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## Outcome of Early Versus Delay Hip Spica Casting for Children with Femoral Shaft Fractures

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### ABSTRACT

Femoral shaft fractures are among the most prevalent fractures of the lower extremities in children. Although many approaches and options are available for their treatment, the most appropriate treatment option for school going children is still debatable. In this study 34 children with femoral fractures were recruited between Jan. 2018 and Jan 2019 at the Nangarhar university and public health Hospital. which is divided into two groups: (Group-A) immediate reduction with hip Spica consists 22 children and (Group-B) treatment consist of skin traction for 2-3 weeks precede with hip Spica casting consists 12 children and we studied gender distribution, fracture side, site and type of the fracture, also we note complications include; initial shortening, axial, sagittal and rotational alignment and hospital stay. All patients were under observation for a period of 3 months after removal of Spica cast. The study found that boys were more affected than girls, which the middle third of the femoral shaft was the most common site fracture (58.92%), that the spiral fracture was the most common type of femoral shaft fracture (43.18%), as well as that side way alignment was observed more than other kinds of complications in both treatment modalities; for immediate Spica, four children (18.18%) and three cases (25%). Conclusions: There was minimal difference between early and delayed Spica in terms of treatment complications and functional result. However, early Spica greatly reduced hospitalization time and treatment costs while producing equivalent results as delayed Spica use.

**Keywords:** Femoral, Shaft fractures, Non-operative, Treatment, Spica, Early versus, and Application.

### INTRODUCTION:

Femoral shaft fractures are one of the most common fractures of lower extremity in children and the most commonly requiring hospitalization (Flynn JM and Schwandt RM, 2004). Some degrees of angular deformity and some centimeters of shortening are acceptable in children according to age group because children have tremendous remodeling potential (Kirby *et al.*, 1981). Pediatric diaphyseal femur fractures are treated using a variety of treatments, ranging initial Spica casting, traction subsequent to Spica casting,

external fixators, osteosynthesis with plate, internal fixation with intramedullary rod or flexible intramedullary nail. Treatment options are determined on the children's age, anatomical location, and fracture type. Traditionally, children under the age of six are treated with immediate hip Spica and adolescent children are with operative methods (Mann *et al.*, 1986). Femoral shaft fractures represent the third most common location of children's fractures, after those of the higher limbs. Usually caused by major violence, so related wounds are common, their prognosis is good

due to the growth potential (American Academy of Orthopedic Surgeons, 2008). The femoral shaft is surrounded by powerful muscles, which cause severe displacement of femoral shaft fractures by these muscles pull and this requires powerful traction for their correction (A. Graham Apley, 2001). Non-operative therapy is often a successful technique of treatment for closed femoral shaft fractures in children. Spica casts can be administered early or delayed if applied after traction and x-ray surveillance. Non effective treatment is the gold standard for children under 8-years because of the excellent bone union and the remodeling qualities. However, the main complication of femoral shaft fracture is the limb span discrepancy resulting from the overgrowth of the broken limb. This problem is reported by many authors whichever non operative treatment is used and must be taken into account when choosing the therapeutic method (Thomas *et al.*, 2009). This is essentially a fracture of young adults and usually results from a high -energy injury. Diaphyseal fractures in elderly patients should be considered 'pathological' until proved otherwise. In children under 4 years of age the possibility of physical abuse must be kept in Lind (Solomon *et al.*, 2014). Femoral breaks are among the most frequent long bone fractures (Bridgman and Wilson, 2004). The treatment of juvenile femoral fractures is mostly determined by the child's age, however bone age and size may also influence treatment options (Harvey *et al.*, 2002). The choice of management may also be determined by surgical experience and local trends in practice. Non-operative management plays a role in some cases still though current practice has veered towards operative fixation as it allows early mobilization and shorter hospital stays.

### **The Study Aim**

The purpose of this study is to evaluate the outcomes of two orthopedic therapy methods: early reduction and Spica cast against skin traction and delayed Spica application.

