

Transepiphyseal Separation of Distal Humerus in Young Children: An Often-Missed Fracture – A Case Report

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Abstract

Case Report

Background: Transphyseal fracture of the distal humerus (TFDH) is a rare injury in young children. Clinical and radiological examinations can be unclear, leading to delayed diagnosis. The absence of the ossification center of the capitellum complicates the radiological diagnosis and is often reported as an elbow dislocation. **Case Report:** A 1-year-old boy with a left elbow injury following a crush by a cart presented to our department with polytrauma. Radiographs showed a medial displacement of the radius and ulna relative to the humerus with a metaphyseal spike, suggestive of TFDH. Surgical reduction and fixation with Kirschner wires were performed, with good recovery at 6 months.

Conclusion: Awareness of TFDH is crucial for proper diagnosis. Radiographic findings of posteromedial displacement suggest TFDH, which can be confirmed with ultrasound.

Keywords: Transphyseal fracture of the distal humerus, Fracture-separation of the distal humeral epiphysis, radiological diagnosis.

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INTRODUCTION

Transphyseal fracture of the distal humerus (TFDH), also known as fracture-separation of the distal humeral epiphysis or epiphysiolysis of the distal humerus, is a rare injury in children under 3 years old [1]. It occurs when the growth plate separates at the distal humerus. It represents the least frequent type of physeal injury affecting the distal humerus [2]. Consequently, it can be mistakenly diagnosed as one of the more prevalent pediatric elbow injuries typically found in older children, such as dislocation, lateral condyle, or supracondylar fracture [3, 4].

The initial imaging modality for the evaluation of elbow fractures is radiography. However, the diagnosis of distal humeral epiphyseal separation is challenging because the capitellum ossification centre typically appears only after the age of 8 months, and in young children, most or all of the distal humerus epiphysis is made up of cartilage and cannot be visualized directly on radiographs [5]. However, if TFDH is not suspected clinically or at radiography, the definitive diagnosis of TFDH may be delayed.

Accurate diagnosis of TFDH is critical, as missed TFDH can lead to complications like limited movement or deformity. This case report highlights the challenges of diagnosing TFDH and the importance of considering it in young children with elbow injuries.

CASE PRESENTATION

A 1-year-old boy presented to our emergency department with polytrauma after being crushed by the wheels of a cart. This included bruising on his chest, lack of movement in his left upper limb, and irritability when his right elbow was moved. He was conscious and hemodynamically stable, with normal neurological and vascular function of the left shoulder and fingers.

After stabilization, contrast-enhanced computed tomography (CT) body scans revealed pulmonary contusions. Plain radiographs of the left elbow showed medial displacement of the radius and ulna in relation to the humerus, with a metaphyseal spike indicating Salter-Harris Type 2 physis injury (Figure 1).

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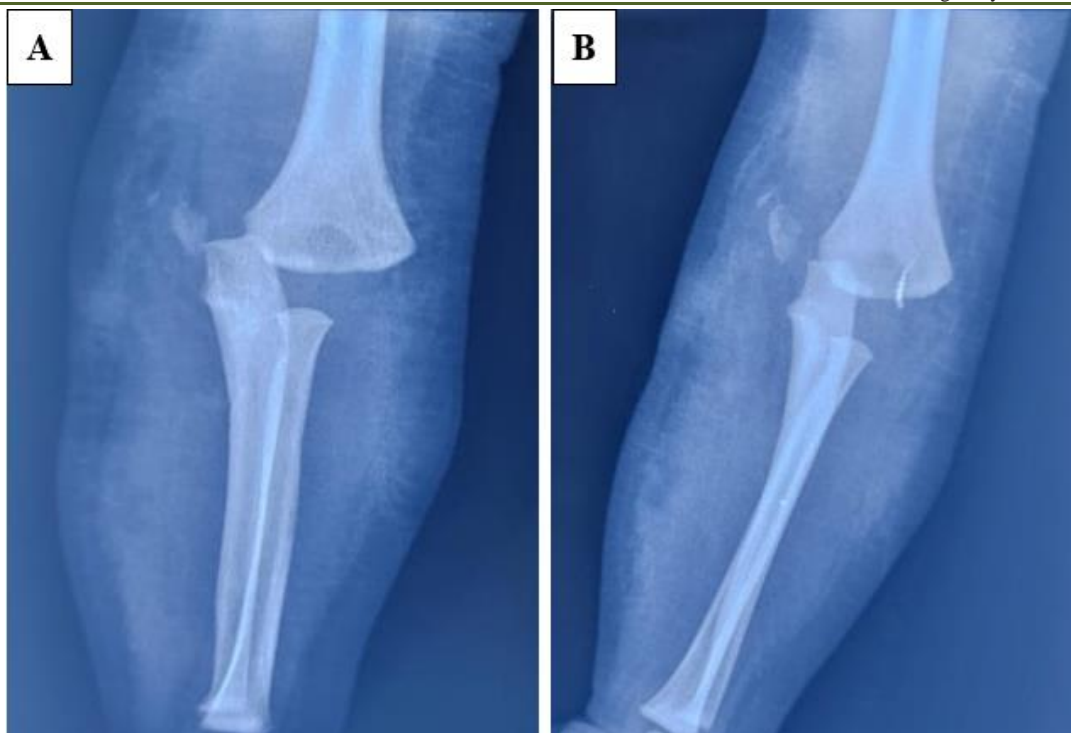


