Study to determine the Results of Femoral Shaft Fractures among Children managed with Immediate Hip Spica Cast

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INTRODUCTION

The frequency of hip fractures in children in the Europe and United States is 20 per 100,000 per year. Diaphyseal fractures are the maximum communal femoral fractures in children, accounting for 62 per cent of all femoral fractures (Das et al., 2020; Alam et al., 2019). Common mechanisms include falls, car accidents, and sports injuries, especially from playground equipment. The femoral shaft fractures treatment varies according to the size and age of the children, the associated injuries and local practice (Prajapati et al., 2019; Mehmood et al., 2019). Contemporary methods of treating femoral shaft fractures comprise many forms of traction, prompt and delayed spica casting, flexible nailing, plate fixation, external fixation and traditional intramedullary nailing for adolescents and older children (Liau et al., 2020; Saeed, 2019). The use of surgical methods is limited by complications such as infections and joint injuries. Historically, trac-
tion and casting have been very successful in treating diaphyseal fractures in children (Gordon et al., 2020; Gao et al., 2020). However, since a 1976 article by Iran and colleagues describing spica immediate dressings in infants, surgeons have been aware that avoiding long hospital stays associated with traction and casts is possible and possibly desirable (Asimuddin et al., 2019; Roaten et al., 2009). Due to the characteristics of fractures in children, the use of emergency immobilization of the hip spica in the femoral shaft fracture treatment is an active alternative to conventional treatment (Misaghi et al., 2020). It has the advantages of avoiding long hospital stays, lowering costs and preventing separation anxiety in children. The current analysis was held to evaluate the treatment outcomes of the immediate hip spica in femoral shaft fractures treatment in children 1-5 years of age.

MATERIALS AND METHODS

In this study, thirty-five children of age one to five years with femoral shaft fractures within seven days of injury were selected from the Orthopedic department. Open fractures, bilateral femoral fractures, pathological fractures, children with fractures without displacement (dislocation or greenstick fractures), vascular complications, Neurological injuries or fractures of the femoral shaft associated with other serious injuries requiring surgical intervention or ICU follow-up were excluded. The hospital’s Ethics Committee has given approval for the study. From the parents of all children: written consent was attained, contributing in the study. After initial evaluation and resuscitation, X-rays of the limb with lateral and AP view were taken. The child was slowly injected over 3 to 5 minutes with diluted intravenous diazepam (Valium-Martin Dow) 0.05-0.3 mg/kg body weight and Sosegan (Pentazocine HCl Searle) 0.5 mg/kg body weight. No fluoroscopy or C-arm, gently closed reduction using spica table and traction to restore the overall alignment and length of the injured limb to exactly fit according to the undamaged limb. The injured limb was held straight on the hip and knee in a neutral position with the ankle, abducted at an angle of 30-40°, and then Plaster of Paris (Gypsona-BSN Medical 4’, 6’) was applied from just below the nipples to the foot, to maintain the limb kept in neutral rotation throughout procedures. Post Spica x-rays and lateral radiographs were obtained to confirm the reduction. (varus / valgus 30 degrees, antero-posterior angulation 30 degrees and shortening 15 mm in children up to 2 years, varus / valgus 15 degrees for 3-5 years, anterior-posterior angulation 20 degrees and shortening of 20 mm. The patient is not required for any re-reduction. Patients were permitted to return home on the day the applied cast was removed 3 to 4 weeks later to allow the foot to freely mobile and to avert additional fracture displacement form the site within the cast, predominantly in spiral fractures. Patients were monitored at the clinic (OPD) weekly for the first 3 weeks, then every 2 weeks until the spica is removed, and then monthly for at least 6 months thereafter. At each appointment, hip spica was scrutinized to observe for weakness, breakage or soaking of cast and compression symptoms. If the spica became broken or weak, it was changed or reinforced. Angle was corrected by wedging the plaster. At the last visit, if the X-ray displayed profuse formation of callus that forms the bridge and binds at the fracture site, the spica was detached, and the examination of a fractured limb was done clinically to confirm fracture union and to estimate limb length using a tape measure. The patients were then allowed to gradually lift weights and mobilize. There was no formal physical therapy.

