. However, while in the adults, any shortening would be permanent, the situation in children is different. In children after fracture, femur grows at an increased rate. Hip spica cast is simple, safe, effective, cheap and definitive method of treatment and does not need prolonged hospital stay. We have been treating these fractures with skin traction for 7-21 days followed by hip spica cast. The spica cast was applied when the fracture site was non tender and sticky that is the fracture was deformable but not displaceable. We have been getting satisfactory results with this method of treatment. 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. This study was undertaken to determine the results and were compared between two methods that is hip spica cast and initial traction followed by spica cast. Although we did not compare different treatment modalities, but we believe that early spica cast treatment is the cheapest of all. Although the cost of the treatment was not calculated, but all the parents stated that their daily expenses were more when their children were being treated at hospital. None of our patient had to pay hospital or physician's charges. The main concern in the treatment of femoral shaft fractures in children is the problem of limb shortening and deformity. However, while in the adults, any shortening would be permanent, the situation in children is different. Parents were worried about the appearance of the fracture on the check radiographs, but when the mechanism of healing, remodeling and accelerated growth rates were explained to them, they were convinced and satisfied.

Conclusion

This was a short term study only to show the results at the time of fracture healing. In children, growth acceleration of femur after fracture is related to the extent of the soft tissue disruption, the degree of remodeling, the amount of overriding and the level of the treatment. The final outcome after cessation of treatment, related overgrowth cannot be concluded from this study. However, on the basis of this series, it is evident that satisfactory results can be obtained in most of the diaphyseal fractures of femur in children. Following points can be concluded from this study.

1. A satisfactory outcome can be achieved by any of the two methods of treatment that is immediate spica cast and initial traction followed by hip spica cast.
2. To achieve satisfactory results, limb should be placed in a proper position depending on the level of the fracture. Careful follow up is necessary.
3. Hip spica cast is simple, effective method of treatment.
4. Hip spica cast allows rapid return of a child to family environment, thus avoiding prolonged separation from their parents.

5. Hip spica cast avoids prolonged hospitalization, thus reducing the cost of treatment
6. Hip spica cast avoids prolonged hospitalization, thus reducing the cost of treatment.
7. Hip spica cast reduces occupancy of hospital beds, thus making them available for other sick children.
8. Children feel more comfortable at home environment, while being treated with hip spica cast.
9. Reliability of the parents should be considered while treating the children in early spica cast. They should bring the child for follow up at proper time, so that appropriate changes in the treatment, if needed can be made. They should inform the problems related to cast such as breakage of cast or sores.
10. Early detected angulation at fracture site can be corrected by wedging the cast. This gives satisfactory outcome.
11. Hip spica cast also avoids complications related to traction and operative treatment methods.

As the results achieved with both 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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