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Radio-Diagnosis

ROLE OF MAGNETIC RESONANCE IMAGING IN THE EVALUATION OF THE DISEASES OF THE WRIST JOINT IN A TERTIARY CARE CENTRE.

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ABSTRACT **Background:** MRI of the wrist joint, particularly with 3 dimensional imaging, is a valuable radiation-free diagnostic tool is highly effective imaging technique for diagnosing various wrist joint pathologies. MRI is the preferred method for evaluating painful wrist joint conditions because of its superior soft tissue contrast resolution and multi-planar imaging capabilities. MRI is especially useful for examining soft tissue structures around the wrist including tendons, ligaments, nerves, and fascia, as well as for detecting subtle bone injuries. **Material and Methods:** We examined MRI scans of 45 patients with various wrist joint pathologies. The imaging was carried out on a 3 -Tesla Siemens Magnetom Verio system, utilizing a surface coil while patients were positioned prone. The affected wrist joint was assessed using multiplanar sequences, including T1-weighted, T2-weighted, and proton density fat-saturated (PDFS) imaging. **Results:** Total 45 wrist joints were studied out of The most frequent pathology is TFCC (triangular fibrocartilage complex) injury, representing 28.9% of the cases. Tenosynovitis follows at 13.3%, and TB arthritis accounts for 6.7%. Other conditions such as carpal tunnel syndrome, inflammatory arthritis, Kienbock disease, scapholunate dissociation, and tendinitis each occur in 4.4% of cases. Rare pathologies like 1st CMC joint dislocation, capitate AVN, and others have lower frequencies (2.2% each). **Conclusion:** MRI of the wrist joint, particularly with 3 dimensional imaging, is a valuable radiation-free diagnostic tool is highly effective imaging technique for diagnosing various wrist joint pathologies.

KEYWORDS : MRI, Wrist Joint

INTRODUCTION

The wrist joint is a condyloid synovial joint and is built up of eight unique carpal bones. They are interposed between the forearm (radius and ulna) and five metacarpal bones. It is composed of two rows of carpal bones: the proximal carpal row (PCR) includes from radial to ulnar the scaphoid, lunate, triquetrum, and Pisiform. The distal carpal row (DCR) includes from radial to ulnar the trapezium, trapezoid, capitate and hamate. [1]

Wrist pain can arise from a range of causes, and it's crucial to distinguish between traumatic and non-traumatic origins. For traumatic injuries, it is essential to assess for fractures, tendon damage, and ligament tears. Non-traumatic causes of wrist pain are numerous, and evaluating the nature of the pain and any accompanying systemic symptoms is useful. Sudden pain might indicate conditions such as osteonecrosis, arthritis, or infection, whereas a gradual onset is more commonly associated with arthritis, tenosynovitis, or nerve issues.

Posttraumatic carpal injuries are more frequently seen in younger individuals (under 40), while systemic diseases and degenerative changes affecting the wrist are more common in older adults. [2]

MRI of the wrist is valuable for diagnosing a broad range of conditions. Its ability to provide detailed images in multiple planes and excellent contrast of soft tissues makes it effective in identifying subtle bone and soft tissue abnormalities. Despite the complexity of wrist anatomy, clinicians have developed a comprehensive understanding of when to use MRI for wrist evaluation, along with insights into the relevant anatomical structures and potential pathologies. [3]

AIMS AND OBJECTIVE

Aim: To determine the diagnostic utility of magnetic resonance imaging findings in patients with diseases of the wrist joint.

Objectives

Primary Objective:

To evaluate the use and applications of MRI in the diagnosis of various diseases of the wrist joint.

Secondary Objective:

1. To characterize different pathologies of the wrist joint on MRI presenting in a tertiary care hospital.
2. To describe the frequency, anatomic distribution of MRI-detected wrist joint lesions.

MATERIAL AND METHODS

We examined MRI scans of 45 patients with various wrist joint pathologies. The imaging was carried out on a 3 -Tesla Siemens Magnetom Verio system, utilizing a surface coil while patients were positioned prone. Wrist joint was studied with multiplanar T1-weighted, T2-weighted, PD FS, STIR sequences, and T1FS pre & post contrast as per indication. After imaging data collected was analysed for the observations and results.

