Radiology Challenge: "I Can't Move my Elbow"

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Abstract:

The authors describe presentation, diagnosis, and complications of pediatric supraacondylar fracture.

MeSH Words: supracondylar fracture, humerus, epicpondyle, emergency radiology

Case: "I can't move my elbow"

The patient is a 5 year old female brought in by her mother after a fall on the outstretched hand while playing in school. The patient has stable vitals and appears minimally distressed. On examination, her right arm is slightly pronated, held in extension and there is minimal passive and active range of motion. There is slight swelling at the elbow with diffuse tenderness at the distal humerus. She has a distal radial pulse and her motor and sensory function of her hand is intact. Below is a lateral radiograph of her elbow.

Answer:

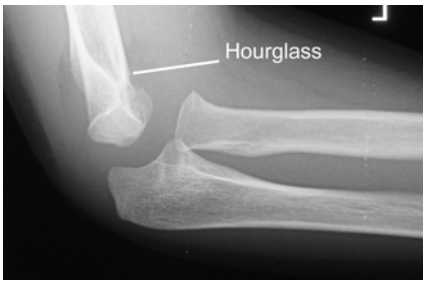
This patient has a Type I supracondylar fracture. This is an injury that is often missed if proper inspection of the radiograph is not made. Supracondylar fractures are fractures of the distal humerus proximal to the epicondyles and account for 60% of all fractures in children. Pediatric elbow fractures include the supracondylar, lateral condylar, medial condylar, and physis fracture-separation. Of these, the supracondylar fractures constitute 60-80% of all elbow fractures. Greater than ninety percent of suprachondylar fractures are of the extension type resulting from a fall on the outstretched hand and the resulting five percent are of the flexion type resulting from a direct fall on a flexed elbow.

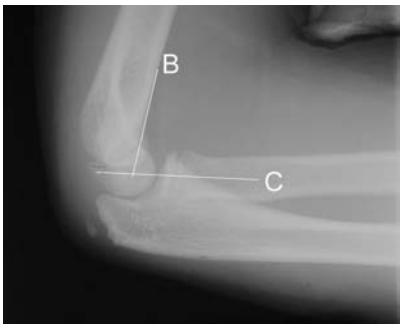
Extension type supracondylar fractures are categorized into three types based on the Gartland Classification. Type I fractures are minimally displaced and for this reason often missed. Type II fractures are displaced posteriorly with an intact posterior cortex. Type III fractures are completely displaced posteriorly with no cortical connection.

Type II

Type III

Diagnosis of the different types of fractures is based on radiographic findings. First, a properly taken lateral radiograph should be confirmed by the presence of the hour-glass created proximally by the cortex of the humerus and distally by the epiphyseal-metaphyseal junction. Then, the fat pads and the bony alignment must be evaluated. A thin anterior fat pad can be seen in normal radiographs, but the presence of a *posterior fat pad* (A) or a displaced anterior fat pad indicates a fracture. Finally, two lines must be drawn to evaluate alignment. The *radio-capitellar line* (C) is drawn from the middle of the radial body through the capitellum and should always transect the capitellum in half. The *anterior humeral line* (B) is drawn from the anterior cortex of the humerus through the capitellum and this line should cross the capitellum at the anterior 1/3rd. This patient with a Type I fracture has the anterior humeral line transect the tip of the capitellum which is indicative of a fracture.





There are various complications of supracondylar fractures. Vascular injuries comprise 13-19% of all injuries and absence of a radial pulse is commonly found in children. This occurs as the brachial artery becomes tethered against the bone, entrapped, or spasms as a result of the injury. Seven to fifteen percent of injuries are neurologic involving either the radial or median nerve. More recent studies indicate that the single most common neurologic injury involves the anterior interosseous branch of the median nerve which is a purely motor nerve allowing for thumb, index finger, and middle finger flexion. The ulnar nerve is rarely involved and is most commonly affected post-operatively by pinning.

A delayed complication is a *Volkmann's ischemic contracture***.** This deformity of the hand is caused by a forearm compartment syndrome resulting from prolonged ischemia and swelling or immediate bleeding into the forearm. Patients can present as early as 12 hours post injury or following splinting, complaining of pain with passive extension of the fingers. A long-term complication of malreduction is the *Cubitus Varus deformity*, a deviated forearm with the elbow in full extension.

Management of suprachondylar fractures depends on the type of fracture and the neurovascular state. A type I fracture requires a long arm splint with the elbow aligned at 90^{o} or with more slightly more extension. A type II fracture requires reduction and splinting in a similar manner and a type III requires percutaneous pinning by an orthopedist. Any neurovascular compromise should warrant an urgent orthopedic consult for consideration of emergent percutaneous pinning. A common pitfall is to splint the arm hyperflexed which increases the chance of compartment syndrome, so it is important that the arm is splinted slightly extended. Return precautions for signs of compartment syndrome should be emphasized to the patient on discharge.

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