RESULTS

In this study, a total of 35 children, 24 (68.6%) boys and 11 (31.42%) girls, with a mean age of 3.8 years, were treated with an immediate hip spica cast. Their ages ranged from 1 to 5 years. The majority (n = 60%) were under the age of five (mentioned in Table 1). Twenty-five (71.42%) children were followed up until the spica dressing was removed and the study was completed. Four (11.42%) children could not come for a checkup after the third week. The right femur was fractured in 19 cases (54.28%), and the remaining 16 (45.7%) has a left-sided fracture. The mechanism of the injury consisted of a fall from a height in 26 patients (74.28%), a traffic accident (RTA) in 5 patients (14.2%) and the fall of heavy objects on a limb in 4 (11.42%) children. The time of immobilization of the Spica cast ranged from 4 to 6 weeks (mean 5.4 weeks), as mentioned in Tables 3 and 4.

In the second week, seven (22.85%) children had spica wetting, and breakage and reinforcement of spica was done, and 5 (14.28%) children had a spica wedging, and casting was applied to fix the angulation. While the cast was removed after the fracture had healed, in 8 (22.8%) children has the shortening ranged from 0.3 cm to 2 cm. No extension or hypertrophy was observed in the fractured limb. Angulation was found in 3 (13%) children (10-15 degrees forward and 5-10 degrees to the lateral side). Tran-
Table 1: The Demographic Features of patients

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>24</td>
<td>68.6%</td>
</tr>
<tr>
<td>Females</td>
<td>11</td>
<td>31.42%</td>
</tr>
</tbody>
</table>

Laterality of Femur Fracture

<table>
<thead>
<tr>
<th>Laterality</th>
<th>Number</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Side</td>
<td>19</td>
<td>54.28%</td>
</tr>
<tr>
<td>Left-Sided</td>
<td>16</td>
<td>45.7%</td>
</tr>
</tbody>
</table>

Table 2: The Age range of Patients

<table>
<thead>
<tr>
<th>Age in years</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>60%</td>
</tr>
<tr>
<td>4-5</td>
<td>40%</td>
</tr>
</tbody>
</table>

Table 3: The types and locations of fractures

<table>
<thead>
<tr>
<th>Shaft of femur</th>
<th>Types of fracture</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oblique</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spiral</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transverse</td>
<td></td>
</tr>
<tr>
<td>Proximal</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Middle</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Distal</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>15(42.9%)</td>
<td>12(34.3%)</td>
</tr>
</tbody>
</table>

Table 4: Various aetiology of fractures

<table>
<thead>
<tr>
<th>Aetiology of fractures</th>
<th>Number</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall from Height</td>
<td>26</td>
<td>74.28%</td>
</tr>
<tr>
<td>RTA</td>
<td>5</td>
<td>14.2%</td>
</tr>
<tr>
<td>Fall of a heavy object</td>
<td>4</td>
<td>11.42%</td>
</tr>
</tbody>
</table>

Sient mild stiffness in the knee was observed in all patients immediately after exposure. Spike is fully responsive to a short cycle of home exercise program. In 4 (11.42%) children, a slight skin break was observed. No complications related to sedation or anaesthesia were reported. The limbs of all children were equal, and no malunion, non-union or rotational deformity were observed at the last follow-up visit six months after the injury. Data were analyzed using SPSS version 20.0, averages were calculated, and, if necessary, data are presented in the table.

