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Original Research Article

Role of MRI in Various Wrist Joint Pathologies

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ABSTRACT

Background: Magnetic resonance imaging (MRI) represents a relevant way to diagnostically assess the wrist with high-resolution, multiplanar imaging without employing ionizing radiation. The wrist joint has a complex anatomy consisting of various tendons, cartilages, ligaments and bones. With MR imaging, it is possible for the radiologist to accomplish accurate, non-invasive imaging of specific ligamentous injuries, rendering the vague diagnosis of "wrist sprain" obsolete.
Purpose: To study the role of MRI in various pathologies of the wrist joint.
Materials and Methods: We studied MR images of 25 patients with different pathologies of the wrist joint. All MR imaging examinations were performed on 1.5-T magnet MR system (Siemens magneto Essenza). Imaging was performed using the surface coil with the patient in a prone position and the affected wrist joint was evaluated. The wrist joints were studied with multiplanar T1-weighted, T2-weighted and PDFS sequences.
Results: Total 25 wrist joints (of 25 patients) were studied out of which 5 showed features of Kienbock's disease, 6 showed mass lesions,4 showed different types of tenosynovitis, 2 showed TFCC tear,4 showed fracture of the bones and tear/ tendinitis of the ligaments and the tendons, 2 showed features arthritis, 1 showed features of tubercular osteomyelitis and 1 showed strain in abductor pollicis muscle.
Conclusion: MRI is an excellent modality for the evaluation of various pathologies of the wrist joint.

Keywords: MRI, wrist joint.

INTRODUCTION

Magnetic resonance imaging (MRI) represents a relevant way to diagnostically assess the wrist with high-resolution, multiplanar imaging without employing ionizing radiation. It influences clinical and surgical diagnosis and management of wrist pathologies. [1]

Magnetic resonance imaging (MRI) is becoming the preferred technique for evaluating a wide range of wrist and hand disorders and has a crucial role in planning arthroscopic and nonarthroscopic wrist surgery.

Aims and objectives:

1. To study the MRI features of the various pathologies of the wrist joints.
2. To study importance of MRI in leading the specific diagnosis of the wrist joint pathologies.

3. To evaluate the abnormalities of ligaments and tendons of the wrist.

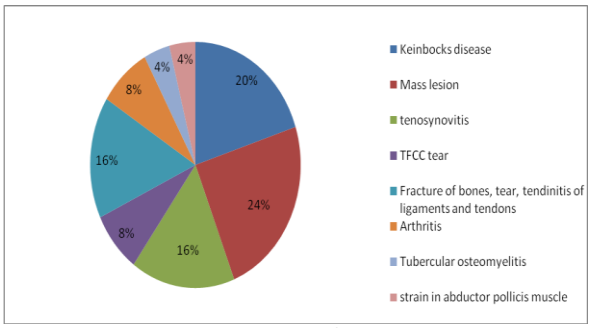
MATERIALS AND METHODS

We studied 25 patients presented in Department of Radio diagnosis at Dr. Vasantrao Pawar Medical College, Hospital and Research Centre, Nashik.

METHODOLOGY

Patients referred for MR imaging of the wrist in the Department of Radio diagnosis at Dr. Vasantrao Pawar Medical College, Hospital and Research Centre, Nashik were included in this study. All MR imaging examinations were performed on a 1.5-T magnet MR system (Siemens magneto Essenza). Imaging was performed using the surface coil with the patient in a prone position. Wrist joint was studied with multiplanar T1-weighted, T2-weighted, PD FS and STIR sequences.

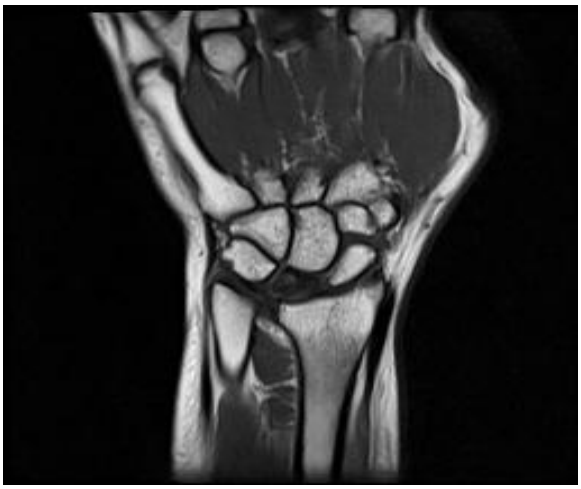
RESULTS



Pie chart: 1. Lesions of wrist joints.

