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ORIGINAL RESEARCH

Wrist Joint Pain: A Clinical and Radiological Correlation

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ABSTRACT

Background: Wrist discomfort is frequent in Orthopedic OPD. Computers, phones, laptops, and other electronics aggravate wrist pain. Treatment requires accurate diagnosis. Diagnostic imaging confirms. Ultrasound, MRI, and X-ray are employed. Critical imaging. Sonography and physical exam solve diagnostic problems. Real-time ultrasound is cost-effective for wrist imaging. Ultrasound imaging has improved for wrist joint diseases. It's cheaper than other methods. Cost and availability make wrist ultrasonography significant in our country. Ultrasound is the primary line of imaging for a patient with wrist joint pain. Use ultrasound along with X-rays and clinical exam to aid in speedy and decisive diagnosis, avoiding expensive investigative modalities. To describe USG image interpretation problems.

Material and Methods: In our study, a prospective analysis of 100 individuals who had wrist pain was included. Additionally, a pre-written consent is obtained. All patients got a complete clinical examination, a USG of the affected wrist with comparison to the other side, and an X-ray (PA & Lateral) of the affected wrist

Results: A wide range of pathologies, including anomalies of the local bones, joints, and soft-tissue structures including tendons, can cause the clinical manifestation of wrist pain. US can help identify the precise source of wrist pain.

Conclusion: For a case of wrist pain, a USG examination can be performed as the initial line of inquiry because it is affordable, real-time, and enables comparison with the contralateral side.

Keywords: Joint pain; clinic-radiological correlation; x-ray; ultrasound; wrist pain.

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INTRODUCTION

Ultrasonography (USG) is an imaging technique that makes use of sound waves that are higher in frequency than those that humans can typically perceive. The frequency range of audible noises is between 30 Hertz (Hz) and 20 KHz (Kilo Hertz).[1-3] Images are created when pulses of ultrasound from the transducer create echoes at tissue or organ borders because ultrasound travels as a longitudinal wave. The frequency range for diagnostic ultrasonic applications is between 1 MHz and 30 MHz (Mega Hertz). Clinical musculoskeletal (MSK) ultrasound requires the highest frequency possible while yet enabling good tissue visualisation. Greater spatial detail or higher resolution are related to higher frequencies.[4-6]

After the Titanic sank in 1912, ultrasound was first used in the maritime industry. Initially employed to locate icebergs, this "echolocation" technology later developed during World Wars I and II to locate submarines.[7] In 1942, the first ultrasound for medical purposes was performed in an effort to identify brain tumours. Obstetrics, gynaecology, cancer, and cardiology all saw an increase in the diagnostic utility of ultrasound technology. In 1958, the musculoskeletal system began using ultrasound to describe the articular and periarticular components, including bones, muscles, tendons, cartilage, and joints.[8,9]

Even though the structure of the hand and wrist is intricate and there are a wide variety of pathologic diseases, many disease processes are localised, and the clinical question is frequently narrow and specific.[10] As a result, ultrasound has traditionally been a desirable imaging technique for the assessment of hand and wrist issues. Unfortunately, inherent challenges in the capture and interpretation of ultrasound images have hindered the adoption of hand and wrist sonography. However, recent advancements in signal processing and high-resolution transducers with frequencies between 3 and 17 MHz have significantly enhanced scanning flexibility and image quality. Because of this, hand and wrist sonography is becoming more and more popular and is replacing older techniques like radiography, computed tomography, magnetic resonance imaging, and arthrography.[11,12] Evaluation of tendon inflammation and rupture, evaluation of palpable masses or suspected occult masses, and evaluation of suspected foreign bodies are some specific scenarios in which ultrasonography gives undeniable benefits. Patients with CTS may also undergo analysis of the median nerve, which may potentially be important.[13] The current study's goals and objectives were evaluating a patient with wrist joint pain in terms of ultrasound as a primary imaging modality for wrist joint evaluation. To assess the diagnostic value of ultrasound versus X-rays for the diagnosis of non-traumatic wrist joint discomfort.

