



ORIGINAL RESEARCH PAPER

Radiodiagnosis

“ROLE OF HIGH RESOLUTION SONOGRAPHY IN THE EVALUATION OF NON-TRAUMATIC PAINFUL WRIST”

KEY WORDS:Painful wrist, Ganglion cyst, Fibrolipomatous hamartoma, Rheumatoid arthritis.

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ABSTRACT

Background: Determination of the cause of wrist pain is frequently a challenge. Musculoskeletal ultrasound is a quick and easy method of obtaining diagnostic information from dynamic studies with low patient discomfort.
Aim: To determine the spectrum of ultrasound abnormalities in patients with non-traumatic painful wrist and to correlate the findings with clinical, laboratory & MRI findings wherever possible.
Materials and Methods: The study was conducted in the Department of Radiodiagnosis, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry. Patients having history of non-traumatic painful wrist were included in the study.
Result and Conclusion: Ultrasound revealed an abnormality in 41/44 cases of painful wrist. Various findings noted include ganglion cyst, tenosynovitis, haemangioma, fibrolipomatous hamartoma, rheumatoid arthritis and synovial osteochondromatosis. Ultrasound is a valuable imaging modality for evaluation of wrist pain and is able to detect abnormality in high percentage of cases. It has a limited role in assessing other osseous abnormalities.

INTRODUCTION:

Non-traumatic etiologies of wrist pain can vary. A thorough and accurate medical history and a review of the systems are important to uncover potential systemic causes of wrist pain. Most physicians agree that imaging evaluation of a painful wrist should begin with radiography as it is cheap and simple. High frequency Ultrasound is useful in differential diagnosis of various local and systemic causes of the pain. Magnetic resonance imaging (MRI) is advocated for patients with chronic wrist pain because of the excellent soft tissue evaluation. The inherent soft tissue contrast of MRI is well known and is a major advantage over computed tomography (CT). A highly significant association exists between ultrasound indices of inflammation and post contrast magnetic resonance imaging scores. Musculoskeletal ultrasound is a quick and easy method of obtaining diagnostic information from dynamic studies and bilateral comparisons with low patient discomfort¹.

AIMS AND OBJECTIVES:

To determine the efficacy of high frequency ultrasound in differential diagnosis of various causes of non-traumatic painful wrist and to correlate the findings with clinical, laboratory & MRI findings wherever possible.

MATERIALS AND METHODS:

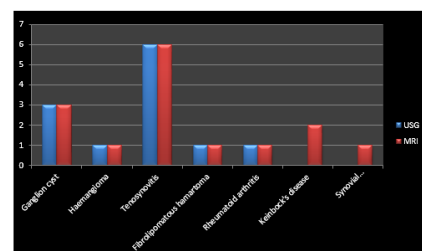
The study was conducted in the Department of Radiodiagnosis, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry. A total of 44 patients including 16 males and 28 females having history of non-traumatic painful wrist were included in the study. A written, well informed consent in vernacular language was taken from all the patients. Patients with non-traumatic painful wrist, within 18-60 years of age and willing to give consent were included in the study. Appropriate clinical history such as duration of pain, swelling, number of joints involved and restricted movement of wrist joint was noted in all the patients. Relevant laboratory findings (RA factor, ESR, CRP, anti CCP, nerve conduction velocity test) were recorded. This was followed by ultrasound examination of affected wrist using high frequency linear transducers. Dorsal aspect was evaluated first followed by the palmar aspect. Depending on the specific clinical presentation, ultrasound images were obtained in different positions of the wrist. Contralateral wrist was also examined. MR scan was performed on a seimens system (TIM and DOT) 1.5 T scanner in 15 patients using dedicated wrist coil. T1W, T2W, fat saturated T2/STIR sequences were used to acquire images in axial, coronal and

sagittal planes. Post contrast scans were also obtained wherever needed.

RESULTS: In our study, 38/44 (86.3%) had pain of more than 3 months duration. Swelling around wrist joint was the most commonly associated symptom noted in 21/44 (47.72%) patients. 14/44 (31.81%) patients also complained of associated restricted wrist movement. Sensory symptoms (Paresthesia, burning sensation, numbness) were noted in 6 (13.63%) patients while motor symptoms (weakness of hand muscles) were present in 4 (9.09%) patients. Ganglion cyst was the most common lesion, found in 15/44 (34.05%) patients.