Inclusion Criteria:

Patients of age groups 18 and above who were referred by the clinician for MRI of the wrist joint and with history of any of the following : (1) Pain over the wrist joint. (2) Trauma to the wrist joint. (3) Restricted range of motion at the wrist joint. (4) Complaints unrelated to trauma at the wrist joint.

Exclusion Criteria:

- Patients with MRI non-compatible metallic implants.

RESULTS AND OBSERVATIONS:

1. Mean age of the patients in our study was 35.89 years+/- 14.862. No of patients belonging to age group ,belonging to 18-30 years was 21 (46.6 %) ,belonging to 31-40 years was 8 (17.78%) ,belonging to 41-50 years was 8(17.78%) and belonging to 51-60 years was 5(11.11 %) and above 60 years was 3(6.67 %).
2. There were 21 (46.67 %) females and 24 (53.3%) males in our study
3. Out of total 45 patients ,42 had pain ,14 had difficulty in movements,12 had pain with swelling,4 had pain with paraesthesia ,3 had swelling ,2 had pus with discharge in our study
4. Right side pain was 26(57.78%) was affected more than left side in 18(40.0%) patients. Bilateral case was present in one (2.2%) patient. Diffuse site of pain was seen in 12(26.67%) patients followed by ulnar in 18(40.0%) patients and radial in 15(33.33%)
5. History of trauma was present in 18 (40.0%) and not present in 27(60.0%) patients.
6. Degenerative disease was seen in 5 patients (10.6%), Infective disease in 2 patients (4.3%), Infective arthritis in 3 patients (6.4%), Inflammatory disease in 10 patients (21.3%), Neoplastic disease in 5 patients (10.6%), Neurologic disease in 1 patient (2.1%),Traumatic in fourteen patients (29.8%)and vascular in six patients (11.1%)
7. In the present study TFCC tear was seen in 13 patients (28.9%),Tenosynovitis in 6 patients (13.3%) and AVN seen in 4 patients (8.9%)and Ganglion cyst seen in 4 patients (8.9%), 3 cases of tubercular arthritis (6.7%) followed by giant cell tumor, infective, cyst, tears ,carpel tunnel syndrome, sprain, tendinosis, dislocation and inflammatory as other etiology.

Table 01: Showing Disease Distribution of the Patients. The most Common Pathology is TFCC Injury.

	Frequency	Percent
1st CMC joint dislocation	1	2.2
Capitate AVN	1	2.2
Carpal tunnel syndrome	2	4.4
Ganglion cyst	4	8.9
GCT	1	2.2
Infective arthritis	1	2.2
Inflammatory arthritis	2	4.4
Kienbock disease	2	4.4
Osteomyelitis	1	2.2
Preiser's disease	1	2.2
Rheumatoid arthritis	1	2.2
Scapholunate Dissociation	2	4.4
TB arthritis	3	6.7
Tendinitis	2	4.4
Tenosynovitis	6	13.3
TFCC Injury	13	28.9
Traumatic neuropathy	1	2.2
venous malformation	1	2.2
Total	45	100.0

DISCUSSION:

Disease Classification

In our study Degenerative disease was seen in 5 patients (10.6%), Inflammatory disease in 10 patients (21.3%), Infective disease in 5 patients (10.7 %), Neoplastic disease in 5 patients (10.6%), vascular in six patients (11.1%), Neurologic disease in 1patient (2.1%),Traumatic in fourteen patients (29.8%).

Which was comparable to study done by Vivek Chail. In this study there was a total of 11 cases (37%) of degenerative and inflammatory diseases, 10 cases (33%) of infective disorders, 6 cases (20%) of neoplastic lesions, 2 vascular disorders (7%) and 1 neurological disorder (3%). [(2)]

In the present study TFCC tear was seen in 13 patients (28.9%), Tenosynovitis in 6 patients (13.3%) simple ganglion cyst in 4 patients (8.9%) and avascular necrosis seen in 4 patients (8.9%), 3 cases of tubercular arthritis (6.7%) followed by giant cell tumor, infective, cyst, tears ,carpel tunnel syndrome in 2 patients (4.4%), sprain, tendinosis, dislocation and inflammatory as other etiology.

