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X-ray Evaluation of the True Neutral Position of the Wrist: The Groove for Extensor Carpi Ulnaris as a Landmark

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Wrist problems have gained increased interest among hand surgeons. For accurate preoperative and postoperative x-ray examinations, reproducible methods are required. We report an x-ray observation that demonstrates the true neutral position of the wrist.

Materials and Methods

The sulcus of the extensor carpi ulnaris (ECU) tendon is located in the posterolateral aspect of the ulna in the groove between the head of the ulna and the ulnar styloid process. This is well demonstrated in a cross-section through the cadaver wrist at the level of the distal radioulnar joint (Fig. 1). The ulnar styloid process of the ulna is always posterior to the head of the ulna.

To evaluate imaging of the ECU groove with different degrees of abduction in the shoulder, an anatomic study of dry skeletal material was undertaken. Seven humerus-ulnar bone complexes were used. The radius was not included. The elbow was kept in 90° flexion throughout the experiment. The humerus was elevated from vertical toward horizontal position, imitating abduction (0° to 90°) in the shoulder joint. The position of the ulna was changed to the same degree as the humerus was elevated; that is, from lateral wrist view with maximal adduction to the frontal wrist view with 90° of abduction. At each 10° elevation of the humerus an x-ray film was taken over the caput ulnae, using a vertical x-ray beam with film-focus distance of 100 cm. In this way, a series of projections of the whole

Figure 1. Cross-section of the distal radius and ulna showing the extensor carpi ulnaris (ECU) tendon in the posterolateral aspect of the ulna in the groove (straight black arrows) between the ulnar styloid (S) and ulnar head (H).
cortex of the bottom of the ECU groove, seen as a white line, and the outlines of the ulnar head and ulnar styloid were registered (Fig. 2).

**Results**

At 0° elevation of the humerus (adduction) the ulnar styloid is projected in the middle of the ulnar head. As the elevation of the humerus is increased, the ulnar styloid projects toward the lateral outline of the ulnar head. At approximately 45° of humerus abduction, the cortical outline of the concavity of the ECU groove becomes visible as a discrete white line of cortical bone projected over both the ulnar head and ulnar styloid. As the angulation is additionally increased to 50°, 60°, 70°, and 80°, the projection of the cortical line of the ECU groove “moves” anteriorly through the ulnar styloid width toward the ulnar head (Fig. 2). At 90° elevation of the humerus, the cortical line is absent. In this position the ulnar styloid can be demonstrated in the true lateral, anatomic view.

**Discussion**

A number of studies have shown the importance of standard projections in neutral position. Hulten introduced the term “ulnar variance” to refer to the relative length of the ulna in relation to the radius. Relative length differences between these two bones have since been considered an important factor in the pathogenesis of Kienböck’s disease and ulnar abutment syndrome.

In this study we have found that the projection of the ECU groove can be used as a control to ensure that the wrist has been x-rayed properly. The ECU line clearly indicates the position of the ulna in the distal radioulnar joint during the wrist x-ray examination.

**References**