

## Original Research Article

# Results of traction followed by hip spica cast for closed fracture shaft of femur in children from 2 years upto 10 years of age: experience from a remote centre in North India

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## ABSTRACT

**Background:** Fracture shaft of femur is a common fracture in children, with treatment from conservative in form of skin traction to intramedullary nailing depending on age. Conservative treatment is mostly used upto six years of age, while for children more than 12 years surgery is usually preferred. We extended conservative in form of hip spica cast till 10 years of age. This study evaluates results of skin traction followed by spica cast in children upto 10 years of age.

**Methods:** Study was done in GMC Doda from April 2019 to March 2022. 47 patients were enrolled for study, patients were initially given skin traction to get alignment which was followed by spica cast. Patients were evaluated at 3, 6, 9 and 12 weeks, final follow up was done at 6 months.

**Results:** Out of 47 children, 4 patients were lost to follow up. Average age of children was 5.83 years. Mode of trauma was mostly RTA or fall from height. Average duration of traction was 9.14 days and average stay in hospital was 11.5 days. Average union time was 8.36 weeks. We had significant limb length discrepancy or angulation in 6 (13.9%) of our patients.

**Conclusions:** skin traction followed by spica cast gives good results in fracture shaft femur in children upto 10 years of age.

**Keywords:** Fracture femur, Skin traction, Hip spica cast

## INTRODUCTION

Asterion is the confluence of the temporal, occipital and Shaft femur fractures are common fractures in children. A variety of treatment options from conservative from observation in skin traction to operative are available.<sup>1</sup> Children upto 6 years are mostly treated conservatively in form of hip spica cast as they have good remodeling potential. Children more than 12 are usually treated

surgically as that allows for an early weight bearing and rehabilitation.

There is a grey zone between 6 years to 12 years with no clear guidelines for the ideal treatment.<sup>2,3</sup> With better implants and universal availability of fluoroscopy many surgeons now treat them surgically. However chances of infection, injury to growth plates and need of second surgery for removal of hardware are the limitations.<sup>4</sup>

Spica cast treatment when applied properly is reported to give good results without these limitations.<sup>5</sup>

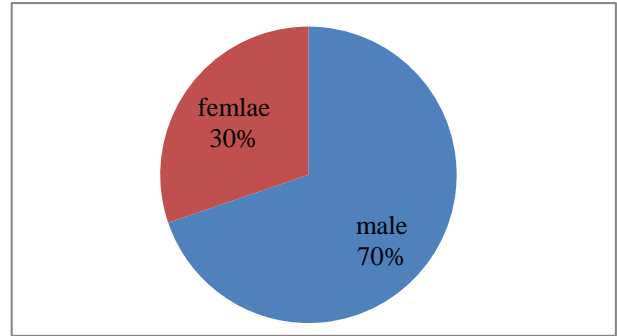
**METHODS**

This prospective study was done in GMC Doda from April 2019 to March 2022. Our institute is located in remote hilly area of Jammu and Kashmir India and is the only orthopaedic referral hospital for about six and half lakh population residing in Doda and Kishtawar districts of the region. Due to regional topography and bad road conditions, we receive a heavy load of road traffic accidents due to vehicles plunging into gorges. During this period 47 patients with closed fractures of shaft of femur within ages 2 years to 10 years were enrolled in the study. Polytrauma patients, patients with another major fracture of lower limb, open fractures, pathological fractures and fractures involving upper one fourth or lower one fourth were excluded. We also excluded patients with BMI more than 30. After receiving children in hospital, patients were stabilized in casualty section. Patients were then shifted to ward and skin traction appropriate for weight was given, limb positioning was aided by sand bags. A check X-ray was taken next day after 24 hours of traction and then again when fracture was sticky on clinical examination. A well molded Spica cast was given after that by a senior consultant surgeon with patient under general anaesthesia and fluoroscopic control. Hips were kept in of 40-45 degree of flexion, 20-30 degree of abduction and knee at 70 degrees of flexion. We used a single leg spica in 9 patients with hip in 30 degrees of abduction, 20 degrees flexion and 20 degrees knee flexion. Check X-ray was taken next day. For children 2 years to 5 years a varus valgus of 15 degrees, anterior posterior angulation of 20 degrees and shortening of 20 mm was accepted and for children 5 years to 10 years a varus valgus of 10 degree, antero posterior angulation of 15 degrees and shortening of 15 mm was accepted. Any correction needed was done by either reapplying or wedging the cast. Parents were taught spica care before discharging.