MATERIALS & METHODS

During the study period, all eligible cases that visited the orthopaedics OPD and/or were admitted to th SVS Hospital and Medical College in Mahabubnagar will be counted. It was a study of the descriptive variety. The study has 50 patients in it. The Department of Radiodiagnosis, SVS Hospital and Medical College, Mahabubnagar, was the site of the study. It was done between January 2020 to September 2022.

Method of collection of Data

The orthopedist examines every patient with wrist joint pain and refers them to the radiology department. A pre-informed written consent is obtained from the patient and is accompanied to a questionnaire that asks about their medical history, includes a general physical examination, and includes a thorough assessment of their wrist joints. Using the high-frequency linear array probe 4-18 MHz all scans will be performed on the Philips Affinity 70 USG machine. The imaging modality's results will also is entered.

Statistical Analysis: The data that were gathered for this study will be subjected to statistical analysis, during which the mean, standard deviation, and percentages will be taken into consideration.

Inclusion criteria:

- Ageabove25yrs.
- History of pain neither wrist joint

Exclusion criteria:

- Known cases of a cute trauma.
- Known cases of congenital abnormalities of the wrist.

RESULTS

The following results obtained while performing the study.

Table No 1: Age wise distribution of study subjects

Age(Years)	Frequency	Percent
25-34	27	54.0
35-44	10	20.0
45-54	10	20.0
≥55	03	06.0
Total	**50**	**100.0**

Descriptive statistical analysis based on number and percentage is done and present edintable1itreveals that the subjects were between 25-34 years, remaining subjects were between 35-44 years, few of subjects were between 45-54 years and rest 20% of the subjects were above 55 years of age.

Table No 2: Sex wise distribution of study subjects

Sex	Frequency	Percent
Male	25	50.0
Female	25	50.0
Total	50	100.0

Descriptivestatisticalanalysisofgenderdistributionisdonebasedonnumbersand percentages, and represented in [Table 2]. It shows both are equally distributed.

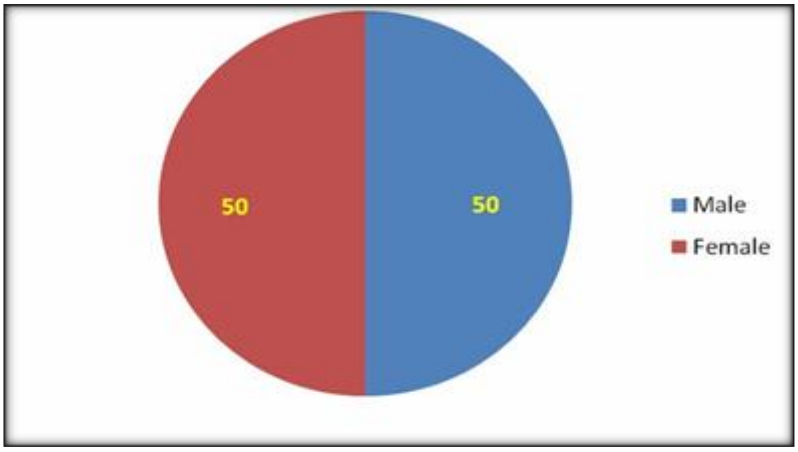

Figure No 1: Pie chart showing sex wise distribution of study subjects

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

Category	Frequency	Percent
Low	10	20.0
Medium	34	68.0
High	06	12.0
Total	50	100.0

Descriptive statistical analysis of socio economic status of study subject's is done based on numbers and percentages, and represented in [Table 3]. It shows 68% of subjects were from middle class, 20% of subject from lower class andtherest12%werefromhighclass.

