Wrist: Different views in CT scanning

Abed-Al Nasser Assi

Arab American University, Palestine

Author’s address: Abed Al Nasser Assi, Akaba, Jenin, Palestine, e-mail: aassi@aaup.edu

Summary

This study tests various acquisition and reconstruction protocols for MDCT of the wrist to determine the optimal views in wrist imaging. These views include: wrist in prone position, perpendicularly to CT gantry; wrist in prone position with internal and external deviation of the hand and PA wrist image reformatted in CT workstations along the axis of the scaphoid bone.

Among these different views of wrist CT, the axial image reformatted along the long axis of the scaphoid provides us with the best diagnostic findings of the scaphoid.

Key words: wrist • scaphoid • capitate • triquetrum and hamate

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The wrist is a complex three-dimensional structure that requires imaging in routine coronal, sagittal and oblique planes for a proper evaluation, as it presents a fine and sometimes challenging anatomy [1–4]. The main carpal bone includes eight small bones in the wrist joint with the distal ends of the ulna and radius found in two rows.

The bone under the thumb is the trapezium. The one located medially to it is called the trapezoid. The capitate is found under the third metacarpal bone and the hamate finishes that row. Proximal to the trapezium is the scaphoid, which joins with the radius. The next bone in line is the lunate, followed by the triquetrum, and finally by a little pisiform bone of the proximal row (Radial to ulnar wrist).

Most fractures of the wrist involve the radius and the ulna. In preteens and teenagers, fractures of the growth plates are very common. Other, less common but far more worrisome, involve the scaphoid (or navicular), the carpal bone at the base of the thumb.

This bone is very important as it is a bridge between two rows of the carpal bones. This bone presents a unique healing problem, and so it was termed the “slowest healer”. This is due to its limited blood supply. Only one small artery supplies the scaphoid with blood and this is within the proximal pole.

An injury to the scaphoid usually results from a fall on the outstretched hand. There may be swelling of the wrist. The most characteristic symptom is usually pain on palpation of the anatomical snuff box.

Early x-rays are often negative for fracture. An athlete should be splinted for 7 to 10 days and then re-examined. If the “snuff box” is still tender, repeat x-rays should be taken. If they are still negative, a bone scan or CT scan should be performed to rule out this fracture [5,6].

The aim of this study was to scan the wrist from different views to find the best view of the scaphoid bone and to assess the clinical implications of acute traumatic lesions and their sequelae (chronic).

CT scanning of the wrist of normal subjects was performed. For a better evaluation of the scaphoid bone, their hands were scanned in different views; those views included: wrist in PA position, internal and external deviation of the hand and PA wrist image reformatted in CT workstations along the axis of the scaphoid bone.

To acquire the axial sections of the PA wrist, the patient was lying in prone position with his/her arms extended. The hands were placed symmetrically, with palms down, and fixed to the scanning table (Figure 1). The scanning range included carpal bones and distal radius. No contrast media were injected.

To acquire an internal deviation of the subject’s wrist, the wrist was scanned as in PA positions but with hands moved medially toward the thumb (radial deviation). The same applied to the external deviation, but the hand was moved toward the ulnar side (Figure 2).
Finally, to acquire images along the long axis of the scaphoid bone, the wrists were scanned in PA positions, and then the images were reformatted with the workstation of the CT scanner, as shown in the Figure 3.

On the basis of the images it was found out that for wrist and hand scanning “wrist prone positions” are recommended, i.e. with the forearm positioned perpendicularly to the gantry (Figure 4), to simplify image interpretation. The figure shows the axial image of the carpal bone in prone wrist positions. However, when the hand was in prone position, with internal deviation, the best view of the capitate, triquetrum and hamate, was obtained.

Reformatting of the image of the scaphoid long axis with CT workstation shows more details (Figure 5).

In general, a simple radiographic examination of the wrist is satisfactory to solve the clinical problem. However, in selected difficult cases, CT can be useful and may add significant information on patients’ treatment [7,8].
In wrist CT scanning, PA positions are recommended to simplify image interpretation of intercarpal and distal radioulnar articulations [9,10] and fractures of the hamate hook or ventral trapezial tubercle, which cannot be seen in conventional radiographs. For other wrist problems, CT scanning with prone positions of the hand and internal deviations were the best selected views. These positions can be used to diagnose clinical signs, e.g. tenderness in the anatomical snuff box and over the scaphoid tubercle, pain on longitudinal compression of the thumb and range of thumb movement. Reformatting of the image along the axis of the scaphoid bone is recommended.

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