

10 original article:

ROLE OF ULTRASONOGRAPHY IN WRIST PATHOLOGY –original article.

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ABSTRACT :

Objective:

The aim of this study is to demonstrate USG findings of various wrist pathologies. **Material and Method:** During the period of September- 2015 to January 2017 a prospective study of eighty patients was carried out with relevant clinical history, examination and laboratory investigations. High resolution ultrasound was carried out on GE logiq P5 with 7.5 MHz linear and 3.5MHz curvilinear probe with adequate standoff mound of gel to allow optimal visualization of most superficial structures. Bilateral wrists, second to fifth metacarpophalangeal joints and proximal interphalangeal joints were examined in axial and sagittal planes, keeping the joint in neutral position. Power Doppler mode was also used to evaluate vascularity of hypertrophied synovium or thickened tendon sheath and to differentiate it from fluid (effusion). **Results:**

Our study included patients from age group 21-60 years. Mean age of our study group was 40.6 years, total 60 females and 20 male patients. Out of 80 patients, 56(70%) consisted of patients with ganglion cyst, 10(12.5%) were of rheumatoid arthritis, 8(10%) were of tenosynovitis, 4(5%) were of tendon tear and 2(2.5%) was of carpal tunnel syndrome. Synovial hypertrophy was seen as abnormal hypoechoic intraarticular tissue that may show Doppler signal. Synovial effusion was seen as abnormal anechoic intraarticular area that does not show Doppler signal. It was found in 2/10 (20%) patients of RA, 3/4 (75%) patients of tenosynovitis, 4/4(100%) patients of tendon tears. Vascularity (on power Doppler) of the

thickened synovial tendon sheath was found in 12/56 (21%) patients of ganglion cyst, 4/10 (40%) patients of rheumatoid arthritis, 6/8(75%) of tenosynovitis.**CONCLUSION:** USG provides a cheap and cost effective alternative to costlier modalities like MRI. Its real-time imaging ability is a major advantage while evaluating tendons of the hand. Thus, ultrasound has multidimensional role in various wrist pathologies such as ganglion cyst, rheumatoid arthritis, tenosynovitis, tendon tears and carpal tunnel syndromes.

Key words:

Ultrasonography (USG), RA- rheumatoid arthritis, Wrist, Ganglion

INTRODUCTION:

Advances in transducer technology have led to the development of very high frequency probes that allow imaging of superficial structures with excellent details. The major advantages of USG wrist is fine spatial resolution, speed of examination and real time dynamic assessment, lack of radiation, portability and low cost ⁽¹⁾. So despite dramatic advances in imaging in form of CT scan and MRI, USG provides economic, non invasive imaging of tissues in static as well as dynamic states and in serial studies where indicated.⁽¹⁾

In addition synovial and cartilage thickness can be accurately quantitated providing an objective means following the patients with inflammatory arthritis. Joint effusion, loose bodies, tendinitis and tendon and muscle ruptures can all be demonstrated sonographically.⁽²⁾

AIMS AND OBJECTIVES

1. To subject wrist lesions suspected clinically or detected by radiography, to ultrasound.

2. To study the ultrasound characteristics of wrist lesions of muscles, tendons, joints and their internal architecture and bones.
3. To study the incidence of age and sex with various wrist pathologies.
4. To highlight sensitivity and specificity of ultrasound in detection and characterisation of wrist disorders in comparison with other modalities.

METHODS AND MATERIALS:

During the period of September- 2015 to January 2017 a prospective study of eighty patients was carried out.

- Each patient was studied in detail with relevant clinical history, examination and laboratory investigations. High resolution ultrasound was carried out on a GE logiq P5 with 7.5 MHz linear and 3.5MHz curvilinear probe) with adequate standoff mound of gel to allow optimal visualization of most superficial structures. Bilateral wrists, second to fifth metacarpophalangeal joints and proximal interphalangeal joints were examined in axial and sagittal planes, keeping the joint in neutral position.
- Ultrasound findings such as synovial hypertrophy (pannus), peri tendinous fluid, integrity of the tendon, synovial effusion, bone erosions, tendon sheath thickening or fluid were recorded.
- Power Doppler mode was also used to evaluate vascularity of hypertrophied synovium or thickened tendon sheath and to differentiate it from fluid (effusion).