### **Patients and Methods**

The 34 children with closed femoral fractures were recruited between Jan. 2018 and Jan 2012 at the Nangarhar University and public health Hospital. All patients in our study they were divided into two

groups: The first group consists of 22 patient's undergoing immediate treatment of Spica and the second group includes 12 patients receiving treatment with a period of 2-3 weeks of skin traction and then delay the use of Spica. Patients were followed for four months. Patients were admitted to Nangarhar University and Public Health Hospital, we chased the patients Name, age, sex, address, date of injury, mechanism of injury, side of fracture, type and location of fracture.

### **Excluded criteria**

Combined femoral shaft fracture, multiple fractures, severe injuries and cerebral palsy.

### **Management**

General examination of patients was performed and head, chest, abdomen, pelvic injuries, which are very important, emergency treatment was performed. Paying special attention to the heart and lungs, abdomen and central nervous system. This strategy was to hospitalize all children Used to reduce fractures under general anesthesia. Parents should be instructed to care for their child in the Spica area. Except for the neurovascular of the affected limb, they were then carefully evaluated and compared to the contralateral side. Skin traction was then applied to the injured limb and the patient was admitted to orthopedic wards. Specific type of treatment: All patients treated with Spica cast had no other supplementary harms, or with speedy decrease and delayed use of Spica Cast or Spica. This decision was made at random. The first group (early Spica cost): 22 patients were treated with this method, in their age was between (3-9) years. Immediate reduction and Spica were performed in the first 24 hours after admission to the Hospital.

### **Initial procedures**

When the child is seen for the first time, analgesia is given and radiograph is taken, using skin traction until the Spica is ready, and the child is completely free from such conditions as complications from mild head injury or the abdomen is improved.

### **Method of reduction and application of cast**

The reduction manipulation and casting technique is simple and clear programs. This procedure was performed under general anesthesia. The injured limb is fixed to the cast about 20 degrees, while the assistant

maintains a slight tension with the knee. The cast must be properly formed in the supracondylar area so that the limb may be stretched without the cast sliding. After allowing the cast to adapt, the infant is transported to the casting table. A light pull is now applied to the cast and the cast is used handle to place the fracture pieces. The cast controls Varus-valgus and anteroposterior angles as well as rotation. Situational judgment is associated with experience. For fractures below one-third of the proximal tibia; Holding the plaster with the pelvis bent at about 30 degrees, abducted at about 30 degrees, and generally rotating about 15 degrees outward provides an acceptable reduction. Whereas if the break is in the third proximal flexion of the current joint up to 45 degrees it may be necessary. We keep the reduction while the assistant completes the cast, and education approved with image enhancer. We accepted to twenty mm shortening, 20° from the front angles, and 15° Valgus angular but neither posterior nor Varus angular. Rotation is clinically evaluated; the foot should be slightly in lateral rotation. The correct rotation is achieved by placing the foot in a slight rotation mode, with additional 10-degree lateral rotation.

The 2<sup>nd</sup> group (delay of Spica after stretching): With this method, 12 patients, aged between 3 -9 years, were treated. Daily skin traction was monitored daily and X-rays were performed. After 2-3 weeks, X-rays showed a slight callus in the thigh. Appears under common anesthesia the spinach fracture was shortened and the radiological examination was performed after Spica then every two weeks before the fracture occurred. Subsequent care (for both groups): When it is suitable for the child to return home, the parents should be shown how to care for the child, one week after the radiographic discharge, if it is satisfactory. For children who received initial treatment for spica, it was done 4 - 6 weeks after the examination. There are clinical and radiological signs for cast removal. Union usually after 4 - 8 weeks. After removing Spica's face. All of these patients were carefully examined for gait position, length difference, deformity, and angles. All of these patients were followed up for the 2 weeks. statistical analysis the results are expressed as mean values and amplitude. Comparison of the quantitative parameters between two groups of the patients was

performed with the help of Statistical Package for Social Sciences (SPSS) version 16) Database program. The value of P is considered below 0.06, which statistically shows the importance.