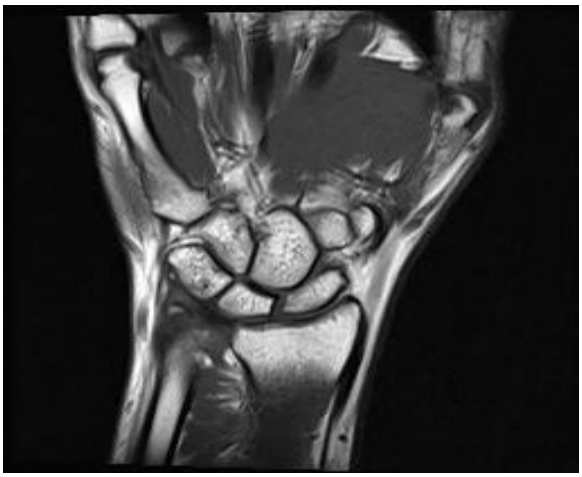
Total 25 wrist joints (of 25 patients) were studied out of which 5 showed features of Kienbock's disease (20%), 6 showed e/o mass lesion (24%), 4 showed different types of tenosynovitis (16%), 2 TFCC tear (8%), 4 showed fracture of the bones and tear/ tendinitis of the ligaments and the tendons (16%), 2 showed features arthritis (8%), 1 showed features of tubercular osteomyelitis (4%) and 1 showed strain in abductor pollicis muscle(4%).

Patient age ranged from 20- 60 years.

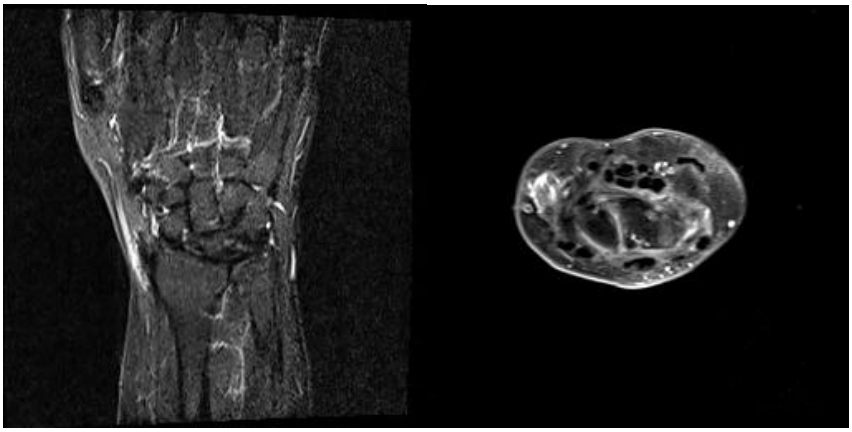


(Fig1): T1 coronal image showing Keinboch's Disease of lunate

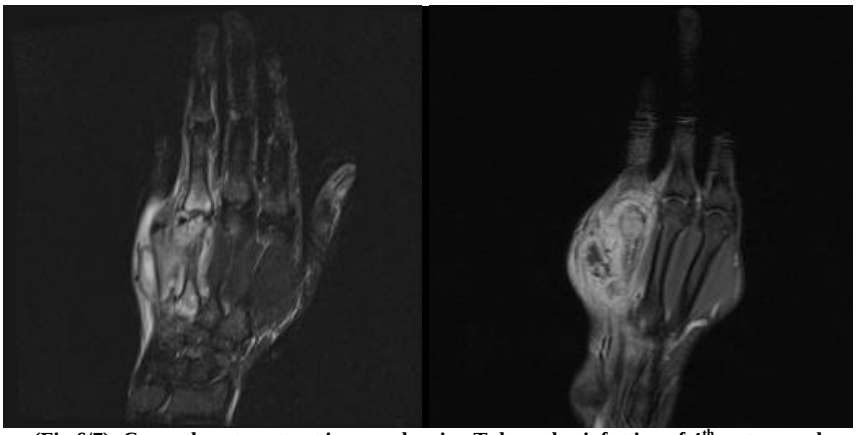
(Fig 2): PDFS coronal image showing intraosseous ganglion cyst in lunate



(Fig 3): T1 coronal image showing TFCC (Triangular fibrocartilage complex) tear near its ulnar attachment



(Fig 4/5): PDFS coronal and axial images showing Dequervain's teno synovitis



(Fig 6/7): Coronal post contrast images showing Tubercular infection of 4th metacarpal

DISCUSSION

The wrist joint has a complex anatomy consisting of various tendons, cartilages, ligaments and bones. Various pathologies are seen affecting the wrist joint. MRI is the most sensitive modality for early and accurate detection of such pathologies. With MR imaging, it is possible for the radiologist to accomplish accurate, non-invasive imaging of specific ligamentous injuries, rendering the vague diagnosis of "wrist sprain" obsolete.

TRIANGULAR FIBROCARTILAGE COMPLEX (TFCC): Amongst the various pathologies affecting the wrist, injuries to TFCC is of clinical significance and important from the point of view of the stability of the wrist joint.

