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Original Article

Tendo-ligamentous pathologies of the wrist joint: Can ultrasonography replace magnetic resonance imaging?

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ABSTRACT

Background: Characterization of tendo-ligamentous pathologies of wrist remains problematic, despite advances in imaging. By using clinical history and imaging appearance, one can determine the diagnosis. USG is used as first imaging modality whereas MRI aids in making a specific diagnosis of few of the lesions.
Aims: To investigate the etiological spectrum of tendo-ligamentous pathologies of wrist on USG & MRI with statistical correlation.
Patients and methods: 80 patients (male/female = 46/34) with complaint of swelling or pain in wrist were included and underwent USG and MRI of both the wrists.
Results: The spectrum included ganglion cysts, vascular malformations, tenosynovitis, tendinopathy, ligament tears and fibrosis. The analysis was done using kappa coefficient and spearman's rho correlation coefficient. The strength of agreement between USG and MRI for the diagnosis of ganglion cysts, vascular malformations, tenosynovitis and tendinopathy was found to be very good.
Conclusion: USG provides detailed depiction of superficial structures, is less expensive, and allows dynamic examinations of the wrist. It should be the first choice of investigation for majority of the cystic, tendinous, vascular, and fibrotic pathologies of the wrist. However, less promising results were observed for ligamentous pathologies on USG in our study.

1. Introduction

The wrist is an articular complex composed of the radio-carpal, distal radio-ulnar, and midcarpal articulations. These are covered by a fibrous capsule and are held together by multiple ligaments, tendons, and other soft tissues that provide carpal stability along both the dorsal and volar aspects [1]. Ultrasonography (USG) and magnetic resonance imaging (MRI) play an important role in the characterization of wrist pathologies. USG provides a reliable diagnosis regarding cystic or solid nature of lesions and can help in diagnosis based on their imaging patterns [2]. MRI helps in the assessment of various ligaments, tendons, and nerves. It can also aid in the visualization of bones and soft tissue lesions, especially in cases of radiographically occult osseous lesions [3]. The aim of the present study was to study the etiological spectrum of tendo-ligamentous pathologies of the wrist and their work-up with USG and MRI to correlate imaging findings with clinical diagnosis. Patients underwent ultrasonography followed by MRI conducted by two different radiologists, and both were blinded to the imaging findings of the other modality to reduce bias. Imaging findings on both modalities were then statistically correlated.

2. Materials and methods

The ethics committee of Sri Guru Ram Das Institute Of Medical Sciences and Research, Vallah, Sri Amritsar approved this study and written informed consent was obtained from all the patients. Eighty patients above 15 years of age, who presented with symptoms of wrist pain or swelling, were included in the study. After taking relevant history and performing a thorough clinical examination, identification on ultrasonography and signal characterization on MRI of the tendons, ligaments, and other soft tissues of symptomatic and contralateral asymptomatic wrists were done over a period of 2 years. Thus, a total of 160 wrists were studied to correlate the imaging-based diagnosis with clinical findings,

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wherever possible, and the data obtained were analyzed statistically. Of the 80 patients included in the study, 34 were women and 46 were men. The mean age was 30 ± 12.8 years (mean ± SD) with an age range of 15–65 years.

2.1. Ultrasonographic examination

The ultrasonographic examinations were performed using VOLUSON E8 EXPERT BT09 (GE) equipped with an 11 LD high frequency linear transducer (4–10 MHz) or SP-10-16 D wide linear transducer (7–18 MHz). The patients were examined in a sitting position on a chair. USG images of the wrists were obtained with the patient seated in front of the radiologist. Imaging was carried out both in the longitudinal and transverse axes along the dorsal as well as volar aspects.

2.2. MRI examination

All patients underwent MRI examinations using Philips Gyroscan Achieva 1.5 Tesla MRI with Sense Body Coil. The scans were performed from the proximal metacarpals to the distal radius/ulnar metaphysis. The planes chosen were the axial plane (parallel to the distal radio-carpal joint), coronal plane (parallel to a line drawn from the ulnar to the radial styloid), and sagittal plane (perpendicular to the coronal plane). The sequences included short tau inversion recovery sequence in the coronal plane (TR/TE = 4500/110 ms, section thickness of 3 mm, intersection gap of 0.6 mm, FOV/RFOV = 160/80% and matrix = 224 $\times$ 256), T1-weighted fast spin echo in the coronal plane (TR/TE = 450/20 ms, section thickness of 3 mm, intersection gap of 0.6 mm, FOV/RFOV = 160/80% and matrix = 256 $\times$ 256), proton density fat suppressed sequence in all the three planes (TR/TE = 2200/90, section thickness of 3 mm, intersection gap of 0.6 mm, FOV/RFOV = 160/80% and matrix = 240 $\times$ 256). T2FFE sequence was done in one patient due to incomplete fat suppression achieved on proton density fat suppressed sequence.

