



ORIGINAL RESEARCH PAPER

Radiodiagnosis

COMPARISON IN DIAGNOSTIC ACCURACY OF ULTRASONOGRAPHY AND PLAIN X-RAYS IN EVALUATION OF NON TRAUMATIC CAUSES OF WRIST PAIN.

KEY WORDS:

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ABSTRACT

Objective- The purpose of this study was to determine the diagnostic accuracy of ultrasonography and plain x-rays in evaluation of non traumatic causes of wrist pain.

Material and methods- Prospective analysis of 100 patients presenting with wrist pain were included in study. All patients underwent an x-ray (PA & Lateral) of the affected wrist and USG of the affected wrist.

Results- The clinical presentation of wrist pain can be due to a wide variety of pathologies of regional bones, joints, and soft-tissue structures such as tendons. Ultrasonography can assist in determining the specific cause for wrist pain.

Conclusion- USG examination can be used as the first line of investigation for a case of wrist pain as it is inexpensive, real time and allows for comparison with the opposite side as compared to x-rays which are unable to diagnose non osseous lesions of wrist.

Introduction-

Ultrasonography is an imaging modality which uses ultrasonic waves which travel as longitudinal waves and images are generated when pulses of ultrasound waves from the transducer produce echoes at tissue or organ boundaries(1) . USG of wrist needs as high frequency as possible which can still allow adequate visualization depth into tissues as higher frequencies are associated with improved spatial detail and excellent resolution(2).

USG has the ability to image changes in the cortical surface of bone, or of the periosteum, have increased applications to the diagnosis of fractures, osteomyelitis, and characterization of some neoplastic processes(3). Dynamic Sonography performed during movements and stress can give functional information about tendons and ligaments (4) as some patients might not have any pain at rest. Because of Sonography being in real time, it gives a clear advantage over plain X-ray in evaluation of a wide range of musculoskeletal interventions because the needle can reach its intended target while avoiding major blood vessels and nerves.



Figure1- (a), (b) Photographs showing the normal position of the wrist and the transducer for evaluation of the tendons of the first extensor compartment. (c) Transverse US image through the anatomical snuff box tendons of the shows first extensor compartment: Abductor pollicis longus(APL) and the extensor pollicis brevis (EPL)

The new Extended Field of View (FOV) technology has allowed imaging of larger segments and has made their interpretation easier (5). Tissue harmonic imaging (THI) is a new sonographic technique that allows for improved display of large lesions and improved visualization of anatomic relationships (6). The substantial growth in power Doppler US application can identify increased blood perfusion in the synovium and in several inflammatory conditions, including tenosynovitis and enthesitis (10) , cellulitis, abscess, synovitis, myositis, and bursitis.

Contra lateral comparison is easily performed as it distinguishes significant findings from normal variants and occasionally reveals unsuspected abnormalities, which can be crucial to the treatment of a patient. Split-screen function that is available on most Sonography machines can expand the field of view to approximately double or can be used for side-by-side contra lateral comparisons(7) . Ultrasound accurately characterizes masses of the hand and wrist as cystic or solid and can be used to obtain specific diagnoses for the majority of these lesions(8).

The main disadvantages of US are limited assessment capability of internal structures of the joints, bone and bone marrow.

Plain X-rays-

It is the most widely used modality in the evaluation of the musculoskeletal system. The visualization of these components depends on the natural contrast between the five radiographic densities that is air, fat, water, and bone. A minimum requirement in plain film evaluation is the absolute necessity of having at least two views, preferably perpendicular to each other.



Figure2 – Xray AP projection of wrist bones.

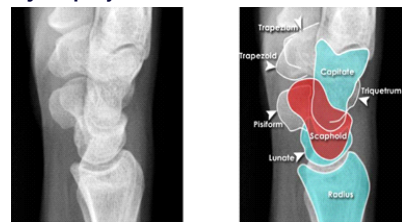


Figure3- Xray Lateral view of wrist Joint.

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It is often the initial investigation of skeletal abnormalities and provides pivotal information regarding any additional imaging modality that may be indicated or contraindicated. Recognition of a definite diagnosis is frequently possible or at least a short list of differential diagnoses can be determined. In addition, plain films are important for comparison of changes in the disease process over time or with therapy and provide incidental detection of unsuspected bony and soft tissue abnormalities.

