ORIGINAL ARTICLE

Femoral Shaft Fracture in Children Treated by Early Hip Spica Cast: Early Result of a Prospective Study

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Summary

Twenty-four children under the age of 10 years with femoral shaft fractures were treated by early immobilization of fracture and application of hip spica cast. The average hospital stay was 3.5 days. The average shortening at time of fracture union was 15 mm. The average time of follow up was 6.7 months. All fractures healed, except for one, in an acceptable position. The average shortening at last follow up was 9.5 mm and the average overgrowth up to the time was 6 mm. There was no incidence of refracture, joint stiffness or any pressure sore.

Key Words: Children, Femoral shaft fractures, Early hip spica

Introduction

Fractures of the femoral shaft in children are usually treated by initial traction for 3 to 4 weeks followed by an additional period of immobilization in hip spica cast till 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 separation from their families. The use of traction itself is not without complications. Skin traction including Bryant's traction may be complicated by blistering, loss of correction and even ischemia of the lower limb. Skeletal traction meanwhile poses the danger of bone infection and accidental epiphyseal plate damage.

Early hip spica cast application of femoral shaft fracture in children is a useful alternative to the traditional method of treatment. It allows for a short hospital stay thereby avoiding all the problems associated with prolonged hospitalization. This paper is a report of our early experience with 24 consecutive patients with femoral shaft fractures treated by early immobilization in hip spica cast.

Materials and Methods

All children of less than 10 years of age with femoral shaft fractures admitted into the University Orthopaedic Unit from April 1989 to March 1990 were included in the study. Those with severe multiple injuries, ipsilateral tibial fracture and past history of fracture in the same lower limb were excluded from the study

On admission all patients were put on Thomas splint and skin traction. Immobilization in hip spica cast was done on the next convenient day usually within one week.

Application of hip spica

This was done under sedation using oral chloral hydrate 25 to 50 mg per kg body weight.

The child was placed on small spica table and a long leg cast was applied with the knee at about 40-45 degrees of flexion. When the cast has set, a single hip spica was then completed while maintaining the alignment of the shaft of femur. The hip was flexed to about 45 degrees, abducted to about 25 degrees and neutral in rotation. No attempt was made to obtain an end to end reduction. We tried to avoid more than 20 mm of shortening and 20 degrees of valgus angulation. We also tried to avoid any varus angulation. Rotation was judged clinically. X-rays of both femurs were then taken to measure shortening and angulation. The patients were allowed to go home on the day the cast was successfully applied. We did not remove the cast under the sole of foot as was suggested by Irani and his colleagues. Instead we removed the foot part of the cast after about 3 to 4 weeks leaving the ankle free to move.

Follow up

The patients were seen weekly for 3 weeks. X-rays were done on each visit to check the shortening and angulation. The fourth follow up varied from 3 weeks to 6 weeks depending on the age of the patient. The hip spica was removed and X-rays of both femurs were taken upon union of fractures. The patients were then allowed gradual mobilization and weight bearing. No formal physiotherapy was given.

Results

There were 27 patients admitted during the period of the study. However 3 patients defaulted treatment leaving 24 patients with 24 femoral shaft fractures in the series.

The age ranged from 3 months to 10 years with an average of 4.5 years.

There were 20 male and 4 female patients. 50% of the fractures occurred on the right side. The length of follow up was from 5 months to 12 months with an average of 6.7 months.

The first patient required second casting after failure to obtain satisfactory fracture position.

Two patients required change of hip spica cast at 4 weeks and 6 weeks due to soiling of the cast. The length of hospital stay was from one day to 7 days with an average of 3.5 days. The duration of immobilization in cast was from 3 to 11 weeks. At the final follow up all fractures except for one were found to have healed in a satisfactory position. The unsatisfactory position was that of a 10-year-old girl who defaulted follow up and came back 8 weeks later with full weight bearing. Her fracture has united with 25 mm shortening and 21 degrees of anterior angulation. No patients developed hip, knee or ankle stiffness or pressure sores following the use of the spicas.

Etiology

50 per cent of the patients were pedestrians knocked down by cars. Another 38 per cent sustained fracture as a result of fall and the rest were pillion riders.

There were 15 midshaft, 8 upperthird and one lower third fractures. Nine patients had transverse, 8 spiral and 7 oblique fractures.

