

Pelvic Fractures in Children (Pelvic Ring and Acetabulum)

Ходжимуратов Давронжон Икрамалиевич
Angren University, Angren City, Tashkent Region Teacher
of the Faculty of Medicine

Мурзаев Фуркам Фархон Узлу
Angren University, Angren City, Tashkent Region Student
of the Faculty of Medicine

Anotation: *Pelvic fractures in children are rare and often the result of high-energy trauma. The possibility of associated lesions cannot be ignored. Treatment at a specialized children's hospital is a must. The multidisciplinary care team must include a paediatric orthopaedic surgeon. In the emergency room, the surgeon contributes to haemodynamic stabilization of the child by reducing and stabilizing posterior arch fractures and restoring the skeletal cohesion to make it easier to move the child and allow other examinations to be performed. Imaging modalities are used to determine the stability of the pelvic ring fracture, the risk of epiphysiodesis of an acetabulum fracture if the triradiate cartilage is open and the joint congruency if the triradiate cartilage is closed. Internal fixation can be used if surgery is being performed for associated non-orthopaedic injuries. Most vertically stable fractures are treated non-surgically. Fractures that are unstable vertically will require surgical treatment. Treatment of acetabulum fractures depends on the status of the triradiate cartilage. In older children, it is similar to the treatments used in adults. In children with open growth plates, the goal is to make sure the acetabulum continues growing. In all cases, the patients must be instructed to start physical therapy as soon as possible. Full recovery can be expected after stable pelvic fractures. Unstable pelvic fractures can lead to sequelae, the severity of which depend on the residual pelvic displacement and involvement of the growth plates that can cause epiphysiodesis. Surgery to correct these deformities is challenging. The most serious occur when the vertical displacement of the hemipelvis must be corrected. After an acetabulum fracture, removal of the growth blocker can be done in children under 10 years of age. In older children, acetabular dysplasia requires periacetabular osteotomy.*

Keywords: *Pelvic ring fracture Pelvis fracture Acetabular fracture Child*

Pelvic fractures in children are rare, as they make up less than 0.2% of all childhood fractures, with an incidence of 1/100,000 children. The acetabulum is involved in 4% to 20% of these fractures and is frequently associated with a pelvic ring fracture. It is important to point out that these fractures often occur in the context of high-energy trauma and polytrauma. In the vast majority of cases, these are motor vehicle-related accidents: car-pedestrian accident in 40% to 80% of cases or passenger in a light vehicle in 10% to 30% of cases. In rare instances, the cause is non-accidental trauma (child abuse). Given the context, practitioners must be aware of the increased possibility of associated and potentially life-threatening injuries. This is even more true in young children where the triradiate cartilage is still open, as it is normally protected by the elasticity of the pubic symphysis and sacroiliac joint. In adults, the bleeding caused by a pelvic fracture may be life threatening. But this is rarely the case in children: on one hand, the thickness of the periosteum helps to limit the

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displacement, and on the other hand, the haemostatic response is more effective in children than in adults. Thus, the patient's life may be threatened by the presence of one or more associated injuries, which occur in more than 60% of cases. The most common is a cranial injury, which leads to death in 75% of cases. Peripheral neurological lesions are much rarer (3% of cases) and are mainly due to rupture of the posterior arch with stretching of the lumbosacral plexus. The next most common are abdominal injuries, which occur in an estimated 10% to 20% of cases (liver or spleen), and then thoracic injuries, which vary widely in frequency between 7% and 60%. Conversely, if the patient is stable, a full-body CT scan should be done within the first 45 minutes: brain CT scan without contrast, neck-chest-abdomen-pelvic scan with contrast and 5-minute delayed abdomen-pelvic scan if a pelvic fracture is confirmed. In fact, while AP X-rays of the pelvis are useful during the initial workup of pelvic injuries, its lack of sensitivity means that a CT scan is essential for precise exploration of bone elements. It turns out that 30% of pelvic fractures found on CT scan were not seen on plain X-rays (Fig. 1).

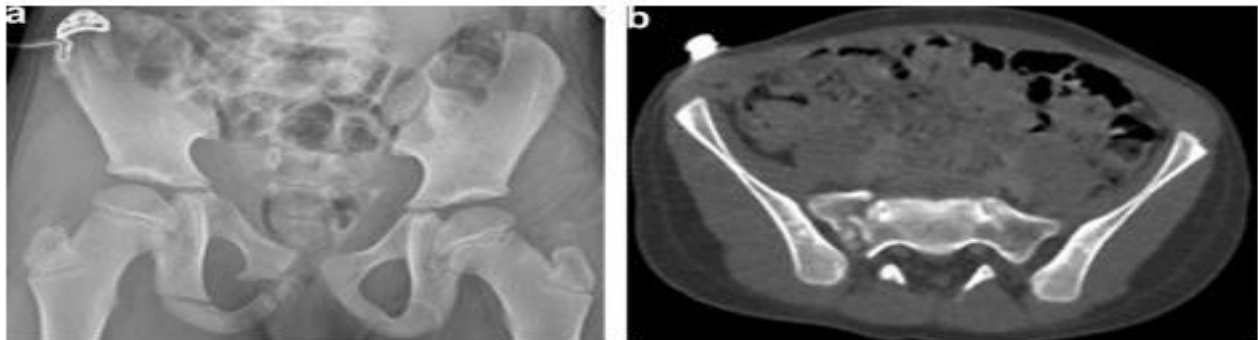


Fig. 1. Sacrum fracture in a 6-year-old child that was missed on pelvis X-rays (3a), but detected on CT scan (3b) (Image courtesy of M. Panuel).