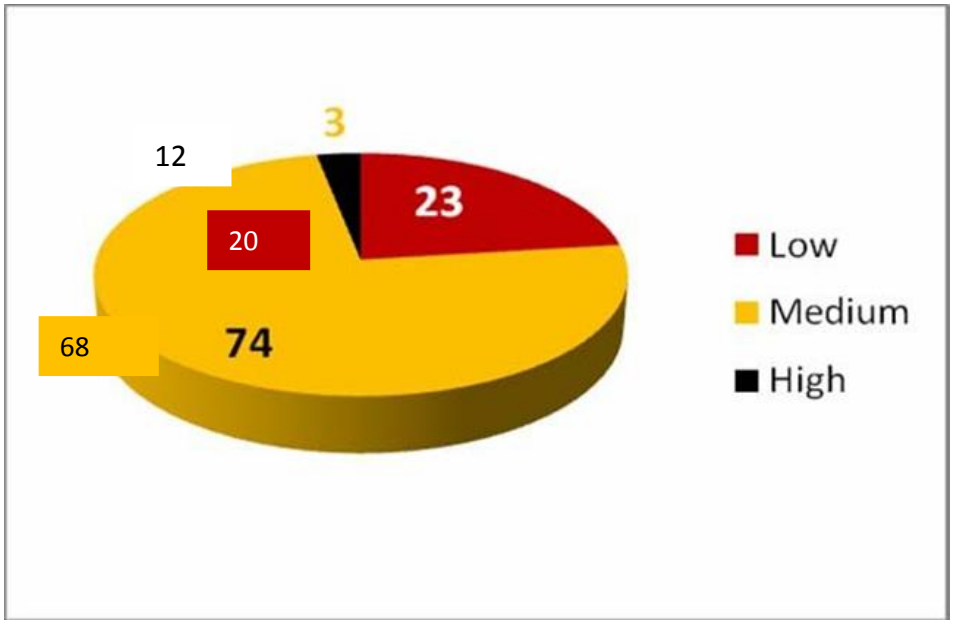

Figure No 2: Pie chart showing distribution of study subjects based on their socioeconomic status

Table No 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, and 4% of subjects having numbness of fingers and 2% were having restriction of movements of wrist. Major it of the subjects were having more than one symptom.

Table No 5: Distribution of study subjects based on duration of symptoms.

Duration(Days)	Frequency	Percent
1-20	11	22.0
21-40	13	26.0

41-60	16	32.0
61-80	10	20.0
Total	50	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 26% of subjects were having symptoms for the duration of 21-40days, 32% of subjects were having symptoms for duration of 41-60days, 22% of subjects having symptoms for duration of 1-20 days and the rest of 20% were having symptoms for duration of 61-80days.

Table No 6: Distribution of study subjects based on affected wrist

Limb	Frequency	Percent
Right	27	54.0
Left	23	46.0
Total	50	100.0

Descriptive statistical analysis of affected wrist based on number and percentages done in [Table 6], shows 54% of subjects with right wrist involvement and rest 46% to have left wrist involvement.

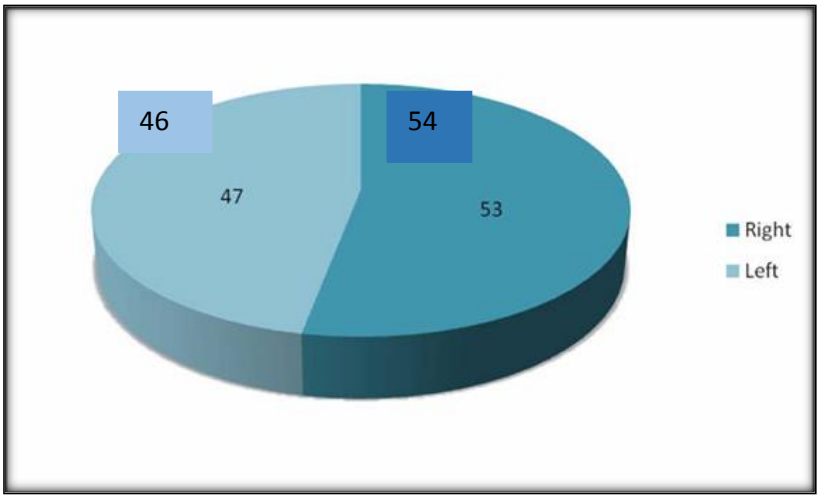

Figure No 3: Pie chart showing distribution of study subjects based on affected wrist

Table No 7: Past History

Morbidities	Frequency	Percent
Hypertension	39	78.0
Diabetes	11	12.0
Total	50	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 39 subjects had a history of hypertension and 11 subjects were known diabetics.