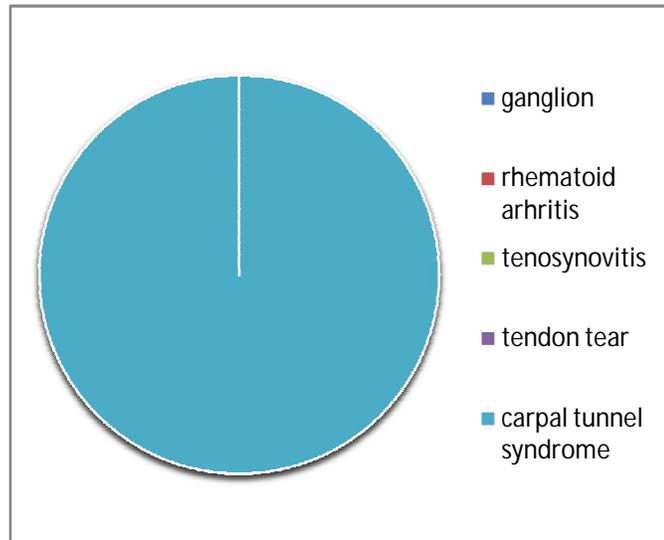
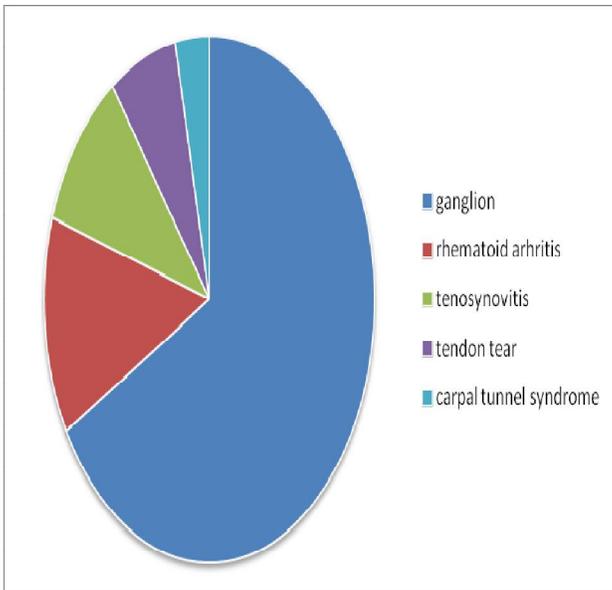
RESULTS

TABLE 1

Distribution of cases according to sex (n=80)

Female (n=60)

male (n=20)



- The study group consisted of 60 females and 20 male patients.
- Out of 80 patients, 56(70%) (40 female, 16 male) consisted of patients with ganglion cyst, 10(12.5%) (8 female, 2 male) were of rheumatoid artheritis, 8(10%) (6 female, 2 male) were of tenosynovitis, 4(5%) (4 female) were of tendon tear and 2(2.5%) (2 female) were of carpal tunnel syndrome.

TABLE 2

Distribution of cases according to age (n=80)

AGE	GANGLION	RA	TENOSYNOVITIS	TENDON TEAR	CARPAL TUNNEL
In years	Number of patients				
21-30	10	4	2	0	0
31-40	22	2	2	4	0
41-50	14	4	2	0	0
51-60	10	0	2	0	2
TOTAL	56	10	8	4	2

- Our study included patients from age group 21-60 years.
- Mean age of our study group was 40.6 years

TABLE 3

Distribution of cases according to clinical symptoms (n=80)

Clinical symptom	GANGLION	RA	TENOSYNOVITIS	TENDON TEAR	CARPAL TUNNEL
	Number of patients				
PAIN	6	5	8	4	2
SOFT TISSUE	28	1	2	0	0

SWELLING					
JOINT SWELLING	0	3	0	0	0
MOVEMENT DIFFICULTY	0	2	8	4	2
MORNING STIFFNESS	0	1	0	0	0

- Most patients presented with more than one symptom.
- Most common symptom in ganglion was soft tissue swelling.
- Joint pain or tenderness was the most common symptom seen in rheumatoid arthritis. Morning stiffness was predominantly seen in rheumatoid arthritis patients.
- Most common symptom in tenosynovitis, tendon tear and carpal tunnel syndrome were pain and difficulty in movement.

TABLE 4

Ultrasound findings of examined cases (n=80)

Diseases Ultrasound findings	GANGLION	RA	TENOSYNOVITIS	TENDON TEAR	CARPAL TUNNEL SYNDROME
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Synovial hypertrophy	0	9	0	0	0
Vascularity of synovium	0	8	0	0	0
Synovial effusion	0	2	6	4	0
Tendon sheath thickening	14	6	6	0	0

Vascularity in thickened sheath	12	4	6	0	0
Enlargement of median nerve	0	0	0	0	2
Peritendinous collection	6	1	6	4	0
Anechoic cyst	25	0	0	0	0

- Ganglions most commonly presented with anechoic cystic lesion- seen in 25/56 patients, 14/56 patients show tendon sheath thickening and 12/56 patients show vascularity in tendon sheath and 6/56 patients show peritendinous collection.
- Synovial hypertrophy was seen as abnormal hypo echoic intraarticular tissue that may show Doppler signal. It was found in 9/10 patients of RA. Power Doppler showed vascularity of hypertrophied synovium in 8/10 patients of RA.
- Synovial effusion was seen as abnormal anechoic intraarticular area that does not show Doppler signal. It was found in 2/10 patients of RA. 6/8 patients of tenosynovitis, 4/4 patients of tendon tears.
- Carpal tunnel syndrome presents with enlarged median nerve as compared to contra lateral wrist.