Shortening

All patients had increase shortening of the femoral shaft as measured by serial X-rays in the first 2 weeks while in spica. However no further shortening occurred after the 3rd week of immobilization. At last follow up only one patient had shortening of more than 20 mm. The shortening at the last follow up ranged from 0 to 25 mm with an average of 9.1 mm. 10 out of 24 patients had overgrowth ranging from 2 mm to 13 mm with an average of 6 mm. Only 4 patients showed no overgrowth. The patient with 25 mm shortening was a 10-year-old girl who defaulted treatment for 2 months and started early weight bearing.

Angulation

In general there was also some increase in angulation in the first 3 weeks. However at the time of union all patients had angulation which were within acceptable range except for one patient mentioned earlier. In general the angulation which tended to be more rapidly corrected was the anterior angulation followed by the medial angulation.

Discussion

The main concern in the treatment of femoral shaft

tracture in children is the problem of limb shortening and deformity. However, while in adults any shortening would be permanent, the situation in children is different. Perfect anatomical reduction is not essential for perfect function[3]. The post traumatic overgrowth phenomenon following fracture has allowed acceptance of shortening of up to 2 cm at the time of fracture union[1,2,6,7,10]. In fact some over riding is usually desirable at the time of fracture healing[6,9]. Furthermore remodelling is also expected to correct moderate amount of angulation[4,5,7].

Because of this characteristics of fracture in children, the use of immediate hip spica immobilization for the treatment of femoral shaft fracture is an attractive alternative to the conventional method of treatment. It has the advantages of avoiding prolonged hospital stay, reducing costs and prevention of separation anxiety in children[6].

In all our patients except one, the outcome of treatment was satisfactory. The average hospital stay was 3.5 days which was comparable to other studies[6,10].

We did not remove the sole of the spica cast as advocated by Irani and his co-workers. Instead we freed the ankle after 3 or 4 weeks by removing the cast just above the malleoli. We did not encounter any loss of correction with this method.

The problem of early spica application in older children is the tendency of the fracture to override and angulate. This is due to the size of the patients[10] and the tendency in older children to ambulate without supervision early. Furthermore remodelling and overgrowth in patient above 10 years of age is generally much less[7,9]. While Staheli and Sheridan limited their patients to 8 years of age, Irani and his co-workers, and Sugi and Cole included children of up to 10 years of age. However we agree with Staheli and Sheridan that children with additional injuries, unreliable parents and anaesthetic skin should not be treated by immediate hip spica immobilization.

We have used the method of treatment at all levels of shaft fracture[6]. Others had excluded patients with proximal femoral shaft fracture for fear of development of coxa vara[10].

While others have used double hip spica for children below 5 years[6] we did not find it necessary. All our patients were treated with single spica (one and half spica).

The anaesthesia used during fracture immobilization and cast application also differed among authors. While some did not use any anaesthesia[6] others used general anaesthesia[10]. We used oral chloral hydrate as sedative during immobilization and cast application. There was no need for proper fracture reduction. Immobilization in proper alignment is adequate as shortening of up to 2 cm is still acceptable.

Despite a short follow up period (5-12 months) we have noticed a considerable amount of overgrowth and correction of angulation in most patients. This is not surprising as maximal overgrowth usually occurs between 3 to 6 months after trauma[8]. Only 4 out of 24 patients showed no overgrowth. The rest had overgrowth ranging from 2 to 13 mm (average 6.0 mm). As overgrowth is expected to occur well beyond 2 years after trauma[8], those with residual shortening will improve further with time.

In patients of age 2 and less, all have demonstrated significant overgrowth ranging from 5 to 11 mm (average 7 mm) during the follow up period. This is in contrast to the findings of Kohan and Cummings, who observed reduced growth tendency in patients less than 2 years of age[7].

Due to the small number of patients and a short follow up, we are not able to correlate the amount of overgrowth to the age and sex of patients, the type and level of fracture. However we were able to observe that there was a reasonable amount of angular correction by remodelling in our patients. Anterior angulation is the most easily corrected of all angulations followed by medial angulation. It would appear that while all angulations should be minimised, no lateral angulation should be accepted.

Conclusion

Early hip spica cast immobilization in the treatment of femoral shaft fracture in children is a suitable alternative to the traditional method of initial traction

followed by extended period of hip spica cast immobilization.

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