Table No 8: Clinical examination-Inspection

Observation	Frequency	Percent
Abnormal position	08	16.0

Swelling	32	64.0
Deformity	08	16.0
Sinus	02	04.0
Total	50	100.0

Descriptive statistical analysis of inspection findings of the study subjects based on numbers and percentages from [Table 8], reveal that 64% of subjects had swelling of the wrist, 16% had abnormal position of wrist and 16% had deformity of the wrist and 04% having sinus.

Table No 9: Clinical examination–Palpation

Observation	Frequency	Percent
Swelling	32	64.0
Deformity	08	16.0
Tenderness	10	20.0
Total	50	100.0

Descriptive statistical analysis of palpation findings of the study subjects based on numbers and percentages from [Table 9], reveal that 20% of subjects had tenderness of the wrist, 64% of subjects had swelling of the wrist and 16% had deformity of the wrist. Majority of the subjects were having more than one finding.

Table-10: Clinical examination – Movements of wrist joint.

Type	Frequency	Percent
A	1	2.0
B	37	74.0
C	0	0.0
D	12	24.0
Total	50	100.0

Descriptive statistical analysis of findings of movements of the wrist joint of study subjects based on numbers and percentages from [Table 10], reveal that 74% of subjects had type B movements, 24% of subjects had type D movements and rest 2% had type A movements.