Developing a classification of acetabular fractures in children has been difficult because of the low incidence of this type of injury. In our opinion, the simplest is the one proposed by Salter and Harris (Fig 2). Acetabular fractures in children most often impact the posterior arch and the Y cartilage. They often occur in combination with posterior hip dislocation. Fracture-avulsions of the Y cartilage can impact one or more branches (Fig.3)

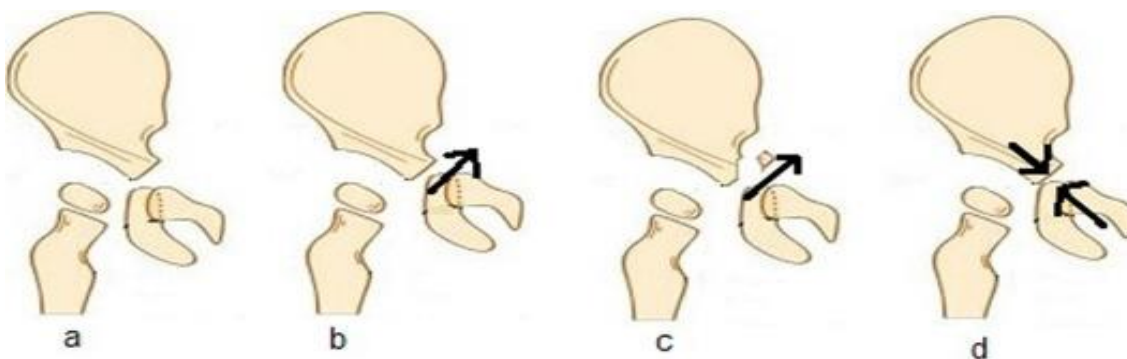


Fig. 2. Classification of acetabulum fractures in children based on Salter and Harris. a: Normal

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appearance: b: Salter and Harris type 1 fracture: c: Salter and Harris type 2 fracture: d: Salter and Harris type 5 fracture.

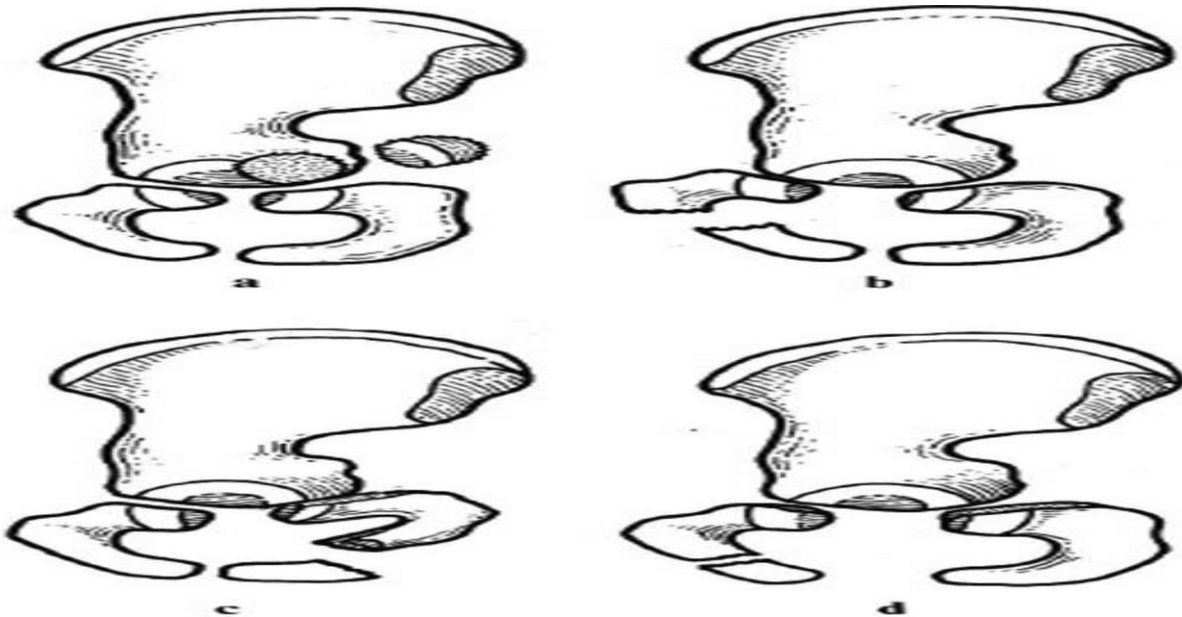


Fig. 4. Acetabular fracture in children according to Lascombes . a: fracture of posterior wall: b: anterior detachment of pubic branch and ischiopubic fracture: c: posterior detachment of ischium and ischiopubic fracture: d: separation of the three branches of the Y cartilage.

Pelvic fractures in children are rare injuries that often occur in the context of severe polytrauma. Thus, their initial care will be mainly determined by the patient's clinical stability and the presence of associated injuries. In the emergency room and for unstable patients, external fixation of the pelvis may be necessary to limit blood loss and facilitate nursing care. If the patient is stable, surgical treatment for pelvic ring fractures depends on the injury's mechanical stability. Stable lesions (Tile A) will be treated conservatively. Unstable fractures (Tile C) require surgical treatment. As for partially stable fractures (Tile B), the choice between conservative treatment and surgery depends on the deformity and expected residual instability. Acetabular fractures require surgical treatment in cases of considerable intra-articular displacement or joint instability.

In all cases, special attention must be placed on the skeletal maturity age to avoid inducing growth disturbances, which will have severe functional consequences and are difficult to repair later on.

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