

Prospective and Observational Study On A Clinico-Radiological Correlation of Wrist Joint Pain**Thakur Rajani¹, Aluka Sundeep Kund Reddy^{2*}**¹*Assistant Professor, Department of Radiodiagnosis and Imageology, NIZAM'S Institute of Medical Sciences, Hyderabad, Telangana, India*²*Assistant Professor, Department of Orthopaedics, NIZAM'S Institute of Medical Sciences, Hyderabad, Telangana, India***Received: 12-09-2020 / Revised: 18-11-2020 / Accepted: 04-12-2020****Abstract**

Background: Wrist joint pain is one of the commonest conditions that are encountered in the Orthopedic OPD. The prevalence of wrist joint pain is increasing because of repetitive stress injury caused by increased use of personal computers, mobile phones, laptops and other latest devices. Diagnosis is made clinically and confirmed by imaging modalities. The imaging modalities used are X-ray, Ultrasonography and MR imaging. Imaging modalities play a very important role in the diagnosis. High frequency sonography combined with physical examination often solves the diagnostic challenges. High resolution real time ultrasound has shown to be cost effective means of investigating the wrist joint. **Objective:** To evaluate a patient with wrist joint pain in terms of assessment by Ultrasound as the first line of imaging modality. To use ultrasound along with X-rays and clinical examination to aid in quick and decisive diagnosis, thus avoiding further investigative modalities which are costlier. **Methods:** Prospective analysis of 100 patients presenting with wrist pain were included in our study. A pre-formed written consent is also taken. All patients underwent a thorough clinical examination, followed by X-ray (PA & Lateral) of the affected wrist and USG of the affected wrist with comparison of the opposite side. **Results:** The clinical presentation of wrist pain can be due to a wide variety of pathology, including abnormalities of regional bones, joints, and soft-tissue structures such as tendons. US 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.

Keywords: X-ray, Ultrasound, Wrist pain.

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Introduction

Ultrasonography (USG) is an imaging modality that uses sound waves in the higher frequency range which normally cannot be heard by human beings. Audible sounds are in the range of 30 Hertz (Hz) - 20 KHz (Kilo Hertz) frequency range. Ultrasound travels as a longitudinal wave, and images are generated when

pulses of ultrasound from the transducer produce echoes at tissue or organ boundaries[1]. Diagnostic ultrasound applications use frequencies in the 1 MHz (Mega Hertz) – 30 (Mega Hertz) frequency range. Clinical musculoskeletal (MSK) ultrasound needs as high frequency as practical that can still allow adequate visualisation depth into tissues. Higher frequencies are associated with improved spatial detail or better resolution[2]. Although the anatomy of the hand and wrist is complex and the pathologic conditions encountered are diverse, many of the disease processes are localized, and in many situations, the clinical question is specific and limited. Because of this, ultrasound has always been an attractive imaging modality for evaluation of hand and wrist problems. Unfortunately, intrinsic difficulties in ultrasound image

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acquisition and interpretation have slowed the Recently, however, new developments in high-resolution transducers with frequencies in the range of 3-17 MHz and signal processing have dramatically improved image quality and scanning flexibility. For this reason, hand and wrist sonography is now more widely accepted and is taking its place along side other traditional modalities such as radiography, computed tomography, magnetic resonance imaging, and arthrography. Specific situations in which ultrasound offers definite benefits include evaluation of tendon inflammation and rupture, evaluation of palpable masses or suspected occult masses, and evaluation of suspected foreign bodies. 7,8 Analysis of the median nerve is also possible and can also play a role in patients with carpal tunnel syndrome⁹.

Aims and Objectives

- To evaluate a patient with wrist joint pain in terms of: Assessment of Ultrasound as a first line of imaging modality for evaluation of wrist joint.
- To compare the usefulness of X rays and Ultrasound in the diagnosis of non traumatic wrist joint pain.

Materials and methods

Sources of Data:All the eligible cases attending OPD of Radiodiagnosis & Orthopedics and/or admitted to NIZAM'S Institute of Medical Sciences, Hyderabad during the period of study will be included.

Study design :Descriptive study

Sample size :100

Sample design :Purposive sampling

Study place :Dept. of Radio-diagnosis, NIZAM'S Institute of Medical Sciences, Hyderabad.

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

Descriptive statistical analysis based on number and percentage is done and presented in table 1, it reveals that 37% of the subjects were between 25-34 years, 23% of subjects were between 35-44 years, 23% of subjects were between 45- 54 years and rest 17% of the subjects were above 55 years of age.

Table 2: Sex wise distribution of study subjects.

Sex	Frequency	Percent
Male	50	50.0
Female	50	50.0
Total	100	100.0

acceptance of hand and wrist sonography. [3-6].

Study period:December 2017 to September 2019.