**RESULTS:**

The study involved 34 patients who were followed for a period of 3 -4 months between the ages of 3-9 years. The mean age was 5.30 years for the patients who underwent early SPICA and 7.14 years for patients who underwent late SPICA. The study included 5(14.70%) women and 29(85.29) men in terms of age. In terms of fracture site: 18(52.94%) patients had left fractures and 16(47.05%) patients had right fractures.

**Table 1:** Fracture side and sex distribution.

No	Side	Male	Female	Total
1	Left	15	3	18
2	Right	13	3	16
3	Total	28	6	34

The causes of femoral shaft fracture in pediatric in our study were 10(29.41%) cases due to falls from a height, 17(50.00%) cases due to traffic accidents and 7(20.58%) cases due to other cases.

**Table 2:** Causes of femoral shaft fractures.

No	Causes	Patients No	Percentage %
1	RTA	17	50,00%
2	Fall from height	10	29,41%
3	Other	7	20, 58%
4	Total	34	99,99%

In terms of femoral shaft fracture line, there were 15(44.11%) spiral cases, 13(38.23%) oblique cases and 6(17.64%) transversal cases.

**Table 3:** Types of femoral shaft fractures.

No	Types of fractures	Patients No	%
1	Spiral	15	44.11%
2	Oblique	13	38.23%
3	Transvers	6	17.64%

The position of the femoral shaft fracture depends on which third of the femur is located. 20(58.92%) fractures in the middle third, 8(23.52%) in the proximal third and 6(17.64%) in the distal third:

**Table 4:** Typing of femoral shaft fractures in children.

No	Site of fracture	Patients no	%
1	Proximal third	8	23,52%
2	Middle third	20	58.92%
3	Distal third	6	17.64%

The total number of patients in this study, which contained a particular medical opinion, was separated into two groups: those who received Spica in the early days were 22(64.70%), while those who experienced Spica following skin traction removal were 12(35.29%).

**Table 5:** Methods of treatment of femoral shaft fracture in children.

No	Type of treatment	Patients no	%
1	Early Spica	22	64,70%
2	Deleted Spica	12	35,29%

**Table 6:** In term of complications (P. 0.0506).

No	Complications	Early Spica	%	Late Spica	%
1	Ante angulation	2	9.09%	2	16.66%
2	Sid way angulation	4	18.18%	3	25.00%
3	Shortening	1	4.54%	1	8.00%
4	Total	7	31.81%	6	49.99%

The middle Third fracture, with lateral angle aside 4 cases (80%) with middle third fracture, 1 case (20%) with upper third fracture and 2 case (40%) with lower

Time of hospitalization: In early Spica group hospital stay was between 3 - 6 days, and the stay 17 - 25 days in late Spica group.

**Complications**

Complications that were seen for the first-time observation after removal of Spica in the early Spica group as a below: 4(18.18%) cases of lateral angulation, 1(4.54%) cases of shortening and 2(9.09%) case of anterior angle reported. Patients treated with late Spica sought 2(16.66%) anterior angle and 3(25.00%) lateral angle follow-up, and no shortening was reported. In the patients who have considered shortening or angle here, there are only those who have deformities that are too much allowed (shortening 20 mm, 15° lateral angle and 20° for anterior angulation).

third fracture and shortening 1case (100%) recorded with a third middle fracture.

**Table 7:** In term of Site complications (P.0.016).

No	Complication	Upper 1/3		Middle 1/3		Lower 1/3	
1	Anterior angulation	0	0%	2	100%	2	100%
2	Side way angulation	1	20%	4	80%	2	40%
3	Shortening	0	0%	2	100%	0	0%

Skin complications after cast application: 2(9.09%) cases (bedsores) on crest iliac occurred in initially Spica group but no required no changed of the therapeutic strategy and resolved rapidly after local treatment. After four months of follow up the initially observed complications were corrected to the accepted limits. The shortening which reported initially overcomes by overgrowth within in accepted limits. All patients had a good condition of walking and good range of movement in knee and hip joints.

in 15 cases subsided with daily physiotherapy after 2 weeks in this research.