DISCUSSION:

USG is the modality for the examination of the soft tissues because of its multiplanar and real time imaging facilities. Information can be gained during active and passive mobilisation which can't be gained by other modalities. The non invasive nature of the examination and lack of ionising radiation make it very well accepted by patients as well as radiologists. Brief discussion of common wrist pathologies is as below:

(1) Ganglion

Ganglion cysts are very common lumps within the hand and wrist that occur adjacent to joints or tendons. ^(3, 4, 5) The most common locations are the top of the wrist, the palmer side of the wrist, the base of the finger on the palm side, and the top of the end joint of the finger. Though nowadays MRI has been used to characterize such lesions, but a recent study has shown that sonography can also be used not only for distinguishing solid from cystic lesions but also for specifically diagnosing ganglia. Classically ganglia seen as a well-defined, cystic lesions with posterior acoustic enhancement, implying that most are "simple cysts" ^(4, 5) but all cysts don't follow these criteria. The strength of sonography lies in its ability to differentiate a solid mass from a cyst; this is critical because the differential diagnosis for a solid mass typically includes malignant tumours. The treatment for a ganglion differs from a benign neoplasm and synovitis. Majority of ganglia are completely avascular on colour Doppler sonography, few complex cystic ganglia may show colour Doppler flow, likely due to superimposed inflammation.

(2) Rheumatoid arthritis:

Rheumatoid arthritis is a chronic progressive systemic disease, characterized by synovial inflammation, leading to cartilage damage and bone destruction ^(8, 9). USG is a method of choice for directly visualizing the articular and periarticular pathology in rheumatoid arthritis, and it can also detect the early inflammatory changes, such as synovitis and bone erosions. It can also be used as a good indicator for disease activity, especially with power Doppler USG, to diagnose subclinical cases of arthritis and evaluate response to therapy ^(4, 8). Findings on USG include bone erosions, tenosynovitis with tendon thickening and increased color Doppler flow in the thickened tendon sheath and joint effusion with hypertrophic synovium⁽⁹⁾.

(3) Tendon tears:

The annular pulleys can be accessed directly by USG, increased tendon-phalanx distance and the consequent bowstringing of the tendon helps in diagnosis. This is measured at the level of the A2 and A4 pulleys, at rest and on flexion against resistance^(4,11). The normal distance at the A2 pulley is < 1mm and at the A4 pulley is < 2.5 mm. For A2 pulley, distance of > 1mm, < 3mm is considered a sign of incomplete and >3 mm is a sign of complete rupture. A tendon-phalanx distance of > 5 mm is a sign of A2 and A3 pulley rupture. For the A4 pulley, a distance of > 2.5 mm is a sign of complete rupture⁽¹³⁾.

(4) Tendon disorders:

Tendon disorders usually associated with athletic and occupational activities leading to overuse. Major advantage is their superficial location, so can be easily assessed.

Tendinitis is mostly associated with activities which lead to repeated microtrauma. Acute tendinitis shows the thickened tendon with ill-defined margins and decreased echogenicity.

Tenosynovitis is an inflammation of the tendon sheath⁽³⁾ and can be caused by trauma, pyogenic infection or rheumatoid arthritis^(4,5,6). USG reveals fluid in the tendon sheath. This is seen as an anechoic halo around the tendon on axial images. During USG, percussion of the tendon sheath can be used to differentiate between fluid and inflamed synovium. Hypoechoic synovial sheath thickening is seen in chronic tenosynovitis.

(5) Carpal tunnel syndrome :

Carpal tunnel syndrome arises from compression of the median nerve at the wrist. This is mostly seen in female and can be due to pregnancy, hypothyroidism, space occupying lesions, diabetes, and anatomic variants like narrow tunnel and abnormal / accessory muscles or vessels. In later cases the nerve becomes swollen and exhibits changes in shape and echo pattern The nerve appears bulky at the proximally and flattened at the distal aspect. A cross-sectional area of > 10 mm of the median nerve, is considered diagnostic at the proximal tunnel level.^(2,4)

(6) Other pathologies identified by ultrasonography:

- Nerve injury
- wrist effusion and/or synovial thickening (inflammatory/traumatic/septic)
- intersection syndrome
- scapholunate ligament injury
- TFCC injury

- aneurysm/pseudoaneurysm
- neuromas

CONCLUSION:

USG provides a cheap and cost effective alternative to costlier modalities like MRI. Its real-time imaging ability is a major advantage while evaluating tendons of the hand. Thus, ultrasound has multidimensional role in various wrist pathologies such as ganglion cyst, rheumatoid arthritis, tenosynovitis, tendon tears and carpal tunnel syndromes.