Figure 1: Radiographs of the elbow at initial presentation showing medial displacement of the radius and ulna in relation to the humerus, with a metaphyseal spike indicating distal physis separation with a metaphyseal spike. A. Anteroposterior and B. lateral

The child underwent surgical treatment 24 hours post-injury. An open lateral approach was performed and the diagnosis of TFDH was confirmed intraoperatively. The fracture was gently reduced and

fixed with cross-bracketing using two smooth Kirschner wires (Figure 2). The patient was discharged the next day with an above-elbow half-cast. Paracetamol was used as an analgesic.

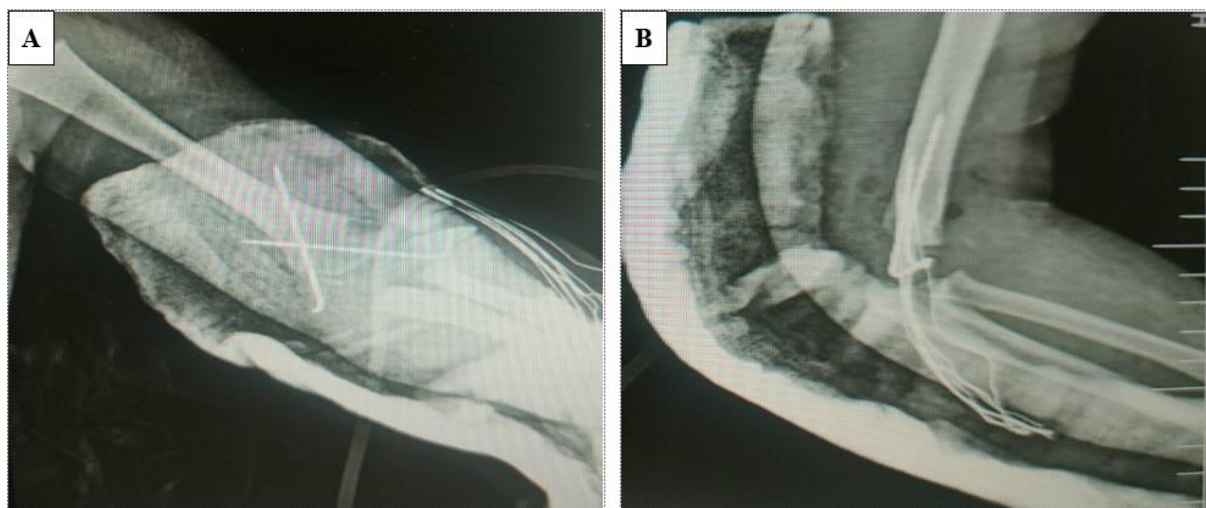


Figure 2: Immediate postoperative radiographs showing successful reduction and fixation of TFDH. A. anteroposterior view B. lateral view

Postoperative X-rays and follow-up showed satisfactory progress, leading to the removal of the half-cast and wires at 4 weeks and the subsequent application of a hinged elbow brace for progressive mobilization. The brace was removed at 6 weeks, allowing full

mobilization, and by then, the fracture had healed (Figure 3).

At the 6-month follow-up, there were no signs of complications. The patient had a full range of motion. However, their parents did not report any complaints.