Table 1: Comparison between US and MRI

Diagnosis	No of cases positive on ultrasound (%)	No of cases positive on MRI (%)
Ganglion cysts (n=15)	3 (20%)	3 (20%)
Haemangioma (n=2)	1 (6.66%)	1 (6.66%)
Tenosynovitis (n=12)	6 (40%)	6 (40%)
Fibrolipomatoushamartoma (n=1)	1 (6.66%)	1 (6.66%)
Rheumatoid arthritis (n=5)	1 (6.66%)	1 (6.66%)
Keinbock's disease (n=2)	-	2 (13.33%)
Synovial osteochondro-matosis (n=1)	-	1 (6.66%)
Total	12 (80%)	15 (100%)



Bar Graph 1: Correlation between US & MRI

In all the 6 cases of tenosynovitis both MR and ultrasound showed abnormalities but the extent of disease and various osseous changes were better evaluated on MR scans as in 2 cases of tubercular tenosynovitis in whom cortical erosions and marrow edema were better evaluated on MR scans than on ultrasound. MRI showed osseous abnormality in both patients of Keinbock's disease while no abnormality was detected on ultrasound in both the patients. In solitary patient with synovial osteochondromatosis, MR showed abnormality in the form of few well-defined nodules on the dorsal aspect of wrist distal to the ulna with adjacent small loculated fluidpocket while ultrasound was found to be negative in this patient.

DISCUSSION:

Ultrasound of wrist revealed a wide spectrum of finding in our study group. Among the 44 patients ultrasound abnormality was found in 41 i.e. 93% patients. The most common pathology noted on ultrasound was the presence of cystic/solid soft tissue masses, noted in 17/44 i.e. 38.59% of patients. 15 of these 17 (88.23%) patients had ganglion cyst, of which 46.6% were clinically occult while 2 (11.76%) had a hemangioma. This is in agreement with a review article published by **Bianchi S.** et al in **2008** to present the sonographic appearance of the most common masses of the wrist and hand and to discuss the role of sonography in their diagnosis stated Ganglia are the most common masse of the wrist and hand.2 When the location and sonographic appearance of the ganglia was analyzed, the following facts emerged in our study. 9/15 (60%) ganglion cysts were seen on volar aspect while 6/15(40%) were seen on extensor aspect (Fig1A,B). Most of the ganglion cysts i.e. 12/15 (80%) showed presence of internal septae/ echoes. 9/15(60%) of the ganglion cysts had well defined margins while joint communication was visualized in 6/15 i.e. 40% patients having ganglion cyst. None of the ganglia in our study showed internal vascularity.



Figure 1 (A, B): (A) High resolution gray scale ultrasound along the dorsal aspect of wrist in longitudinal plane. STIR coronal (B) MR images of the same patient showing a small hyperintense lobulated lesion at the flexor aspect of wrist (arrow).

The findings are in agreement with a study by **WangG.** et al in which they found that 75% of ganglia were volar, 35 showed joint communications, 65% showed well defined vascularity within.3 In the present study **Tenosynovitis** was noted in 12/44 (27%) of the patients. This is in accordance with the prospective study done by **Van vugt RM** and colleagues in the year **1999**, in which they found 25% patients were having tenosynovitis/ tendinitis as the main pathology in patients of wrist pain.4 Out of 12 patients who had tenosynovitis, 7(58.33%) patients were finally diagnosed as having infective etiology (5 cases of tubercular tenosynovitis and 2 pyogenic tenosynovitis) while other 5 cases included 4 non-infective tenosynovitis (2 due to overuse and 2 cases of idiopathic tenosynovitis) and 1 case had deQuervain's tenosynovitis. 3 cases of ganglia evaluated on MR were seen as well-defined T2 hyper intense lesions with no significant post contrast enhancement. Ganglia may be unilocular or multilocular, are round to lobular in configuration, and often contain sharply defined internal septa.