**DISCUSSION:**

We compared our results to that of the unique study which was done by Thomas d'Ollonne and Amandine Rubio in Nice University-France and published on line on 2009 which involved 35 children with closed femoral shaft fracture treated by immediate and delayed Spica cast and they follow them for ten years. Our study revealed that boys 28(85.7%) were affected more than girls 6(14.3%) and the left side cases (53.5%) comes nearly similar to that of right side (46.

No case of delayed union, nonunion, and abnormal rotation but few degrees of knee stiffness were present

5%). These results nearly similar to that of Thomas d'Ollonne and Amandine Rubio in which the male: female ratio is (7.8:2.2). The mean age that recorded in

our thesis was (5.30) years for early Spica and (7.14) years for delayed Spica (Rana *et al.*, 2021).



**Fig. 1:** Early spica group-A and Delay spica group-B.

This is different from the mean age that appears with Thomas d'Ollonne *et al.* study in which the mean age was (2.4) years for early Spica and (3.2) years for delayed Spica, because the age range of our study was 3-9 years while in Thomas study was 2 - 6 years. The causes of femoral shaft fracture in our paper shows the road traffic accident is the major causative factor recording 50.00% followed by fall from height 29.41% and this is a little bit different from Thomas d'Ollonne *et al.* results which suggest that falls is the first cause followed by falls from height then pedestrian-motor vehicle accidents. The middle third of the femoral shaft was the most common site of fracture (58.92%) followed by upper third (23.52%) and lastly the lower third (17.64%) while in the comparative study of Thomas d'Ollonne *et al.* The cases with middle third fracture were 27 cases out of 35 cases (77.14%).

This is due to distribution of the forces that cause the fractures are maximally applied at middle third. Our study shows that spiral fracture was the common type of the femoral shaft fracture (44.11%) whereas oblique fracture record a nearby result of about (38.23%); while that of Thomas d'Ollonne considered the transverse fracture to be the second type after the spiral one. We believed that the cause of this result was due to the indirect forces (twisting force) that were applied to the femur e.g. fall from height which result in spiral type of fracture. Pain relief is greatly enhanced by skin

traction and the use of a cast. Patients who were treated with traction, on the other hand, required more pain relievers and anti-inflammatory medicines.

General anesthesia contributes to successful reduction as it allows relaxation of muscle spasms and complete pain relief Lateral angle more than other cases due to various complications in both treatments; the observed Complications for the first-time after (18.18%) cases of lateral angulation, 1(4.54%) case of shortening and 2(9.09%) case of anterior angle reported. Patients treated with late Spica sought 2(16.66%) anterior angle and 3(25.00%) lateral angle follow - up, and no shortening was reported. We also noted in our collections that the middle of the third and oblique fracture has the highest rate. Ensuring parental understanding is crucial to a natural recovery history. They are often disturbed when a radiograph reveals a diagonal fracture with a clear clinic

#### **CONCLUSION:**

Broken femur in children undergoing initial casting or skin stretching followed by Spica cast proved that we get good results from initial casting despite some short degrees or angles, which are fixed. There will be limited follow-up at the end. Primary Spica has an advantage over delay. Spica casting has a shorter hospital stay, so parents and patients will be more aware. Reducing hospitalization time will allow more free beds for other patients.

4 - Patients who are delayed in casting Spica have less complication in terms of shortening, but more percentage with angle. It is easier for the family to cure patients in primary Spica.

### Suggestions

- 1) Spica was the treatment management of choice for hip fractures between the ages of 3 -9 years.
- 2) The treated patients with Spica casting, sooner or later, should be followed up for a long period of time to delay complications.
- 3) Parents should be informed that the radiograph is deceptive and the end result is predictable to be better than the operation.

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### CONFLICTS OF INTEREST:

The author(s) declare that there are no potential conflicts in publishing the present review study.

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