

External fixation in femur fractures in children

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Abstract : This trial was carried out at Orthopaedic & Trauma Unit Bahawal Victoria Hospital Bahawalpur-Pakistan. Fifteen children were treated with external fixation from Jan 2009 to June 2009. Mean age was eight years and eight months (ranging from six to 13 years). All fractures were followed up for up to five months after consolidation, which was observed in 100% of the cases when the external fixator was removed after a mean time of 51 days (ranging from 45 to 65 days). Infection through the screw hole was frequent, but settled unevenly. The major complication was refracture (13%), which required a new procedure with external fixator.

Introduction

Diaphysial and metaphysial fractures of the femur in children accounts for approximately 1.6% of all fractures in pediatric population and can be considered severe due to the intensity of energy released and associated lesions, head injuries being the most common associated lesions. The distribution of femoral fractures is bimodal (distribution), with peaks at the age of two and during adolescence¹⁾.

Several methods have been currently recommended. Conservative treatment with previous traction and plaster of Paris cast or immediate plaster of Paris cast has been the most supported. However, despite the fact that this method is not invasive, it is not free from complications, the most frequent ones being reduction loss resulting in shortenings and angular deviations, and long periods of home confinement, a common complaint in older children. During the last decades,

an increase in the indication of internal and external fixation for these fractures has been seen because of the complications mentioned above²⁾³⁾. Van Tets and Werken⁴⁾ report that these types of treatment should be used only in patients with open fractures, multiple traumas, specially when associated with head injury⁴⁾ while Blasier et al.⁴⁾, Aronson and Tursky³⁾, and Alonso and Horowitz²⁾ also recommend surgical treatment even for closed femoral fractures.

Skin traction and later preparation of hip-foot plaster of Paris cast or immediate use of plaster of Paris cast are usually adopted for children aged less than four because they are well tolerated and associated with excellent results. In children aged from four to 12 years who present an isolated femoral fracture, skeletal traction can be used, the main disadvantages of which are long hospital stay, difficult management of the patient, need for specialized nurses, and high hospital costs⁵⁾. Patients with multiple fractures or open fractures

can be treated with external or internal fixation. Little controversy about this type of treatment exists in literature.

Recent reports showed that internal fixation with the intramedullary nail through the great trochanter in children aged six years or more has been associated with some complications, the most common ones being deformity of proximal femur with coxa vara at first and coxa valga later⁶ and ultimately halted growth of the great trochanter. Avascular necrosis of the head of the femur is more frequent when the access is through the piriform fossa⁷. Due to these factors and the need for a new operation for removal of the intramedullary nail, this procedure has been less indication than external fixation.

Recent studies have used external fixation in older children and adolescents with isolated femoral fractures^{3,5}. The authors have reported that the main advantages of this therapeutic modality are short hospital stay, stabilization without the risk associated with open surgery, low incidence of complications, easy cleanliness, specialized nurses being not required, good tolerability to heat, early return to daily and school activities, as well as low cost^{7,8}. The present study aimed to evaluate the advantages and disadvantages of external fixation in the management of femoral shaft fractures in older children (\geq six years).

Material and Patients

Study patients underwent osteosynthesis with lateral linear external fixator and were followed up for five months. After the patient was first evaluated by the trauma group at the emergency room, radiographs were taken and the patient was submitted to skin traction. Surgery was carried out under general anesthesia one day

after hospitalization on average. The patient under traction was positioned on an orthopedic table. In all cases, the femoral fracture was reduced, a shortening of up to 1.0-1.5 cm being allowed with no rotational or angular deviation. After disinfection and aseptic cleaning of the leg, the linear external fixator was applied. The linear external fixator consists of a hardened aluminium shaft, steel Schanz screws (4.5 mm ; length : 200 mm). The fixator was placed under visual control with the help of an imaging enhancer. Two Schanz screws were placed both proximal and distal to the fracture site with a total of four Schanz screws. They were then fastened with two parallel lateral bars. Anteroposterior and lateral radiographs were taken. If the reduction was considered satisfactory and Schanz screws were well positioned, a dressing as then applied.

The mean hospital stay was five days and ranged from two to 20 days. As for patients with closed femur fracture not associated with other lesions, the mean hospital stay was three days.

On the first postoperative day, isometric exercises of the thigh and active moments of the ankle were stimulated, a dressing was applied to the area where Schanz screws had been inserted, and passive physiotherapeutic exercises of the knee and hip were carried out. Partial load was allowed within 40 days on average and the total load was allowed within 60 days following surgery. The dynamization of fixators was carried out within 35 days (range : 30 to 110 days).

The mean time until fixator removal was 51 days (ranging from 45 to 65 days). The external fixator was removed after confirmation of fracture consolidation (bone callus) at the surgery room with the patient under narcosis, hospitalization being not required.

Results

3 patients (20%) developed infection along the pathway of Schanz screws and were given oral cephalexin for one week with daily dressings. They were periodically reevaluated.

No patient developed osteomyelitis. Intravenous antibiotic therapy was not needed in any patient.

Only two pts (13%) presented with refracture after 2 weeks of removal of the external fixator which required a new procedure with external fixator.

Rigidity of the knee was seen in one patient. It persisted after removal of the external fixator. Joint mobility returned to normal following intensive physiotherapy

Consolidation of femoral fracture was seen in all patients treated with external fixation. No significant angular or rotational deviation was seen.

Discussion

Although femoral fractures in children have been treated without surgery with good results, an increasing interest in internal or external fixation has emerged for treatment of this type of fracture, specially during the last decades, so as to improve patient's quality of life during treatment and final outcomes.

Several surgical techniques have been used, including fixation with a plate, intramedullary nail, and external fixation, each of them with advantages and disadvantages. Not only surgeon's expertise and patient selection play an important role, but also socioeconomic aspects should be also taken into account.

The use of an external fixator is technically easy to carryout and has been associated with

low rates of complications. In the present study, fracture consolidation was found in all cases with no joint motility limitation six weeks after removal of the fixator.

Despite the fact that infection along the pathway of Schanz screws is relatively common and occurs at a rate of 0% to 45% according to literature⁶⁾, routine use of prophylactic antibiotic therapy is not indicated. In the cases where antibiotic therapy was needed, oral cephalexin for one week combined with daily dressings led to cure. No patient developed osteomyelitis or needed intravenous antibiotic therapy.

Another advantage of external fixation is the short hospital stay, thus resulting in lower costs, as compared to those of other interventional techniques.

Reduction was not lost in any case despite the fact that an auxiliary pin was not used, as recommended by Sola et al.⁶⁾, for unstable fractures.

Shortening and overgrowth (more frequently found) occurred following consolidation at a relative frequency but were not associated with any clinical impact.

Refracture following removal of fixator has been reported⁴⁾ with rates of 1.6 to 21.6% according to some reports. According to Sola et al.⁶⁾, the main factor for refracture is probably the lack of fixator dynamization at opportune time. Therefore, dynamization and load stimulation are recommended for at least 30 days before removal of fixator.

Conclusion

External fixation has been shown to be a very efficient method and an important therapeutic alternative for treatment of femur shaft fractures in older children (\geq six years) and adolescents.

Despite the fact that external fixation is not free from complications, it has many advantages, such as a high rate of fracture consolidation and a low rate of refracture after initial treatment. In addition, it is a procedure easy to carry out.

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