X-rays are readily available, inexpensive, which depict anatomic details that is readily understandable .Key benefits are the demonstration of bony landmarks and the ability to assess contiguous structures over considerable length (9).

Diagnostic sensitivity can be very limited as unless more than 30-

50% loss of bone density and a lesion size of at least 1-5 cm are often necessary before a structure is visible on a radiograph. Similarly, the time interval from when the disease process manifests clinically until it becomes visible radiographically can be quite long (10).

Aims and Objective-

- 1) To compare the usefulness of Ultrasound and x-rays in the diagnosis of non traumatic wrist joint pain.
- 2) Assessment of Ultrasound as a first line of imaging modality for evaluation of wrist joint.

Materials and Methods-

Sources of Data:

All the eligible cases attending OPD of Orthopedics and/or admitted to ACPM Hospital, Dhule during the period of study will be included.

Method of collection of Data

All patients presenting with wrist joint pain examined by the orthopaedician and referred to the dept. of radio-diagnosis for further evaluation.

A pre-informed written consent is taken from the patient, which is attached to a questionnaire which will include the patient's history, general physical examination and detailed wrist joint examination. All eligible patients will then be put through

- A. An Antero Posterior and lateral x-ray of the affected wrist joint.
- B. Ultrasound scans of both, the wrist joint in question and the opposite side for comparative study. All scans will be done on Nemio Toshiba usg machine using the high-frequency linear array probe 6-12 MHz and Harmonic High Definition (HD) probe.

The findings of the imaging modality will also be entered.

Study Design- Descriptive study

Sample size- 100

Sample Design- Purposive sampling

Study Place- Dept. of radiology , ACPM medical College. Dhule.

Study period- 2016-2018

Statistical Analysis: The data collected in this study will be analyzed statistically using descriptive statistics like mean, standard deviation and percentages.

Inclusion Criteria-

- 1) Patients coming with history of pain in either wrist joint.
- 2) Age above 25 years.

Exclusion Criteria-

- 1) Patients coming with known cases of congenital abnormalities of the wrist.
- 2) Wrist pain due to traumatic causes.

Results-

Table-1: Age wise distribution of study subjects.

Age (Years)	Frequency	Percent
25-34	37	37.0
35-44	23	23.0
45-54	23	23.0
> 55	17	17.0
Total	100	100.0

Figure 4 Bar graph representing Age wise distribution of study subjects.

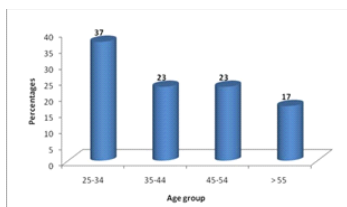


Table 2- Distribution of study subjects based on Chief complaints.

Category	Frequency	Percent
Pain	99	99.0
Swelling	30	30.0
Numbness	4	4.0
Restriction of Movements	2	98.0

Figure 5 Bar graph showing distribution of study subjects based on Chief complaints

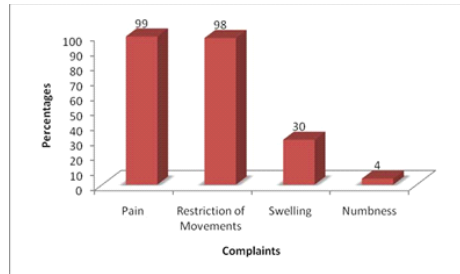


Table-3: Distribution of study subjects based on duration of symptoms.

Duration (Days)	Frequency	Percent
1-20	21	21.0
21-40	33	33.0
41-60	26	26.0
61-80	20	20.0
Total	100	100.0

Table-4 : Past History

Morbidities	Frequency	Percent
Hypertension	9	56.2
Diabetes	7	43.8
Total	16	100.0

Table- 5: X-ray findings

Findings	Frequency	Percent
Abnormal	5	5.0
Normal	95	95.0
Total	100	100.0

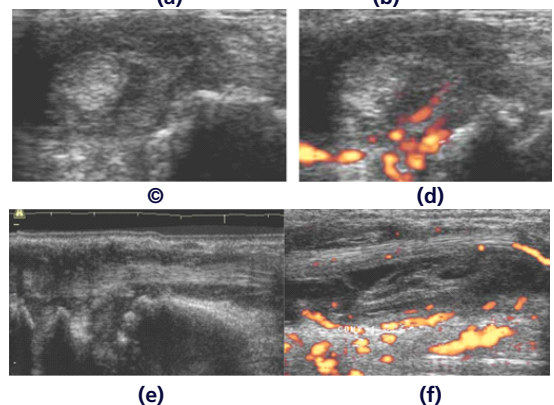
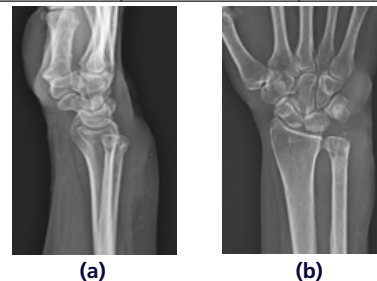


