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ROLE OF HIGH RESOLUTION ULTRASONOGRAPHY AND COLOUR DOPPLER IN THE EVALUATION OF INFLAMMATORY ARTHROPATHY OF PERIPHERAL JOINTS WITH MRI CORRELATION

Rheumatology

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ABSTRACT

OBJECTIVE: The study was undertaken to assess the diagnostic value of High Resolution Ultrasound with Colour Doppler in the evaluation of inflammatory features of inflammatory arthropathy with MRI as reference method.

METHODS: It was a prospective study conducted on 40 diagnosed patients of inflammatory arthritis;30 RA , 7 gout, 1 SLE and 2 spondyloarthropathy patients. 40 joints were examined for various inflammatory features of inflammatory arthropathy with USG and ColourDoppler and the findings were compared with those of contrast enhanced MRI.

RESULTS: With MRI as reference method, grey scale USG showed sensitivity, specificity and accuracy of 94.1%, 16.6% and 82.5% respectively with poor agreement with MRI(kappa=0.13) for synovitis. On addition of Colour Doppler, the corresponding values were 79%, 83.3% and 77.5% respectively with moderate agreement with MRI. For detection of tenosynovitis, HRUS with Colour Doppler showed sensitivity, specificity and accuracy of 71.4%, 89.4% and 80.0% respectively with moderate level of agreement with MRI (kappa=0.60). A sensitivity, specificity and accuracy of 72.7%, 100.0% and 85.0% respectively were noted for detection of joint effusion with good agreement with MRI (kappa=0.70).

CONCLUSION: Although MRI is considered a reference imaging method for inflammatory arthritis, HRUS with Colour Doppler also shows good results for detection of inflammatory features of inflammatory arthropathy and could be a reasonably efficacious alternative to MRI.

KEYWORDS

Inflammatory arthritis, Rheumatoid arthritis, Ultrasonography, Colour Doppler, Magnatic resonance imaging

INTRODUCTION

Traditionally radiographs have been the mainstay for imaging patients with inflammatory arthritis; findings such as soft-tissue swelling, justarticular osteopenia, joint space reduction, joint subluxation, and marginal erosions are all features that may be seen. However, information regarding the synovium is difficult to assess on radiographs. With the increasing use of disease-modifying antirheumatic drugs, early diagnosis is now of supreme importance and disease progression is assessed regularly to monitor efficacy of the treatment. The introduction of these new treatment regimens has placed increased importance on imaging, particularly on the identification of early changes. Studies have suggested that early aggressive treatment may alter the disease course, and close monitoring for signs of persistent synovitis and treatment failure is required. Thus, sensitive and specific methods are urgently needed for the detection of early changes in inflammatory arthritis patients. In addition, new imaging techniques may help to demonstrate a reduction of joint destruction earlier than conventional radiography, which is of great importance in assessing new forms of treatment[1].

Imaging procedures such as 3-phase bone scintigraphy, ultrasound, and magnetic resonance imaging (MRI) are possible alternatives to conventional radiography in the diagnosis of early changes in arthritis. MRI has been shown to be helpful in the diagnosis of early changes in inflammatory arthritis, both with regard to inflammatory aspects and destructive joint processes[2-6].Ultrasound has become an important tool in the diagnosis of joint diseases as it allows assessment of soft tissue structures and superficial bone lesions. In contrast to conventional radiography, ultrasound allows the characterization of early inflammatory changes, especially synovitis and tenosynovitis. It is an inexpensive method that is available at the bedside. However, an experienced examiner is needed to perform the examination and evaluate the findings. The main advantages of this technique include lack of radiation exposure, multiplanar imaging capability, cost efficiency and dynamic real-time investigation. Also color Doppler and power Doppler US which depict vascular signs of synovitis are useful in assessing synovial inflammation. This is important because in the early stages of inflammatory arthritis synovium is affected and synovitis seems to be a predictive marker of future joint damage[7,8].

