

Case Report

Distal Humerus Physeal Separation in Young Children: A Frequently Missed Diagnosis

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Abstract

A 2-year-old child fell and landed on the left hand. Post-trauma, he developed swelling over his left elbow and refused to move the left elbow. He was brought to the emergency department and initially diagnosed with left elbow dislocation. A careful study of the plain radiograph of the left elbow showed left distal humerus physeal separation. A gentle closed manipulative reduction was attempted under sedation but failed to achieve good alignment. The child was put under general anaesthesia, where an elbow arthrogram was performed and closed manipulative and percutaneous pinning was done. The child regained full elbow range of motion at 4 months post-injury. At 1 year follow-up, there was no deformity noted. Distal humerus physeal separation is a relatively uncommon presentation and frequently missed diagnosis due to the cartilaginous nature of the distal humerus. It may result in growth disturbance, deformity, and functional limitations.

Keywords: Distal humerus; children; elbow arthrogram; elbow dislocation; physeal separation

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Introduction

Distal humerus physeal separation or transphyseal fractures of the distal humerus are uncommon injuries that usually occur in children under three years old. The mechanism of injury can be due to birth trauma, a fall into an outstretched hand with an extended elbow or non-accidental injury. These injuries are frequently missed or delayed diagnosis or mistaken as elbow dislocation due to difficult visualisation on plain radiographs of the cartilaginous nature of distal humerus physics (1). An early diagnosis and treatment can provide a favourable outcome.

Case Report

A 2-year-old child had a fall from a 3-foot-high fence and landed on his left hand. Post-trauma, parents noted the child crying in pain and refusing to move the left elbow with swelling over the left elbow. He was

initially treated in the Emergency Department and referred to the orthopaedic team for left elbow dislocation (Figure 1).

A careful review of the plain radiograph of the left elbow showed a left distal humerus physeal separation. Closed manipulative reduction using gentle traction, correction of translation and followed by elbow flexion was performed under sedation. However, the post-reduction radiograph showed that the alignment was still not acceptable.

The child was put under general anaesthesia for an elbow arthrogram, closed manipulative reduction under image intensifier guidance, stabilised with percutaneous pinning and supported with an above-elbow back slab. The post-reduction radiograph showed an acceptable alignment. There was no neurovascular deficit post-procedure (Figure 2).



FIGURE 1: Plain radiograph of the left elbow showed the distal humeral physeal separation which was mistakenly diagnosed as elbow dislocation



FIGURE 2: An elbow arthrogram was performed followed by closed manipulative reduction percutaneous pinning

The child was followed closely with outpatient clinic appointments upon discharge. The pins were removed 3 weeks post operation, where the radiograph showed a good alignment with callus formation, while the back slab was kept for a total of 6 weeks' duration. The child was started on a range of motion exercises upon removal of the back slab. At 2 months post-operation, he achieved an elbow flexion of 0 to 90 degrees. At 4 months post-operation, he achieved a full range of motion of the affected elbow with good bone healing and alignment (Figure 3). At 1 year follow-up, there was no deformity noted.

Discussion

Distal humerus physeal separations are uncommon injuries, with an incidence of 1.6% of all distal humerus fractures in children (2). It is usually diagnosed late or misdiagnosed as elbow dislocation or supracondylar humerus fractures. Plain radiograph is the first line of imaging done for this kind of injury.



FIGURE 3: Elbow radiograph at 4 months' post injury showed a united fracture with good alignment

Getting true anteroposterior and lateral images, focusing on the elbow, has been emphasised to help appropriately diagnose the injury (1).

As ossification of the distal humerus is not seen in young children, the key point for diagnosing transphyseal fracture recognises that the forearm is displaced posteromedially. In contrast, if present, the capitellum ossification centre will be aligned with the shaft of radius (1). The posterior fat pad sign may indicate the presence of an intraarticular fracture. However, in a series of 101 children aged three or younger with elbow fractures, positive posterior fat pad signs were only present in those with displaced injuries (2).

Other modalities of imaging include ultrasonography and MRI. Ultrasonography can identify the separation of distal humerus epiphysis from metaphysis by identifying the absence of cartilage at the distal extent of the humeral metaphysis. It can perform a dynamic assessment of the instability of epiphysis and metaphysis, but it requires an experienced radiologist. Meanwhile, MRI is not readily available in most centres and requires the child to be sedated to perform the examination (1).

Elbow arthrography is a useful method to diagnose and confirm reduction and stability during fracture reduction and fixation during operation. It can either be performed with posterolateral or direct posterior approach (1). It helps to identify the starting point on the unossified capitellum for percutaneous pin fixation and the anterior humeral line to ensure the intersection of the unossified capitellum and the radial head-capitellum relationship. While some surgeons advocate arthrogram before pin placement, they recommend performing closed reduction, then pin

placement and to be confirmed by arthrogram, as they believe once the arthrogram dye is inserted, it can obscure visualisation (3). In our case, we performed an arthrogram before pin placement to help identify the non-ossified capitellum and ensure adequate reduction.

Non-surgical treatment can be applied in non-displaced or minimally displaced injuries by applying a splint or cast for 2-3 weeks. In the displaced or unstable types of fractures, the treatment of choice is closed reduction and percutaneous pinning, with the guidance of elbow arthrogram. The reduction technique is similar to those used for supracondylar fractures: gentle traction, correction of translation/malrotation and elbow flexion. The reduction parameters are also similar, where no cubitus varus is acceptable, no malrotation is allowed, and the anterior humeral line should bisect the capitellum (1).

Complications of distal humerus transphyseal fracture include cubitus varus, growth disturbance, malunion, osteonecrosis, compartment syndrome, joint stiffness and neurovascular injuries (1). Patients are usually observed for at least 3-4 years for growth disturbance and any deformity as the child grows (1).

Conclusion

Distal humeral physeal separation or transphyseal fracture is uncommon but can be frequently missed. Adequate imaging with careful interpretation can help in diagnosis. Early reduction and stabilisation can lead to favourable outcomes.

References

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