A positive fat-pad sign reflects a response to an intra-articular disease process—such as occult fracture of the olecranon, radial head, or coronoid process. Other causes of the fat-pad sign include intra-articular blood from trauma (such as a spontaneously reduced dislocation) or hemophilia; transudates from rheumatoid, crystal, synovial, or neuropathic arthropathies; and exudates from infection and neoplasia.

Elbow trauma, including fracture, is most commonly sustained during a fall onto an outstretched arm, which often occurs in sports settings. Fractures and other trauma occur rarely with forced manipulation of the elbow, as with this patient.

The anterior fat pad is a summation of the radial and coronoid fat pads. The shape is determined by the brachial muscle in extension and by intrinsic surface tension, bone, capsule, and intra-articular volume in flexion. The shape of the posterior fat pad, located in the olecranon fossa, is determined by the triceps tendon and anconeus muscle during flexion. The posterior fat pad is more mobile in extension, and the shape is defined by surface tension, bone, capsule, and intra-articular volume.

Standard x-rays of the elbow include an anteroposterior view with the elbow extended and a true lateral view with the elbow flexed to 90° and the forearm neutral. The fat pads are best visualized in the lateral view.

In a positive anterior fat-pad sign, the fat pad is displaced ventrally and superiorly, changing the inferior margin from convex to concave. This configuration, an exaggeration of its normal appearance, resembles a ship's sail ("sail sign"). A false-negative anterior fat-pad sign can be seen with insufficient effusion, poor positioning, extracapsular fracture, and capsular rupture.

When the posterior fat-pad sign is positive, the extension of the synovial capsule with the elbow in 90° of flexion displaces the fat pad superiorly and dorsally. A false-positive posterior fat-pad sign can occur with the elbow in extension and is caused by olecranon process displacement and posterior capsule laxity. A paradoxical positive posterior fat-pad sign can occur with extra-articular processes. Neoplasia or hemorrhage from a supracondylar humeral fracture may elevate the periosteum and displace the proximal half of the posterior fat pad dorsally.

Posterior fat-pad ~ 75% chance of fracture on MRI, most often radial head

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