Method of collection of Data

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

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 Voluson 730 (Wipro GE) 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.

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

Inclusion criteria:

1. Age above 25 yrs
2. History of pain in either wrist joint

Exclusion criteria:

1. Known cases of acute trauma.
2. Known cases of congenital abnormalities of the wrist.

Descriptive statistical analysis of gender distribution is done based on numbers and percentages, and represented in table 2 . It shows both are equally distributed.

Table 3: Distribution of study subjects based on their socioeconomic status.

Category	Frequency	Percent
Low	23	23.0
Medium	74	74.0
High	3	3.0
Total	100	100.0

Descriptive statistical analysis of socio economic status of study subjects is done based on numbers and percentages, and represented in table 3. It shows 74% of subjects were from middle class, 23% of subject from lower class and the rest 3% were from high class.

Table 4: 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

Descriptive statistical analysis of chief complaints of study subjects is done based on numbers and percentages, and represented in table 4. It shows 99% of subjects were having pain, 30% of subjects were having swelling, 4% of subjects having numbness of fingers and 2% were having restriction of movements of wrist. Majority of the subjects were having more than one symptom.

Table 5: 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

Descriptive statistical analysis of duration of symptoms of study subjects is done based on numbers and percentages, and represented in table 5. It shows 33% of subjects were having symptoms for the duration of 21-40 days, 26% of subjects were having symptoms for a duration of 41-60 days, 21% of subjects having symptoms for a duration of 1-20 days and the rest of 20% were having symptoms for a duration of 61-80 days.

Table 6: Distribution of study subjects based on affected wrist

Limb	Frequency	Percent
Right	53	53.0
Left	47	47.0
Total	100	100.0

Descriptive statistical analysis of affected wrist based on number and percentages done in table 6, shows 53% of subjects with right wrist involvement and rest 47% to have left wrist involvement.

Table 7: Past History

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

Descriptive statistical analysis of co morbid conditions of the study subjects based on numbers and percentages, and represented in table 7 reveals that 9 subjects had a history of hypertension and 7 subjects were known diabetics.

Table 8: Clinical examination – Palpation

Observation	Frequency	Percent
Swelling	32	32.0
Deformity	1	1.0
Tenderness	99	99.0

Descriptive statistical analysis of palpation findings of the study subjects based on numbers and percentages from table 8 reveal that 99% of subjects had tenderness of the wrist, 32% of subjects had swelling of the wrist and 1% had deformity of the wrist. Majority of the subjects were having more than one finding.

Table 9: Clinical examination - Movements of wrist joint

Type	Frequency	Percent
A	1	1.0
B	73	73.0
C	0	0
D	26	26.0
Total	100	100.0

Descriptive statistical analysis of findings of movements of the wrist joint of study subjects based on numbers and percentages from table 9 reveal that 73% of subjects had type B movements, 26% of subjects had type D movements and rest 1% had type A movements.

Table 10: X-ray findings

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

Descriptive statistical analysis of X -ray findings of study subjects based on numbers and percentages from table 10 reveal that 95% of subjects had normal findings and rest 5% had abnormal findings

Table 11: Ultrasound examination- Tendon.

Findings		Frequency	Percent
TENOSYNOVITIS	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

Descriptive statistical analysis of ultrasound findings tendons of study subjects based on numbers and percentages from table 11 reveal that 23 subjects had abnormal findings, among which 10 subjects had De

Quervain's tenosynovitis, 6 subjects had flexor tenosynovitis, 6 subjects had extensor tenosynovitis and 1 subject had tendon rupture.

Table 12: Ultrasound examination- Nerve involvement

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

Descriptive statistical analysis of ultrasound findings of nerve involvement of study subjects based on numbers and percentages from table 12 reveal that 95% of subjects had normal findings, and 5% of subjects had abnormal findings.

Table 13: Ultrasound examination- Type of nerve involved

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

Descriptive statistical analysis of ultrasound findings of type of nerve involvement of study subjects based on numbers and percentages from table 14 reveals that 3 of the subjects had ulnar nerve involvement and 2 of the subjects had median nerve involvement.

Table 14: Ultrasound examination- Vascular abnormality

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

Descriptive statistical analysis of ultrasound findings of frequency of vascular abnormality of wrist joint of study subjects based on numbers and percentages from table 14 reveals that 99% of subjects had no vascular pathologies and rest 1% of subjects had vascular pathology.

Table 15: Ultrasound examination- Focal masses

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

Descriptive statistical analysis of ultrasound findings of focal masses of wrist joint of study subjects based on numbers and percentages from table 15 reveals that 24% of subjects had focal masses. Cystic focal masses were seen in 21 subjects (Simple-12 subjects and infected-9 subjects) and rest 3% of subjects had solid focal masses.