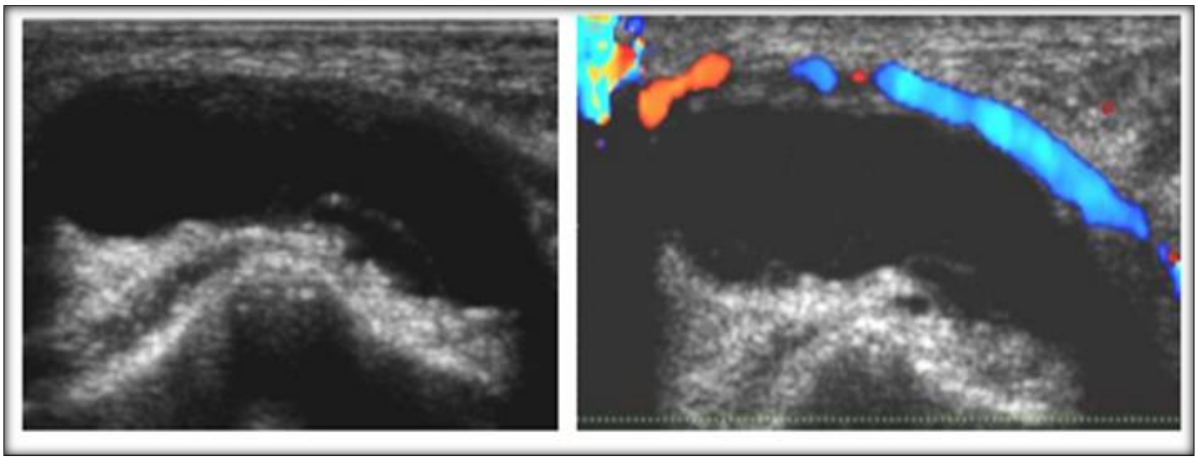

Figure No 4. Volar Ganglion cyst associated with radial artery

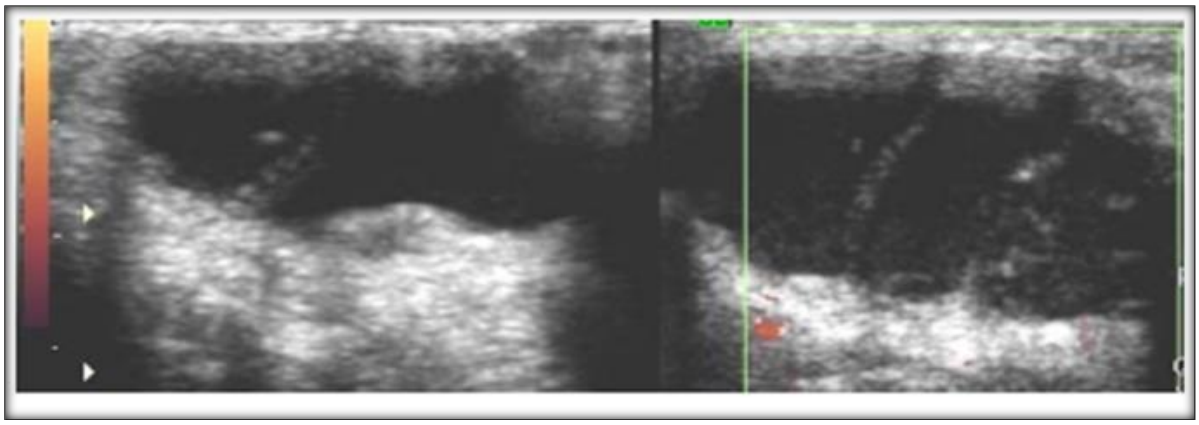

Figure No 5: Extensor Ganglion cyst with low level internal echoes and fewse ptations

Table No 11: X-ray findings

Findings	Frequency	Percent
Abnormal	5	10.0
Normal	45	90.0
Total	50	100.0

Descriptive statistical analysis of X -ray findings of study subjects based on numbers and percentages from [Table 11], reveal that 90% of subjects had normal findings and rest 10% had abnormal findings.

Table No 12: Ultrasound examination -Tendon

Findings		Frequency	Percent
Tenosynovitis	De Quatrain's	10	43.5
	Flexor	06	26.1
	Extensor	06	26.1
Tendontear		00	0.00
Tendonrupture		01	04.3

Descriptivestatisticalanalysisofultrasoundfindingstendonsofstudysubjectsbased on numbers and percentages from [Table 12], reveal that 23 subjects had abnormal findings, among which 10 subjects had De Quatrain's tenosynovitis, 6 subjects had flexor tenosynovitis, 6 subjects had extensor tenosynovitis and 1 subject had tendon rupture.

Table No 13: Ultrasound examination -Nerve involvement

Nerve	Frequency	Percent
Present	5	10.0
Absent	45	90.0
Total	50	100.0

Descriptive statistical analysis of ultrasound findings of nerve involvement of study subjects based on numbers and percentages from [Table 13], reveal that 95% of subjects had normal findings, and 10% of subjects had abnormal findings.

Table No 14: Ultrasound examination – Type of nerve involved

Nerve	Frequency	Percent
Median	07	14.0
Ulnar	43	86.0
Total	50	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 43 of the subjects had ulnar nerve involvement and 07 of the subjects had median nerve involvement.