IMAGES

IMAGE 1: A well defined anechoic cystic lesion noted along dorsal aspect on radial side of right wrist, s/o ganglion cyst.

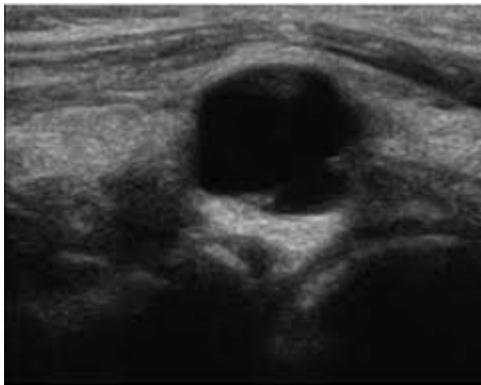


IMAGE 2: In a known case of RA, left wrist shows thickened synovium with increased vascularity on power Doppler study, s/o synovitis .

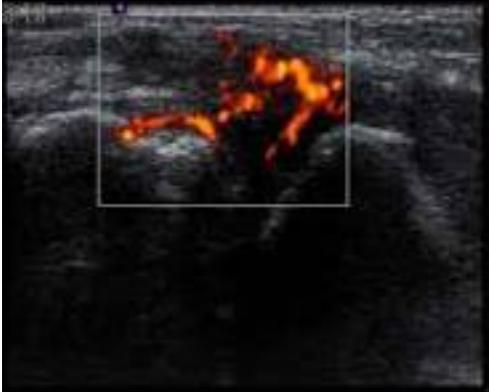


IMAGE 3: In a case of trauma flexor group of muscle show bulky tendon with discontinuity of fibres, s/o tear.

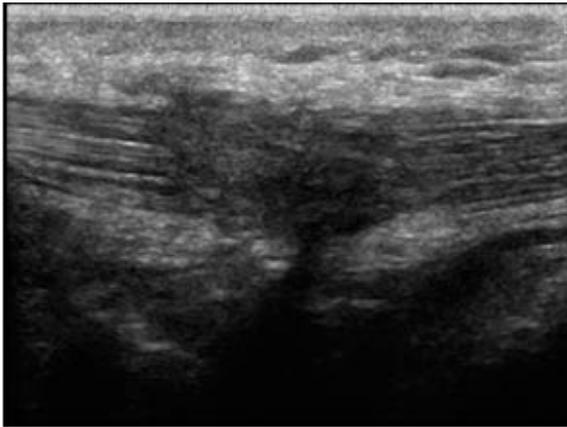


IMAGE 4: On dorsal aspect of left wrist, usg shows bulky tendon with peripheral hallow of fluid, s/o tenosynovitis

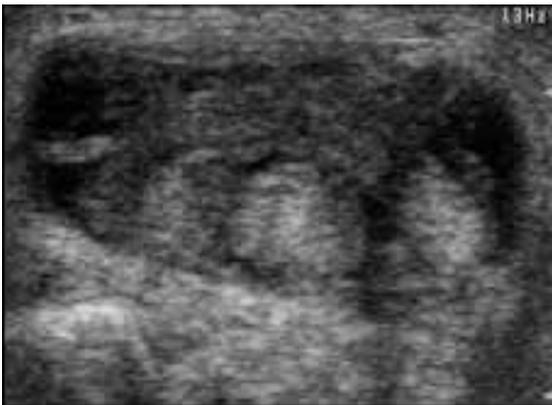
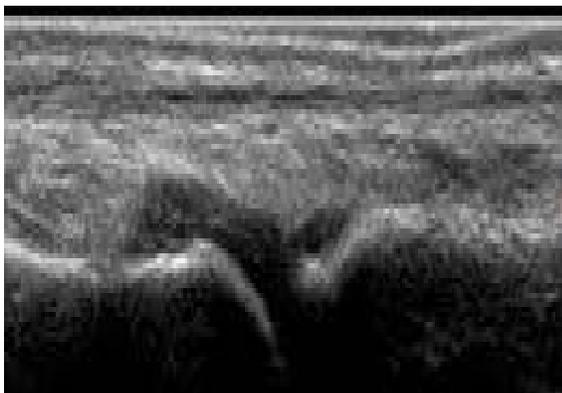


IMAGE 5: in female hypothyroid patient, shows bulky median nerve with CSA 10 mm s/o carpal tunnel syndrome



IMAGE 6: fluid noted in carpo-metacarpal joint on right side, s/o synovial effusion .



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