Case 7988

Volar distal radioulnar joint instability
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Patient: 35 years, female

Clinical History:
A 35-year-old female was referred to the Orthopaedics Clinic of our institution for complaints of right ulnar wrist pain. The patient had a known history of previous homolateral forearm fracture.

Imaging Findings:
A 35-year-old female was referred to the Orthopedics Clinic of our institution for complaints of right ulnar wrist pain. The patient had a history of previous homolateral forearm fracture. At physical exam distal radioulnar joint (DRUJ) instability was suspected.

Computed tomography (CT) scans of the distal radioulnar joint, in extreme pronation (Figure 1a), neutral, and extreme supination (Figure 1b) were obtained for both wrists.

The modified radioulnar line method was applied (Figure 2). In extreme supination, significant incongruence between the right sigmoid notch and the ulnar head with volar displacement of the ulnar head was observed, compatible with volar DRUJ instability.

Notice also the presence of a posttraumatic exuberant bony prominence deforming the styloid apophysis of the right ulna (Figures 3 a - and b - arrow).

Discussion:
Subluxation and dislocation of the distal radioulnar joint (DRUJ) is a frequent cause of ulnar wrist pain and mechanical symptoms, remaining challenging both diagnostically and therapeutically.

DRUJ instability has multiple aetiologies and a wide spectrum of severity. It can result from an isolated ligament injury or be part of a complex lesion such as Colles fracture, or Galleazi or Essex-Lopresti fracture-dislocation. The Essex-Lopresti fracture-dislocation consists of a massive axial radioulnar traumatic derangement with longitudinal DRUJ instability, rupture of the interosseous membrane, and impaction fracture of the radial head.

Standard lateral wrist radiographs can only confirm DRUJ instability if a true lateral neutral view is acquired, which has shown to be consistently difficult. Additionally, in most cases DRUJ subluxation is not obvious in the neutral position, and radiographs do not appreciate the dynamic instability observed during active pronation and supination.

Cross-sectional imaging with CT can overcome these limitations. A suggested protocol scans both wrists in extreme supination, neutral position, and extreme pronation.

The convex articular surface of lateral distal ulna should be congruent with the sigmoid notch regardless of wrist position. There are several proposed CT diagnostic criteria for DRUJ instability (figure 4). The radioulnar line method was modified by Nakamura et al. (1996) to include within normal limits of congruency, the dorsal displacement of the ulna in the pronation arc (neutral to maximum pronation) and its volar displacement in the supination arc (neutral to
maximum supination) of less than one fourth the diameter of the sigmoid notch (figure 5). The modified radioulnar line method due to its simplicity, low false positive results, and good interobserver agreement, is commonly used. The modification introduced expresses the main difficulty of evaluating DRUJ instability with CT - the large normal variation in the DRUJ translation, related to interindividual differences in the laxity of the ligaments and of others stabilizing soft-tissue structures. Comparison with the unaffected contralateral wrist and correlation with the physical exam findings are quite helpful in this behalf. The provocation of symptoms by a stress test is considered an essential step in differentiating an unstable joint from a normal lax joint.

Dorsal DRUJ instability is the most common form, whereby the distal ulna is dorsally displaced with respect to the distal radius and usually is exacerbated by pronation. Volar dislocation is rarer, usually after a hypersupination injury to the wrist and complete tear of the dorsal radioulnar ligament. This results in a prominent ulnar head on the volar aspect of the wrist and is most pronounced in full supination. Anatomical studies have shown that the isolated division of the dorsal radioulnar ligament produces volar dislocation of the ulna when the forearm is supinated. The dislocation can usually be reduced by pronation.

The treatment of chronic volar DRUJ instability is mainly surgical, mostly by using the techniques employed to treat dorsal DRUJ instability. Recently, as the awareness of the importance of the radioulnar ligaments and joint capsule stabilizing action grows, more specific surgical procedures are being developed.

**Differential Diagnosis List:** Volar distal radioulnar joint instability

**Final Diagnosis:** Volar distal radioulnar joint instability

**References:**


Figure 1

Description: CT scans of both wrists in extreme pronation (a) and extreme supination (b) of both wrists; demonstrate significant volar translation of the right ulna head in extreme supine position. Origin:
Description: Coronal reformats (a and b) of the right wrist scans demonstrate the associated exostotic deformity and overgrowth of the styloid apophysis of the ulna (see arrow). Origin:
Description: CT scan of the right wrist in extreme supination with the modified radioulnar line method applied and the dorsal and volar radioulnar lines drawn. Origin:
Description: In the modified radioulnar line method, volar subluxation of the distal ulnar epiphysis is diagnosed when MS (maximum width of the subluxated part of the ulna) is larger than one fourth of SD (sigmoid notch diameter). (RUD – radioulnar dorsal line; RUV – radioulnar volar line)

Origin:
**Figure 5**

Description: Congruity method: The DRUJ is normal when the arc of the sigmoid notch (RS) and the arc of the ulnar head (US), depicted in green, are congruent. Epicenter method: A perpendicular (P) is drawn from the center of rotation (O) of the DRUJ. If P lies in the middle half of the sigmoid notch, the DRUJ is considered normal (M - center of the ulnar head, N - center of the ulnar styloid, O - midpoint of line MN). (adapted from reference 1) **Origin:**