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Educational Corner

Missed Hip Fractures in Pediatrics

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Background

Hip fractures are very common in the adult population (1). However, these fractures are rare in pediatrics, accounting for less than 1% of all fractures in this population (2). Pediatric hip fractures are the result of high energy trauma in 80-90 percent of patients (2), and in multiply traumatized patients, they are easily missed, particularly in the developing countries with less stringent therapeutic measures (3). Delayed diagnosis and treatment of missed hip fractures in pediatrics could be complicated by nonunion, malunion, coxa vara, and osteonecrosis (4). Therefore, in patients with multiple trauma, the proximal femur and pelvic radiographs should be obtained to avoid missing a hip fracture. In pediatric patients with a missed hip fracture, the rationale for treatment includes early anatomic reduction with internal fixation and selective use of supplemental external stabilization such as casting and splinting to minimize the post operative complications. However, the age of the patient and the type of fracture are among several factors which affect the management of a missed hip fracture in pediatrics and due to these factors, the treatment plan is challenging (5, 6). In this article, we aim to provide a treatment algorithm for the treatment of missed pediatric hip fractures, with respect to the patient's age and type of fracture.

Classification of Pediatric Hip Fractures

The Delbet classification is the most favorable classification system which is used for pediatric hip fractures by the orthopedic surgeons, which contains both descriptive and prognostic values. According to this classification, the pediatric hip fractures are classified into four types, including the transphyseal (type I), transcervical (type II), cervicotrochanteric (type III), and intertrochanteric fractures (type IV). Type I fractures are further categorized into type IA (without femoral head dislocation) and type 1B (with femoral head dislocation). Type I fractures are the least common pediatric hip fractures (7%) and are associated with the highest rate of avascular necrosis (AVN) (40%). Type II fractures are the most common pediatric hip fractures (40-50%) and are associated with a 27% risk of AVN. Type III fractures account for about 35% of pediatric hip fractures and carry an approximately 20% risk of developing AVN. Type IV fractures account for almost 10% of pediatric hip fractures and entail a 5% risk of AVN (5). Types III and IV are associated with a higher rate of varus malunion if not properly treated (7).

Management of Pediatric Hip Fractures

In general, non-displaced fractures could be treated by percutaneous screw/pin placement with or without capsulotomy. We should perform an open reduction, if there is any r displacement after an attempted closed reduction. The threshold for open reduction should be any displacement that decreases the incidence of osteonecrosis and nonunion. The specific treatment suggestion for each type of missed pediatric hip fracture has been provided below. It should be noted that the treatment of the fracture is the first priority, accepting the risk of subsequent growth disturbance and leg length discrepancy.

Type I Pediatric Hip Fracture

Non-displaced or minimally displaced stable fractures in toddlers up to the age of 2 years (Figure 1a) should be treated with a spica cast without internal fixation (7). Children older than two years should always have stabilization with internal fixation after anatomic reduction. K-wires are appropriate for internal fixation in small children, while 4- to 7.3-mm cannulated screws crossing the physis can be considered in older/larger children (7). For type IB fractures, the choice of approach is regarding to the position of the femoral epiphysis (Figure 1b). However, a surgical dislocation approach may also be necessary to give complete visualization of the hip (7).

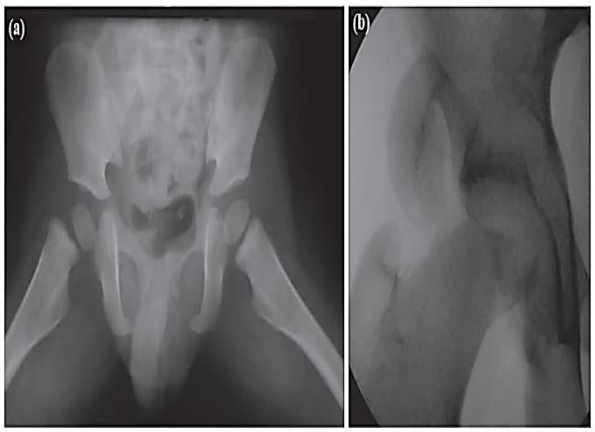

Figure 1. (a) Type Ia pediatric missed hip fracture; (b) Type Ib pediatric missed hip fracture

Type II and III Pediatric Hip Fractures

Depending on the extent of displacement, a closed reduction, open reduction, and surgical dislocation could be implemented (8). For children aged less than eight years, a 4-4.5 cannulated screw should be used for internal fixation, while for children aged over eight years, the 6.5 cannulated screw is suitable (Figure 2).

Type IV Pediatric Hip Fractures

Non-displaced type IV fractures in children younger than 8 years are treated with immobilization in a spica cast for 12 weeks. Displaced type IV fractures in children aged more than 8 years should be treated with internal fixation with a pediatric or juvenile compression hip screw or pediatric locking hip plate placed into the femoral neck short of the physis (5).

Figure 2. Type II pediatric missed hip fracture

Valgus osteotomy is generally associated with favorable outcome in these patients (4) (Figure 3).

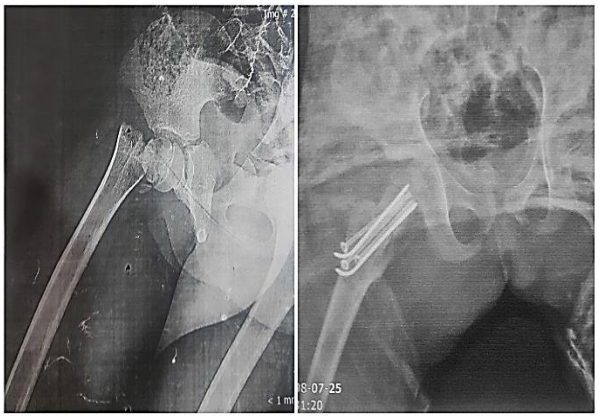

Figure 3. A type IV pediatric missed hip fracture treated with juvenile compression hip screw

Authors' Suggestion

We had several cases of pediatric missed femoral neck fx or non union of pediatric femoral neck fx treated by other surgeons. In these cases, we applied a valgus osteotomy and internal fixation (Figure 4).

We suggest a valgus osteotomy by a closed wedge osteotomy in lesser trochanteric of femur and then internal fixation by a T-Plate bending toward the bone or an angle blade plate by inserting the screws into the neck with the angle of about 130 degrees. Our results were significantly better due to using this method and we offer this method as a good treatment option for pediatric missed hip fractures. Finally, we encourage further studies about this method and its outcome in this type of pediatric fractures.

Figure 4. Non union femoral neck fx treated by valgus osteotomy and T-plate fixation

Conflict of Interest

The authors declare no conflict of interest in this study.

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