All children were given Vitamin D supplements and deworming agents and if needed iron therapy for anaemia if detected during hospital stay as most children have limited contact with health facilities and this was considered as an opportunity to address health issues endemic in the area. Follow up was usually advised at 3 weeks, 6 weeks, 9 weeks and 12 weeks for checking breakage of spica, spica complications and check X-rays. However, most of the patients did not follow up on specific days due to geographical topography and frequent road closures due to rain or other natural factors. Spica was removed when X-ray showed good bridging callus at fracture site. Final follow up was done at least minimum of six months, when gait, limb length discrepancy (LLD) or residual mal-alignment were recorded.

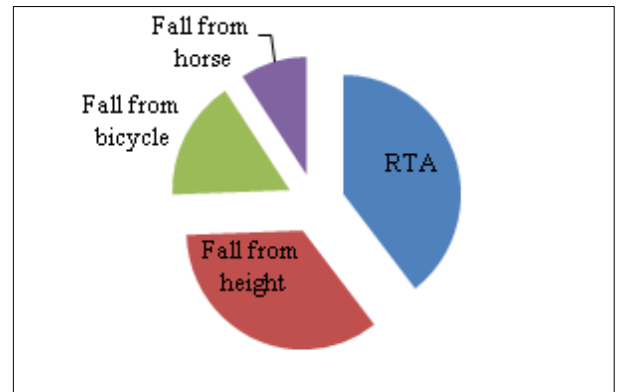
**RESULTS**

Total 47 patients were included in study. 4 patients did not complete 6 months of follow up and were excluded from the study. The average age of children was 5.83 years with range from 2 years 3 months to 10 years. 30 were boys while 13 were females (Figure 1).

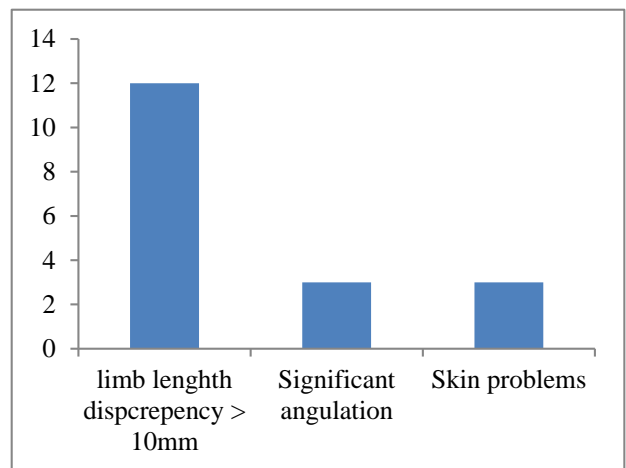


**Figure 1: Gender based distribution.**

Right side was involved in 24 patients while 19 patients had left side injury. Mode of trauma was Road traffic accident (RTA) in 17, fall from height in 15, fall from bicycle in 7, and a fall from horse in 4 (Figure 2).



**Figure 2: Mode of trauma.**



**Figure 3: Distribution based on complications.**

Average duration of skin traction was 9.14 days with range from 6-14 days. Average duration of hospital stay was 11.51 days with range from 8 to 16 days. Average time for fracture union was 8.36 weeks with range from 6 weeks to 14 weeks. We needed recast or wedging in 5 patients. 3 patients developed skin excoriation or a cast sore which needed medical attention or trimming of cast. At final follow up 12 patients had limb length discrepancy of more than 10 mm, which included 10-15mm LLD in 6 children, 15-20mm LLD in 3 and more than 20mm in 3 children. A significant angulation at fracture site was found in 3 patients at final follow up (Figure 3). Only 2 children had an obvious short limb gait at 6 months of follow up.