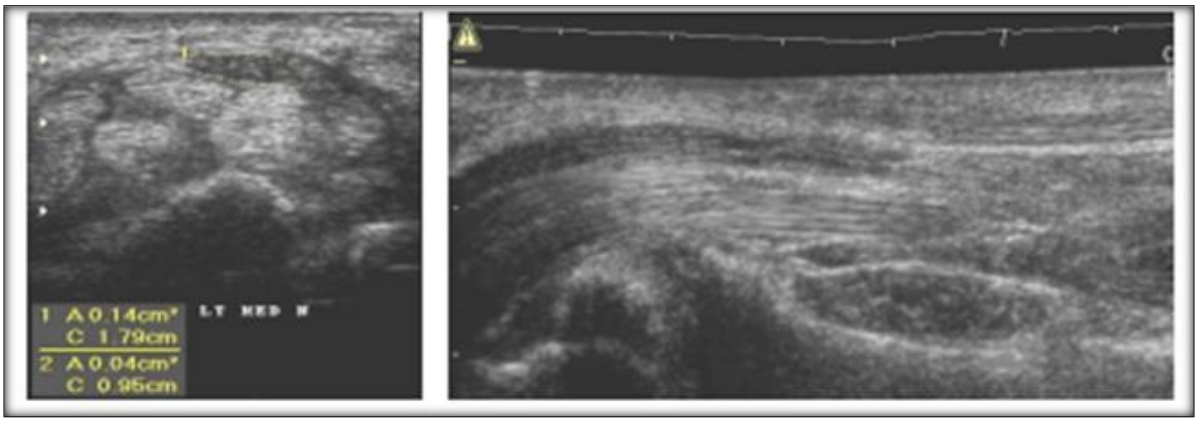

Figure No 6: Carpal tunnel syndrome

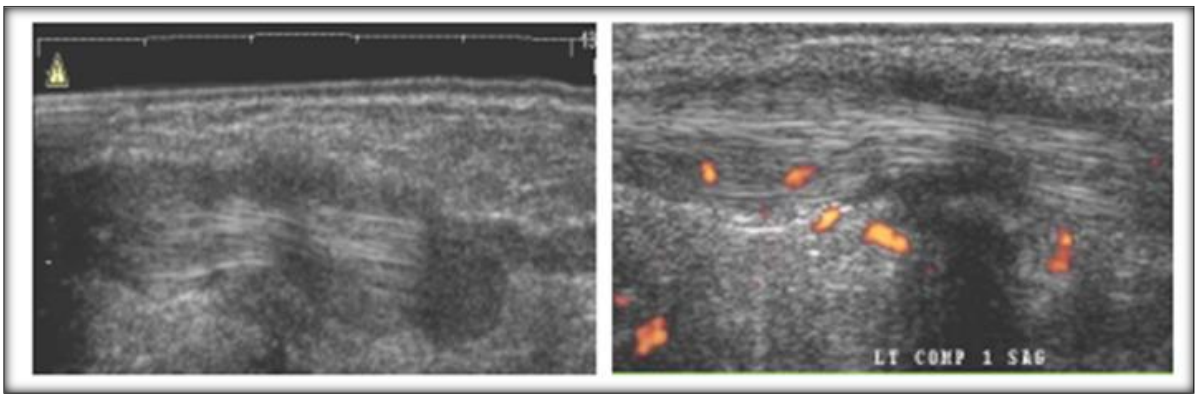

Figure 7: De Quervain's disease

Table No 15: Ultrasound examination- Vascular abnormality

Vascular abnormality	Frequency	Percent
Present	1	2.0
Absent	49	98.0
Total	50	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 15], reveals that 98% of subjects had no vascular pathologies and rest 2% of subjects had vascular pathology.

Table No 16: Ultrasound examination - Focal masses

Focal masses	Frequency	Percent

Cystic	Simple	32	64.0
	Infected	08	16.0
Solid		10	20.0
Total		50	100.0

Descriptive statistical analysis of ultrasound findings of focal masses of wrist joint of study subjects based on numbers and percentages from [Table 16], reveals that 80% of subjects had focal masses. Cystic focal masses were seen in 40 subjects (Simple-32 subjects and infected-08 subjects) and rest 20% of subjects had solid focal masses.

Table No 17: Ultrasound examination – Cystic mass affected aspect

Part	Frequency	Percent
Flexor	42	84.0
Extensor	08	16.0
Total	50	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 [Table17], reveals that 42 subjects had flexor aspect involvement and 8 subjects had extensor aspect involvement.