Table 16: Ultrasound examination- Cystic mass affected aspect

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

Descriptive statistical analysis of ultrasound findings of affected aspect of cystic focal masses of wrist joint of study subjects based on numbers and percentages from table 16 reveals that 13 subjects had flexor aspect involvement and 8 subjects had extensor aspect involvement.

Table 17: Ultrasound examination- Joint involvement

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

Descriptive statistical analysis of ultrasound findings of affected wrist joint of study subjects based on numbers and percentages from table 17 reveals 99% of subjects had no joint involvement and the rest 1% of subjects had joint involvement.

Table 18: Comparison of X ray and USG findings of study subjects

Result	X RAY	Ultrasound	χ^2	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 USG was more 51 (51.0%) compared to X- Ray 5 (5.0%), the difference was found to be statistically significant ($\chi^2=52.5$, $P=0.001$).

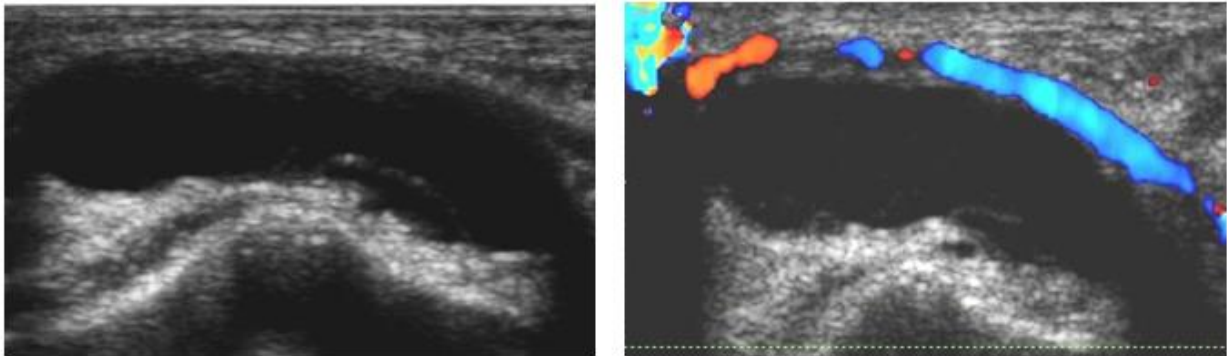


Fig 1:Volar Ganglion cyst associated with radial artery. (a) Longitudinal US image with Color Doppler showing a well defined cystic lesion in relation to the distal end of radius adjacent to and deviating the radial artery

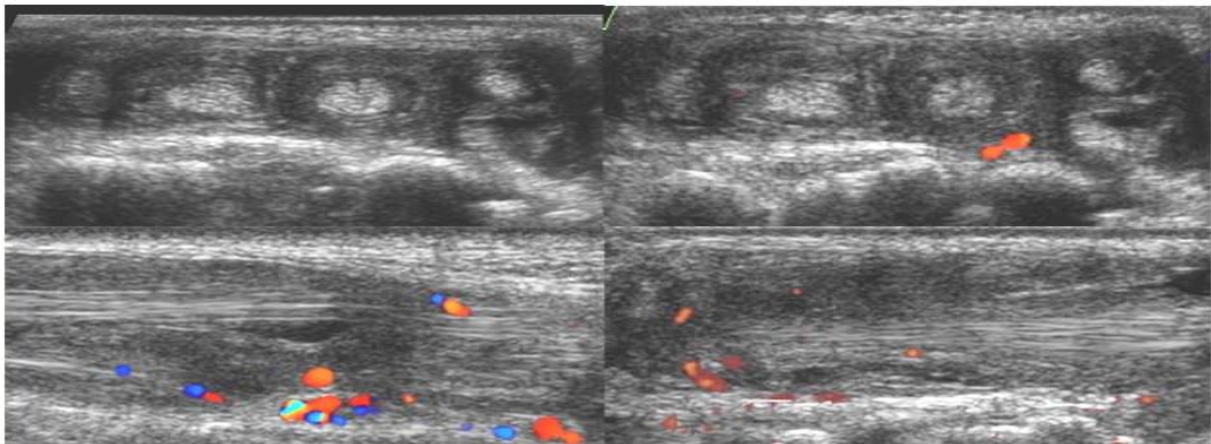


Fig.2: Extensor tenosynovitis. (a) Transverse US image with (b)Color Doppler, (c) Longitudinal Color Doppler and (d) Power Doppler US image showing extensive tendon sheath thickening involving all extensor tendons with hypoechoic tendon

Discussion

In the present study, A Clinico-radiological correlation of wrist joint pain was done in selected patients with wrist joint pain attending the

orthopaedic outpatient department in NIZAM'S Institute of Medical Sciences, a tertiary care teaching hospital. The age distribution of the study subjects is shown in Table-1. Many of the patients (37%) were under 34 years of age. 23% of patients were between

34-44 years and another 23% of patients were between 44 -54 years. Only 17% of the subjects were above 55 years.