The TFCC is composed of ligament, cartilage, and tendon and is considered the main stabilizer of the distal radioulnar joint and a contributor to ulnocarpal stability.

The TFCC consists of the triangular fibrocartilage (articular disk), ulnocarpal (ulnolunate and ulnotriquetral) ligaments, meniscus homologue (triangular meniscus like structure), dorsal and volar radioulnar ligaments, extensor carpi ulnaris tendon sheath, ulnar collateral ligament, and part of the distal radioulnar joint capsule. [2] It originates from the medial border of the distal radial cartilage (as opposed to the radioulnar ligaments, which insert on to the bone) and inserts medially as two distinct bands onto the ulnar styloid process and ulnar fovea and distally onto the hamate, triquetrum, and base of the fifth metacarpal bone. [3]

The TFCC cushions the ulnar head and lunate during axial loading and ulnar deviation of the wrist and extends the

gliding surface of the radius for carpal motion. [4]

The TFCC is best assessed on coronal images, and ulnocarpal ligaments are well delineated on sagittal images. [5]

TFCC tears, which appear as regions with signal intensity similar to that of fluid that extend to the surface of the ligament on proton density weighted fat-suppressed (PDFS) images and are often associated with fluid collections in the distal radioulnar joint. [4]

TUBERCULOUS INFECTION:

Tuberculous infection of the wrist is a rare but well-documented disorder. [6-8] In our study 1 out of 25 patients (4 %) showed tuberculous infection of wrist joint. MRI shows altered marrow signal with periosteal reaction and an associated soft tissue component.

MR images reveal prominent synovial thickening around the flexor tendons with fluid collection in the tendon sheath. [9-11] the thickened tenosynovium and synovium usually present as low signal intensity on T1-weighted images. It has been reported that the characteristic hypointense synovium on T2-weighted images that is suggestive of granuloma is seen in approximately 40% of cases. [12] Thus, the characteristic MRI appearance, such as T2 low-signal synovial thickening around the flexor and extensor tendons and synovial fluid collection that contains low-signal and nonenhanced foci in the tendon sheath, may aid us in reaching the proper diagnosis of Tuberculosis of the wrist.

RHEUMATOID ARTHRITIS:

Rheumatoid arthritis is the most common inflammatory arthritis, affecting approximately 1% of the world's population. [13,14] In early rheumatoid arthritis, wrist and hand involvement is usually bilaterally. [15] Findings include synovitis and marrow edema, bone erosions, periarticular cysts and tenosynovitis. [16]

GANGLIA: A ganglion is defined as a cyst in contact with a joint capsule or tendon sheath. Ganglia may be connected to injured ligaments or demonstrate intra-osseous extension. However, their etiology is still not clear. They present with high signal intensity on fluid-sensitive sequences and low signal on T1-weighted sequences, and they may be complex, with debris, loculations or septations. [17]

TENOSYNOVITIS/SYNOVITIS:

Synovitis was defined as suggested by the OMERACT group. [18] According to these definitions, synovitis is an area in the synovial compartment that shows above-normal enhancement after Gd-DTPA administration and of a thickness greater than the width of the normal synovium.

Tenosynovitis and tendinosis of the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons is called de Quervain's tenosynovitis; first described by Swiss surgeon Fritz De Quervain in 1895. [19]

TENDONS AND LIGAMENTS: The flexor and extensor tendons present typical low signal intensity and constant diameter on all sequences. Tendinopathy presents as signal and thickness changes on MRI, and may progress to partial- or full-thickness tears. [20] Ligament tears may be categorized as complete or incomplete on the basis of whether they involve all or only some components of the ligament and as full-thickness or partial-thickness on the basis of whether they extend through the entire thickness of the ligament or leave a portion intact. Partial-thickness tears, although they may be symptomatic, are especially difficult to detect at MR imaging with low magnetic field strengths; they usually appear as thinning and irregularity of the ligament. [4]

BONES AND FRACTURES: Occult fractures are detected as linear, low signal intensity on the T1-weighted sequence with surrounding bone marrow edema. Areas of bone contusion are differentiated mainly by

the absence of a clear fracture line. [21] Avascular necrosis (AVN) of the lunate (Kienbock's disease) is characterized initially by high signal intensity on fluid sensitive sequences, with low signal intensity on all sequences later in disease progression. [22]

CONCLUSION

Thus, to summarize MRI is an excellent modality for the evaluation of various pathologies of the wrist joint. Certain MRI features are pathognomonic of certain pathologies affecting the wrist joint and are demonstrated very well on MRI study. Ligaments, tendons and soft tissues can be assessed very well on MRI unlike plain radiograph and CT scan of the wrist.

***Abbreviations*:** MRI - Magnetic resonance imaging, PDFS- Proton density Fat saturated sequence, TFCC- Triangular fibrocartilage.

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