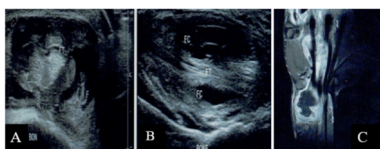


Figure 2 (A, B and C): High resolution gray scale ultrasound images in transverse (A) and longitudinal (B) planes of wrist

showing tendon sheath thickening with surrounding fluid collection with internal septae. (FC- fluid collection, FT – flexor tendons).

Post contrast (C) MR scans showing rim enhancing soft tissue collection around the flexor tendons with thickened tendon sheath

They appear as cystic masses on MR, with low signal intensity on T1- weighted images and high signal intensity on fluid-sensitive and T2-weighted images5-6. In our study, all the 5 cases of tubercular tenosynovitis (**Fig 2A,B**) showed enhancement of the thickened synovium on post contrast scans. In present study, in both the cases of **Keinbock's disease**, MR showed altered signal intensity and collapse in lunate bone. Magnetic resonance imaging is the modality of choice for early diagnosis of Keinbock's disease.7 In all the patients with focal soft tissue mass such as ganglion cyst and haemangioma who underwent both ultrasound and MRI, the findings were diagnosed on both. All the 3 cases of ganglion cysts were diagnosed on both ultrasound and MR scans.

And 7/44 (15.90%) patients in our study group were finally diagnosed to have **median nerve pathology** . 5 carpal tunnel syndromes and 1 case each of fibrolipomatous hamartoma and leprosy neuritis with median nerve abscess. In all 5 patients with clinical suspicion of carpal tunnel syndrome and abnormal nerve conduction velocity test, swelling of the median nerve at carpal tunnel with a cross sectional area of >10 mm² was seen. All the patients also showed increased wrist forearm ratio of cross sectional area of median nerve.(**Fig 3A,B,C**) Our findings are in close agreement with previous studies by **Ziswiler HR** who found that the maximum cross sectional area of median nerve in carpal tunnel increases in patients with carpal tunnel syndrome and there was a high concordance between sonography and nerve conduction.⁸

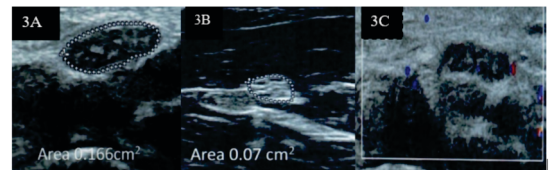


Figure 3 (A, B and C): Transverse scans show median nerve in carpal tunnel (A) and 10 cm proximal to wrist (B). There is increase in cross sectional area of median nerve in carpal tunnel with increased wrist to forearm ratio. On color Doppler (C) the median nerve shows intraneural vascularity.

One female who was diagnosed as having **DeQuervain's tenosynovitis**, presented with pain over the radial side of wrist and showed presence of thickening of the synovial sheath with anechoic fluid surrounding the tendons of first extensor compartment. Mild internal vascularity was also noted within the thickened tendon sheath. (**Fig 4 A,B**) The findings noted were in concordance with **Giovagnorio F** et al who performed high-resolution ultrasonography of the wrists in eight patients with de Quervain disease; and found changes of the tendon sheath in all cases of de Quervain disease in from of thickening and edema of the synovial sheath and fluid within the sheath.⁹

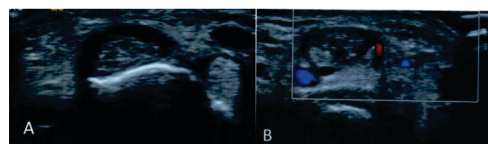


Figure 4 (A and B): High resolution ultrasound scan of wrist in transverse plane along the extensor aspect (A) showing peritendinous fluid and tendon sheath thickening around first extensor compartment. Color Doppler (B) showing mild vascularity in the tendon sheath.

CONCLUSION:

Hence we conclude that ultrasound is a valuable imaging modality for evaluation of wrist pain and is able to detect abnormality in high percentage of cases. It is diagnostic in most of the soft tissue pathologies associated with wrist pain. It also helps early detection of pathology, before radiographic abnormality become apparent especially the soft tissue lesions. It can also help in detecting cortical erosions but has a limited role in assessing other osseous abnormalities in patients with wrist pain where MR is more useful.

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