## DISCUSSION

There is no ideal treatment for fracture shaft of femur fracture in children, as this group includes children from birth to 18 years treatment options vary greatly influenced by healing potential and remodelling potential.<sup>2,6</sup> Usually conservative treatment in the form of spica cast is used in children less than 6 years and operative in form of plating either open or MIPPO or elastic nailing is done in children 12-18 years of age as remodelling potential is little less. Age group 6-12 forms a grey zone where many authors are divided in the opinion.<sup>2</sup> There has been a trend towards operative treatment in this grey zone age group as better OT facilities, better instrumentation and implants are now available in most of the centres.<sup>7</sup> Even with modern equipment chances of infection, growth plate disturbances, implant failures have been reported, besides usually the need for second surgery to remove the implant. We observed that children in our catchment area are usually not obese and tolerate spica well. We extended the age group to 10 years based on these observations, as we found it simpler, economical and easier for our patients. People here usually don't want their children to get operated and then land up with traditional bone-setters which often leads to sub optimal results and sometimes dreadful complications.

Mode of trauma in our study was mostly Road traffic accident or fall from height, this can be explained by the fact that our catchment area is a hilly area with ill maintained roads. Passenger vehicles often skid from these roads adding to the trauma we receive in our facility. Besides houses are constructed on hill slopes with no paly grounds, children often play on their house roof which makes them vulnerable to fall from height. Same observations have been made in other studies.<sup>8</sup> More male children were injured than female with ratio of approximately 3:1, as males are more active and traditionally female children are usually restricted outdoor activities due to local socio-religious beliefs. Similar observations have been made by Zandra Engstrom et al in their study.<sup>9</sup> The healing time reported for fracture shaft of femur in children is 8-12 weeks. One study by Craid MS et al reported average healing time

range of 14-26 weeks in plate fixation group.<sup>10</sup> Our average union time in spica was 8.36 weeks with range 6-14 weeks. Gross et al. reported excessive residual angulation and shortening in 22 of their patients treated with immediate spica casting.<sup>11</sup> While in series published by Scott et al 28.5% patients had excessive angulation or shortening.<sup>12</sup> In some studies significant shortening was seen in 40% patients treated by immediate spica casting.<sup>13,14</sup> We had significant shortening or angulation in 13.9% (6) of our patients. This is due to the pre-cast traction applied to limb till fracture becomes sticky. we believe with skin traction the residual angular deformity is minimal after spica cast. Many other studies published previously have also established the efficacy of spica treatment in this age group. Sugi and Cole have also treated 191 children upto 10 years of age by spica cast. They accepted upto 20-degree anterior angulation, 15 degrees valgus angulation and 2cm of shortening. They did not accept any varus or posterior angulation. They had shortening in all patients at the time of cast removal however we had shortening in only 12 children out of which only 3 were significant. They reported 4.7% cast complication in form of skin excoriation, cast breakage or loss of reduction with need of re casting, in comparison we had such complications in 18.6% (8) of our patients.<sup>15</sup> Jamaluddin et al treated 24 children aged 3 months to 10 years having fracture shaft of femur by early spica cast. They applied cast with child under sedation. Their average hospital stay was 3.5 days<sup>16</sup>. The average hospital stay in our study was 11.5 days. They reported an average shortening of 15mm in their patients with some shortening in all of their patients, we had shortening in 12 patients, with average shortening of 4 mm. we had less shortening and more hospital days than their study because we used traction prior to spica, which increased the hospital stay but improved our overall results.

## Limitations

The limitations of study are that sample size was small and follow up time phase was also short. We couldn't access the remodelling of angulations or correction of LLD. Also, we didn't compare our results with other methods of treatment. Care of a child in spica cast was little tedious for some parents, however all of the parents were satisfied with the outcome at the end of the treatment.

## CONCLUSION

Conservative treatment in form of hip spica cast in fracture shaft femur in children upto 10 years gives good results, and pre spica traction improves the outcome. It avoids complications of operative treatment like infection, and re-surgery for implant removal. It has minor complications like skin excoriation and loss of alignment; these are minor and can be managed easily. Skin traction followed by hip spica cast is safe and effective treatment for fracture shaft of femur in children

upto 10 years of age and should be preferred over other treatments.

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*Ethical approval: The study was approved by the Institutional Ethics Committee*

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