Fig.6. Extensor tenosynovitis. PA (a) and Lateral (b) projection of wrist shows diffuse soft tissue swelling in distal forearm and wrist regions with subtle bony erosions involving the distal ulna and ulnar styloid process. Transverse (c) US image with Power Doppler(d), Longitudinal extended FOV (e) with Power Doppler (f)

showing diffuse tendon sheath thickening with hypoechoic fluid collection and tendon sheath

Ultrasound Results-

Table 6 Ultrasound examination of Tendon pathologies

Findings		Frequency	Percent
TENSYNOVITIS	De Quervain's	10	43.5
	Flexor	6	26.1
	Extensor	6	26.1
Tendon tear		0	
Tendon rupture		1	4.3
Total		23	100.0

Table 7 Ultrasound examination of nerve pathologies

Nerve	Frequency	Percent
Present	5	5.0
Absent	95	95.0
Total	100	100.0

Table 8 ultrasound examination of type of nerve involved

Nerve	Frequency	Percent
Median	2	40.0
Ulnar	3	60.0
Total	5	100.0

Table 9 Ultrasound examination of vascular abnormality.

Vascular abnormality	Frequency	Percent
Present	1	1.0
Absent	99	99.0
Total	100	100.0

Table 10 Ultrasound examination of focal lesions in the wrist.

Focal masses		Frequency	Percent
Cystic	Simple	12	50.0
	Infected	9	37.5
Solid		3	12.5
Total		24	100.0

Table 11 Ultrasound examination of cystic lesions on affected aspect of wrist (Flexor or extensor)

Part	Frequency	Percent
Flexor	13	61.0
Extensor	8	39.0
Total	21	100.0

Table 12 Ultrasound Examination of Joint involvement.

Condition	Frequency	Percent
Abnormal	1	1.0
Normal	99	99.0
Total	100	100.0

Table-13 : Comparison of X ray and USG findings of study subjects.

Result	X RAY	Ultrasound	X2	P
Normal	95 (95.0)	49 (49.0)	52.5	0.001
Abnormal	5 (5.0)	51 (51.0)		
TOTAL	100 (100.0)	100 (100.0)		

The frequency of Case detection from X-rays 5 (5.0%), was less as compared to Ultrasonography 51 (51.0%).

The difference was found to be statistically significant (X2 =52.5, P=0.001).

Conclusion-

In the comparison of X-ray and Ultrasound findings of the study subjects ,5 subjects were found to have abnormal X-ray findings as compared to 51 abnormal subjects in Ultrasound. The difference was found to be statistically significant (X2=52.5, P= 0.001).

The wide variety of pathologies that we have encountered and

diagnosed in our study was shown to be reliably diagnosed with ultrasound with specificity of 1 and positive predictive value of 1 as shown in a study done by John .W. Read et al (11).

US imaging can be considered superior to X-rays in the diagnosis of non traumatic wrist joint pain.

Though operator dependent, a well performed USG can effectively serve as a primary diagnostic method and screening of all painful wrist joints because it is non- invasive, cost effective, portable and easily accessible.

The X-ray (PA & Lateral) of the wrist joint has a limited role, which is restricted to bony lesions and in non traumatic conditions, the accuracy of diagnosis is limited.

High resolution USG examination of the wrist has a high sensitivity and specificity and accurate in the assessment of tendon pathologies. It lacks ionizing radiation and is also cost effective, non invasive, easily accessible and comparison with the opposite side can be readily done. The drawback for USG is that it is operator dependant and a steep learning curve for radiologists because of the complex anatomy and the time taken for the study. Sound USG anatomical knowledge and practice is a must and awareness of the artifacts of this procedure.

Hence USG can be used as a first line of investigation in case of non traumatic wrist joint pain to rule out tendon pathologies.

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