Which was comparable to study done by El-Deek, which included 50 patients with different pathologies, tendinopathy (20 cases; 40%), TFCC tear (8 cases; 16%), simple ganglion (8 cases; 16%), solid masses (3 cases; 6%), foreign body (2 cases; 4%), and CTS (9 cases; 18%). [(4)]

TFCC:

Out of the total 13 cases of TFCC injury, 3 had TFCC degeneration and 10 had TFCC tear. In the 10 TFCC tear, 7 were central in location (70%) and 3 were peripheral in location (30%).

Tubercular Arthritis

Of all the 3 cases of tubercular arthritis, synovial thickening was seen in all the patients (100%). The thickened synovium was T1WI/T2WI hypointense and showed post contrast enhancement. Marrow edema and cortical erosions were present in 2 patients (66%). Infective collections were present in 1 patient (33%). 1 patient had median nerve encasement (33%).

Which was similar to study done by Hsu C-Y et al, with total of eight patients with tuberculous wrist infections. All (100%) patients exhibited thickening of the synovium around both flexor and extensor tendons. Seven patients (87.5%) had multiple small, low signal foci in the synovial fluid without enhancement. Bone erosion (87.5%) was noted in seven patients, osteomyelitis in six (75%), and median nerve encasement in three (37.5%). [(5)]

Avascular Necrosis

Avascular necrosis on MRI presented as T1 hypointensity with a transverse fracture line. There was T2 hyperintensity with subchondral cystic changes.

Out of the 4 AVN in our study, 2 were present in the lunate (Kienbock disease) (50%), 1 in capitate (25%) and 1 in scaphoid (25%).

According to Mohammed R El Kholy et al, avascular necrosis was the most common cause of non-traumatic wrist pain found in 10 patients (26%). 6 patient had kienbock disease (60%), 2 in scaphoid (20%), 2 in trapezoid. This was similar to our study. [(6)]

In our study 4.4% cases of keinbock disease seen, which is comparable to study of Vivek Chail study , where 2 cases (6.6%) of avascular necrosis of lunate were seen [(2)]

CONCLUSION

1. MRI of the wrist joint, particularly with 3 dimensional imaging, is a valuable radiation-free diagnostic tool is highly effective imaging technique for diagnosing various wrist joint pathologies.
2. MRI wrist joint is preferred for evaluating complex, small-structure pathologies, including occult fractures, Triangular Fibrocartilage Complex (TFCC) tears, ligamentous injuries, tendinopathy, and ganglion cysts. It provides high-contrast visualization of bones, soft tissues, and nerves.
3. MRI is the preferred method for evaluating painful wrist joint conditions because of its superior soft tissue contrast resolution and multi-planar imaging capabilities.
4. It offers a non-invasive diagnostic tool that is often more effective than other modalities for identifying wrist joint diseases.
5. In most cases of wrist pain, an MRI of the wrist joint is essential for making an accurate diagnosis, which facilitates more targeted and effective treatment.

TFCC Injury:

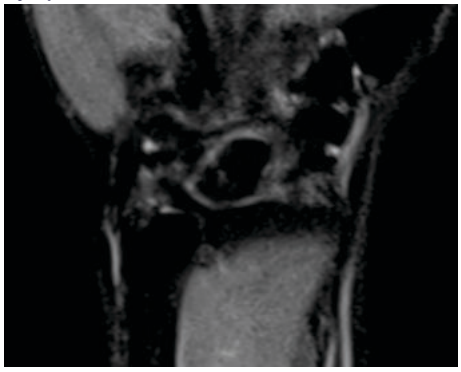

Image 1: PDFS Coronal Image Showing Hyperintense Signal in the Lamina of TFCC

Scaphoid Avascular Necrosis:

Image 2: T1 COR Image Showing Hypointensity in Scaphoid Bone Suggestive of Avascular Necrosis

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