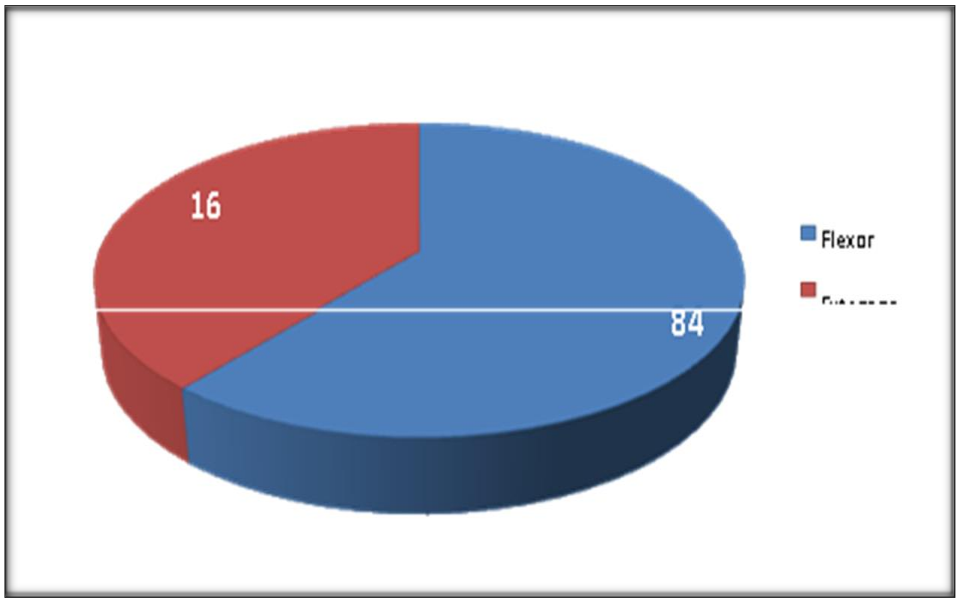

Figure No 8: Pie chart showing frequency of affected aspect of cystic focal masses

Table No 18: Ultrasound examination - Joint involvement.

Condition	Frequency	Percent
Abnormal	1	2.0
Normal	49	98.0
Total	50	100.0

Descriptive statistical analysis of ultrasound findings of affected wrist joint of study subjects based on numbers and percentages from [Table 18], reveals 98% of subjects had no joint involvement and the rest 2% of subjects had joint involvement.