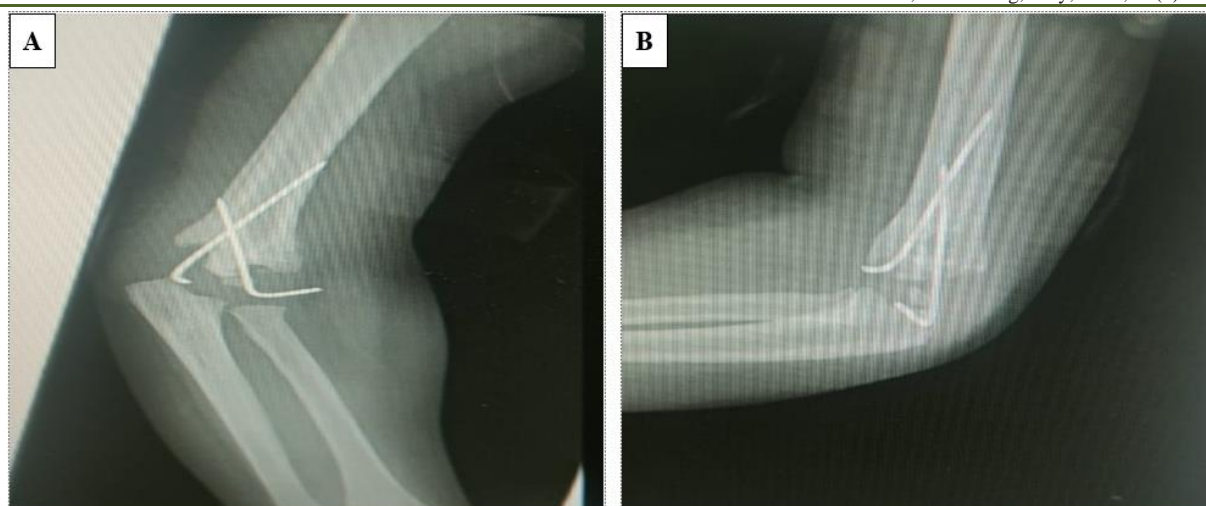


Figure 3: 4 weeks postoperative radiographs. A. anteroposterior view B. lateral view

Ethical Approval and Informed Consent

- Ethical approval was not required for the report in this case.
- Written informed consent was obtained from the parents for the publication of this case.

DISCUSSION

TFDH is a rare injury in neonates and children under three years old because the physeal cartilage at the junction of the layer of cartilage hypertrophy and primary bone spongiosa is weaker than the bone. It was first reported by Camera in 1926 [6].

Common causes include birth injuries, child abuse, falls, and direct trauma [7, 8]. It is a variant of supracondylar fracture seen in older children. TFDH results from rotational shearing forces, with the fracture commonly being an extension type, where the distal epiphysis lies posterior to the metaphysis [4].

Delee's classification divides TFDH into three groups according to the age of the child and the size (absent, small, large) of a metaphyseal spike [9].

- Group A: TFDH (seen in infants upto 12 months of age) before the secondary ossification centre of the capitellum appears without metaphyseal spike usually Salter-Harris Type 1 physis injury.
- Group B: TFDH (seen in children 12 months to 03 years of age) with ossification centre of the capitellum appears with metaphyseal spike indicating Salter-Harris Type 2 physis injury.
- Group C: TFDH (seen in older children between 03 and 07 years of age) with secondary ossification centre of the capitellum with the large metaphyseal fragment which may be confused with lateral condyle or low supracondylar fractures of the humerus.

Clinically, it presents with swelling, tenderness, and limited elbow joint movements with muffled

crepitus. In Infants below 3 years of age with swollen elbows and pseudo paralysis, secondary to trauma TFDH should be suspected.

Differential diagnoses include traumatic elbow dislocation, septic arthritis, osteomyelitis, and the possibility of child abuse should be kept in mind. Diagnosing TFDH can be challenging, especially in infants with unossified epiphyses. The most important sign is the posteromedial displacement of the radius and ulna in relation to the distal humerus [10]. Differentiating this condition from a dislocated elbow is important; however, elbow dislocations are rare in infants and young children, and they typically present with posterolateral displacement of the radius and ulna [5]. Once the ossification center of the capitellum appears, medial displacement of the capitellum can suggest a diagnosis of TFDH [10]. Definitive diagnosis may require arthrography, MRI, or ultrasound if there is any uncertainty [4, 5, 10].

There is no consensus on the optimal treatment of TFDH. In general, the outcome is good, and if the displacement is mild, casting may be sufficient. In other cases, to achieve anatomically aligned closed reduction, percutaneous pinning or open reduction and fixation are performed [5, 4, 9]. Early diagnosis is crucial to allow the reduction of the fracture by closed manipulation and reduce the risk of complications. Delayed manipulation (after 4-7 days) is generally discouraged due to concerns about avascular necrosis, growth plate trauma, and growth disturbances. Intraoperative arthrography or ultrasound may be beneficial for visualizing the anatomy of the distal humerus in young children [5], aiding in fracture alignment and stability [11]. TFDH even with delayed diagnosis conservative management has shown to have a favorable outcome with any residual deformity correcting itself with growth even when anatomic relationship is not initially maintained possibly as in Salter-Harris type 1 lesion the entire epiphyseal growth plate remains with epiphysis so damage to growth plate

is not common [7, 8]. Complications of TFDH are uncommon [9].

Limitation of range of movements, cubitus varus, and rarely cubitus valgus have been reported as long-term complications of TFDH [7, 12], which can be treated in later childhood by osteotomies if required.

CONCLUSION

Physicians should consider TFDH in young children with elbow injuries, particularly when radiographs show posteromedial displacement. Ultrasound can aid in diagnosis. Early and accurate diagnosis is essential for optimal outcomes.

Footnotes: Contributed by

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