There was no significance difference in gender distribution as shown in Table- 2. Both were equally distributed.

Table-3 shows the socio economic status of the study subjects. Majority of the subjects (74%) were from middle class. 23% of the subjects was from the lower class and only 3% of the subjects were from high class.

The main presenting complaints and symptoms have been summarized in Table-4. The main symptoms were pain (99%) and swelling (30%) of the wrist joint. Majority of the patients had more than one symptom. Only 4 subjects complained numbness of the fingers of the involved hand and only 2 subjects complained restriction of movements of the involved wrists. Table-5 shows the distribution of the duration of the symptoms of the study subjects. Many of the subjects (33%) had symptoms for the duration of 21-40 days. Twenty six subjects had symptoms for the duration of 41-60 days, twenty one subjects had the symptoms for the duration of 1-20 days and twenty subjects had for 61-80 days. The distribution of duration of symptom was found to be of no significance. Table-6 & Fig.28 shows the distribution of the affected wrist in the study subjects. Right wrist (53%) is slightly higher than the left wrist (47%) and does not have much significance.

Past history (Table-7) does not have much significance. Nine patients were reported to have hypertension and seven patients were suffering from diabetes mellitus. The clinical examination of the study subjects have been in summarized in Table-8, 9 & 10.

Table-8 shows distribution of the inspection findings in the study subjects. Majority of the patients had swelling (32) at the wrist joint. Abnormal position (1) and deformity (1) of wrist was noted.

Table-9 shows the distribution of the palpation findings in the study subjects. Almost all patients had tenderness (99) in wrist. Swelling (33) and deformity (1) incidence were seen.

Table-10 shows the distribution of the movements of the wrist findings in the study subjects. Majority of the patients had type B movements (73%) mild pain with no restriction of movements. Followed by type D movements (26%) i.e pain with restriction of movements. One patient had type A movement i.e no pain with no restriction. Type C movements was no pain with restriction. X-ray examination findings were shown in Table-11 95% of subjects showed

normal X-ray findings and only 5% of subjects had abnormal findings. Ultrasound examination findings were summarised in Tables- 12- 18 .

Table- 12 shows Ultrasound findings of tendons of the wrist joint. Out of the total 100 subjects, 23 subjects were found to be having abnormal findings in tendons. Within these subjects almost all had tenosynovitis (22). Only one subject had finding of tendon rupture. De Quervain's tenosynovitis was seen in 10 subjects (43.5%) and flexor tenosynovitis (26.1) and extensor tenosynovitis (26.1%) were seen in 6 subjects each.

Table-13, 14 shows the Ultrasound findings of the nerve involvement of the wrist joint in the study subjects. Majority of the subjects had normal findings (95%) and only 5 subjects showed involvement of the nerves. Among these five subjects, two subjects were shown to have Median nerve involvement (40%) and 3 subjects were shown to have Ulnar nerve involvement (60%).

Table-15 shows the Ultrasound findings of frequency of vascular abnormality of the wrist joint in the study subjects. Vascular abnormality was observed in only one subject (1%). Rest of the subjects showed normal Ultrasound findings.

Table-16 shows the Ultrasound findings of the focal masses of the wrist joint. 24 subjects presented with focal masses. Among these subjects, 21 were shown to be having cystic masses (87.5%) and only three subjects were shown to have solid masses (12.5%). Among the subjects with cystic masses, 12 had simple cysts and 9 had infected cystic masses. Table-17 & Fig.39 shows the distribution of the cystic masses in the flexor or extensor aspect of the wrist. Among these, 13 subjects (61%) showed the cystic masses on the flexor aspect of the wrist and 8 subjects (39%) showed the cystic masses on the extensor aspect of the wrist.

Table-18 shows Ultrasound findings in the affected wrist joint in the study subjects. Abnormality of the joint was seen in only one subject. It shows 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 subjects in Ultrasound. The difference was found to be statistically significant ($X^2=52.5$, $P = 0.001$). 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[8].

Advantages of ultrasound: It is non invasive, real time, multi planar and non ionizing. It can be done rapidly without any patient preparation. It is widely available and at a low cost. It has high spatial

resolution. At wrists, it is possible to confuse the median nerve with one of the long flexor tendons and vice versa. The long flexor tendons may also be distinguished from median nerve because they merge with their respective muscles more proximally and displays anisotropy.

Conclusion

- Clinical examination of the wrist joint does not provide adequate insight on the cause of wrist pain.
- The commonest pathology causing wrist pain is tendon pathologies like tenosynovitis commonly De Quervain's followed by focal cystic masses which can be simple or infected.
- 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.

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