2.3. Imaging analysis

B mode ultrasonography was performed by a radiologist. It was followed by MRI of the same patient by a second radiologist. Both the radiologists independently concluded the findings of the respective imaging modalities. The correlation of the radiological findings was determined and statistically analyzed. The contralateral wrist was scanned to provide a reference for normal anatomy.

USG was performed using guidelines outlined by the European Society of Musculoskeletal Radiology (Figs. 1 and 2). The transducer was placed over the dorsal wrist for identification of the extensor tendons. Each tendon was imaged in the short-axis as well as long-axis planes down to its distal insertion. USG was carried over the lateral wrist crease beginning from the anatomical "snuff-box" and then sequentially across the wrist in order to assess each tendon individually. Using the extensor retinaculum and the Lister tubercle as the anatomical reference points, the extensor surface pathologies were determined. The integrity of each of the six separate extensor compartments was assessed. The first compartment was recognized by keeping the patient's wrist halfway between pronation and supination, with the probe over the radial styloid laterally. The Lister tubercle on the dorsal aspect radius was used as the osseous landmark to separate the second compartment (lateral) from the third compartment (medial). The fourth compartment was examined by placing the transducer in the transverse plane over the mid-dorsal wrist. The fifth and sixth compartments were examined by placing the wrist in a

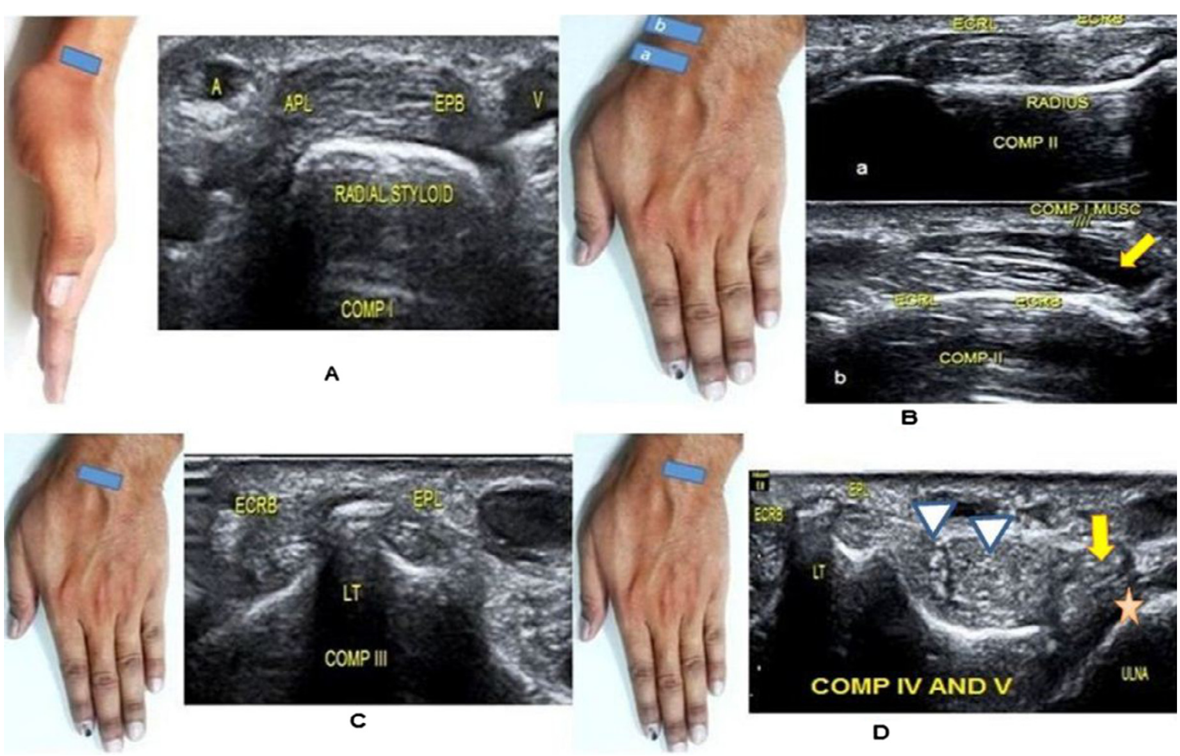

Fig. 1. Ultrasound of the dorsal aspect of the wrist demonstrating extensor compartment I (A) containing the abductor pollicis longus (APL) and extensor pollicis brevis (EPB). (A) Radial artery. (V) Cephalic vein. Compartment II (B) containing the extensor carpi radialis longus and brevis (ECRL and ECRB). If the ultrasound probe is moved slightly proximally, crossing of compartment I tendons superficial to the compartment II tendons can be demonstrated (arrow). Compartment III (C) containing the extensor pollicis longus tendon (EPL). Lister tubercle (LT) is the bony landmark separating compartments II and III. Compartments IV and V (D) containing the extensor digitorum communis (arrow heads), extensor indicis, and extensor digiti quinti proprius (arrow). *: ulnar articular cartilage.

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