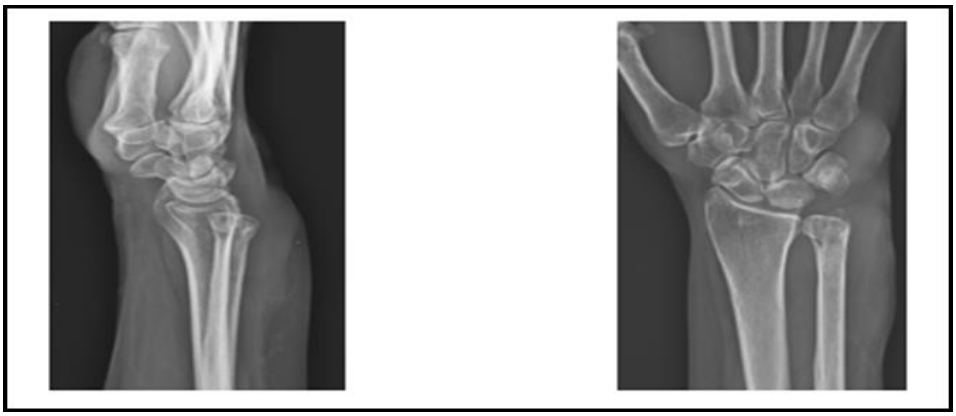

Figure No 9: Extensor tenosynovitis

DISCUSSION

50 patients with wrist pain who were referred from the orthopaedics department participated in our investigation of the clinic-radiological association of wrist pain. The affected wrist of these individuals was subjected to X-ray imaging, which was followed by USG imaging with comparison of the unaffected wrist. The need for radiological diagnosis has increased since clinical examinations cannot reliably diagnose the underlying condition.[14,15] The wrist joint's role for X-rays is restricted to bone lesions, and its diagnostic precision is also constrained in non-traumatic circumstances. In order to accurately diagnose tendon diseases, high resolution USG imaging of the wrist is highly sensitive, specific, and sensitive. In addition to being free of ionizing radiation, affordable, non-invasive, and easily accessible, it also makes comparison with the opposing side simple. The disadvantage of USG is that it is operator-dependent and has a challenging learning curve for radiologists due to the intricate anatomy and length of the examination. Knowledge of the procedure's artefacts as well as excellent USG anatomical knowledge and experience are essential.[16] While comparing the overall performance of the HRUS and MRI, it is observed that HRUS is equal or nearly equal to MRI (67.5%) in the diagnosis of wrist pathologies. This equality between these two modalities was observed mainly in no osseous disorders. MRI was superior to HRUS in 30% patients with bone and bony pathologies. In a small proportion of 2.5% cases, HRUS was found to be superior to MRI namely in synovial hypertrophy. Our findings are in congruence with El-Deek et al. and one son et al. who emphasized the role of MRI in the diagnosis of osseous and intra-articular pathologies.[17-19] Therefore, USG can be utilised to rule out tendon diseases as the initial line of inquiry in cases of non-traumatic wrist joint pain. There were many patients that were younger than 34. Given that both genders were evenly dispersed, there was no discernible change in the gender distribution, as indicated in [Table No 2]. The socioeconomic standing of the research participants is displayed in [Table No 3]. Middle class made up the majority of the subjects. Only 3% of the subjects were from the upper class, and the majority of the subjects were from lower class. [Table No 4] provides an overview of the primary presenting complaints and symptoms. Pain and swelling in the wrist joint were the predominant symptoms. More than one symptom was present in the majority of individuals. Only 4 participants and 2 subjects, respectively, complained of numbness in the concerned hand's fingers and wrist movement limitations. For the infective group, the accuracy of HRUS in our study was 90% similar to that reported by Bortolotto et al. In the noninfective (inflammatory) group primarily represented by rheumatoid arthritis, HRUS had an accuracy of 85% in our study. Our results are consistent with Hoving et al. Hetta et al. and El-Sayed et al.[20,21] The distribution of how long each subject's symptoms lasted is shown in [Table No 5] of the study. Over the course of 21–40 days, many of the individuals had

symptoms. There were 26 participants who experienced symptoms for between 41 and 60 days, 21 subjects for between 1 and 20 days, and 20 subjects for between 61 and 80 days. It was determined that there was no relevance in the distribution of symptom duration. The study subjects' afflicted wrists are distributed as shown in [Table No 6] of the study. There is not much relevance to the right wrist being somewhat higher than the left. There is not much significance in the past [Table No 7). Seven patients had diabetes mellitus, and nine patients had hypertension, according to the reports. [Tables 8, 9, and 10] include a summary of the clinical evaluation of the research patients. El-Deek et al. reported the almost equal detection rates of HRUS and MRI for effusion, synovial findings, tendon pathologies, ganglion cysts and carpel tunnel syndrome consistent with our results. Robinson and Stevic et al. mentioned the role of HRUS in the detection of tendon pathologies. For the assessment of thickening of the carpal tunnel, ultrasonography is an excellent imaging modality as mentioned by Ulasli et al. Singh et al. in their study revealed a high correlation of HRUS with MRI in the diagnosis of ganglion cysts, vascular malformations, tendinopathy, and tenosynovitis, similar to that seen in our study; however, with poor accuracy for ligamentous pathologies.[22-24] The inspection findings' distribution among the study individuals is shown in [Table 8]. The wrist joint was swollen in most of the individuals. There was a malformation and abnormal posture of the wrist. The distribution of wrist movement findings in the study subjects is displayed in [Table 10]. Most of the patients had type B motions, or minor discomfort without mobility restriction. Mobility restrictions of type D are then experienced. One of the patients was able to move freely and without pain. Without constraint, type C movements were painless. Only 5% of individuals reported aberrant X-ray findings, according to [Table 11's] analysis of the results of the subjects' X-ray exams.

CONCLUSION

The clinical examination of the wrist joint does not provide sufficient insight into the source of wrist pain. Tendon diseases, such as tenosynovitis, generally known as De Quervain's disease, are the most prevalent cause of wrist pain. Focal cystic masses, which can be simple or infectious, are the second most common cause of wrist discomfort. When it comes to the diagnosis of non-traumatic wrist joint pain, ultrasound imaging is generally regarded as being superior to X-rays. Because it is non-invasive, cost effective, portable, and easy to access, USG can effectively serve as a primary diagnostic approach and screening of all problematic wrist joints if it is conducted correctly, despite the fact that this is dependent on the individual performing the test.

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