DISCUSSION

Femoral shaft fractures are the utmost communal pediatric injuries managed by an orthopaedic surgeon. Management is influenced by trauma or multiple injuries, personality breakdowns, age, family problems and costs (Misaghi et al., 2020; Edwin et al., 2020; Curran et al., 2020). Spica cast fixation is an effective, safe and simple treatment for pediatric femoral shaft fractures. -In our study, 20/35 (57.14%) children obtained excellent results after removal of the cast without shortening, angulating or lengthening a broken limb. However, while 8 (22.8%) children had a shortness of 0.3 cm to 2 cm, 4 (11.42%) had angulation (10-15 degrees forwards and 5-10 degrees to the side). At the last follow-up visit six months after the injury, none of the children had a significant residual angular deformity, defective union or non-union. In a 46 children's retrospective study with femoral shaft fractures managed with the iliac spica directly by Frech-Dorfler during the follow-up period, an average of 7.3 years after injury, one patient only exhibited a discrepancy in the upper leg length of up to two cm (Brnjoš et al., 2020; Amin et al., 2020). One patient had a rotational deformity and slight valgus. The study concluded that the long-term outcomes of conservative treatment of femoral shaft fractures in nursery children are very virtuous, even in severe dislocated fractures, and an early shortening of the femur to 2.5 cm can be effectively managed with spica plaster. Jauquier and Doerfler compared flexi-
ble intra-medullary nails (FIN) with immediate plaster fixation (SCI) and concluded that young children with femoral shaft fractures treated with FIN or SCI had similar promising results and low complication ratio (Compton et al., 2020; Luo et al., 2019). In a preschool child with a femoral shaft fracture, a sudden SCI, performed according to specific guidelines by the pediatric orthopaedic team, allowed early discharge from the hospital with minor complications. Ezequiel and Brett treated 145 childhood femoral fractures in children under 7 years of age with an immediate spica cast out in the emergency room (ED) and in the absence of related factors requiring hospitalization (e.g., child abuse or multiple injuries), herringbone dressing on Emergency room for femoral fractures in children, followed by emergency discharge is safely administered with a low complication rate in children under 6 years of age, almost eliminating the need for general anesthesia (Kim et al., 2020; Makarewich et al., 2020). As in our study, in another study by Anthony and Michael, 175 children with acute hip fractures of the femur were treated and followed for at least 2 years without reporting any significant angular deformations (Chetia et al., 2020). This study concluded that immediate closed reduction and placement of a well-formed cast of the iliac spine is a safe and reliable option for the treatment of isolated closed femoral fractures in children younger than 10 years after birth. A local study conducted at the Department of Pediatric Surgery of the National Institute of Pediatric Health in Karachi showed excellent results in the treatment of a sudden hip fracture. The study documented that shortening ranged from 0.5 cm to 2.5 cm in 15 (71.42%) of 21 children after plaster removal and extended after finding a kink in one child (2 cm) 3/21 (14.28%) in children (Mishra et al., 2020; Trailescu et al., 2020). However, in this study, general anaesthesia was used for spica plaster, and the age group ranged from 2 to 11 years. Large and Frick reported 2 cases of post-cast tightness syndrome for hip fractures in children, possibly due to excessive pressure on the back of the calf due to plaster cast below the knee. In our study, we used hip spicas in the emergency department and orthopaedic department. The emergency service (ED) and operating room (OR) provide similar outcomes in terms of reduction and complications, but with significantly higher hospital costs for an operating room plaster (Rosin et al., 2019). Although no elongation or hypertrophy of the fractured limb was observed in our study, many authors reported excess growth ranging from 1 cm to 2.5 cm. Despite the strengths of our study, some limitations are worth mentioning. Our sample might not be large enough, and the observation time was short. Given that there is very little evidence to date on acute hip spicas in pediatric femoral shaft fractures in this country, the need for further research cannot be overstated. Our results have been excellent (Mcclure and Riccio, 2020). However, we believe that with a wider case series, longer follow-up, and an improved procedure, a solid conclusion can be drawn about the effectiveness and other aspects of this method of treating femoral shaft fractures.

CONCLUSIONS

An emergency spica cast is a safe, inexpensive and precise treatment of closed femoral shaft fractures in children aged 1-5 years. It eliminates complications such as long-term traction and hospital stay, anaesthesia and surgery, and allows the child to quickly return to the family environment, thus preventing a long-term separation from his parents. Therefore, we recommend it as the first-line treatment of closed shaft fractures in children aged 1-5 years.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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REFERENCES