The present study was conducted to evaluate the efficacy of USG with Colour Doppler in detecting various inflammatory features of inflammatory arthritis with MRI as reference method. In recent years, magnetic resonance imaging (MRI) has been studied extensively in patients with rheumatoid arthritis(RA), and its value has been confirmed both in studies of large joints and in finger joints compared with histological evaluation of biopsy specimens acquired at microarthroscopy[9]. Because of the expensive equipment required, it has not been used widely as a joint assessment tool in RA. However, its benefits of high sensitivity and specificity in the evaluation of RA joints make it a worthy surrogate 'gold standard' in settings where acquiring histological specimens is difficult.

MATERIALS AND METHODS

The study was conducted in the Department of Radiodiagnosis in collaboration with Rheumatology Unit of Department of Internal Medicine at Sher-i-Kashmir Institute of Medical Sciences, Srinagar. In all cases informed consent was taken from the patient before entering the study.The study was approved by institutional ethics committee. It was a prospective study carried out on 40 patients with inflammatory arthropathy from August 2014 to May 2016 after clinical and biochemical evaluation.

Patients with grossly deformed joints, with history of trauma or surgery of the involved joint, patients in whom MRI is otherwise contraindicated (e.g. metallic prosthesis, non-MR compatible pacemakers), pregnant females were excluded from the study.

Detailed clinical history of the patients was recorded followed by general physical and local examination of joint. Baseline investigations like CBC with ESR, CRP, Anti-ccp, rheumatoid factor, uric acid and X-Ray of the joint were done. A high resolution ultrasound examination along with Colour Doppler of an index joint was done. All patients were followed with MRI of the joint, and the MRI findings recorded and correlated with ultrasonography findings.

ULTRASOUND IMAGING:
The ultrasound was performed using Siemens Aloka PROSOUND SSD-3500SX machine equipped with a phased array linear 7 - 11 MHz transducer. The Ultrasound examination of various joints was done as per the guidelines of EULAR's Working Group For Musculoskeletal Ultrasound in Rheumatology[10]. All US examinations were scored according to the presence or absence of US pathology, using the Outcome Measures in Rheumatoid Arthritis Clinical Trials (OMERACT) definitions[11]. For Colour Doppler, the velocity filter of the US unit was set for measurement of low-velocity flow. The color gain was set at the level where noise artifacts appeared, and then was gradually reduced until only a flow signal was left, if present. Wherever possible, the flow was confirmed with spectral waveform. Joint effusion was defined as a compressible anechoic intracapsular area. Synovitis was defined as a hypoechoic synovial thickening (non-compressible hypoechoic intracapsular area) showing presence of doppler signal on Colour Doppler. For tenosynovitis, the presence of hypoechoic thickening of the synovial sheath of tendon with hyperemia on Doppler imaging was considered diagnostic[12]. A small amount of fluid may be associated with tenosynovitis. The joint with maximal swelling or tenderness was chosen for the examination and in those patients with no active complaints wrist joint was chosen for examination due to its easy accessibility. The visualized changes were documented on hard-copy films during the US examinations. For wrist joint, volar transverse scan, volar longitudinal scan, dorsal transverse scan (radial and ulnar) and dorsal longitudinal scan (radial, median and ulnar) were performed. For knee joint, suprapatellar longitudinal scan, suprapatellar transverse scan in 30 degree flexion, infrapatellar longitudinal scan and transverse scan, medial and lateral longitudinal scan, posterior medial and posterior lateral longitudinal scan and posterior transverse scan were performed. For ankle joint anterior longitudinal and transverse scan, perimalleolar medial longitudinal, medial transverse, lateral longitudinal and lateral transverse scan and posterior longitudinal and transverse scan were performed.

MRI IMAGING:
All MRI examinations were performed with a 1.5-T MR system (MAGNETOM Avanto, Siemens). T1 weighted fast spin echo (TR/TE=500-700/10-20 ms, Slice thickness=3 mm), T2 weighted fast spin echo (TR/TE=3000-4500/80-110 ms, Slice thickness=3 mm, Proton density fast spin echo (TR/TE=3000-3500/22-36 ms, Slice thickness=3 mm), STIR sequence (TR/TE=3000-4000/30-50ms, IR=150-160 ms, Slice thickness=3 mm) and T1 weighted post contrast study (TR/TE=500-700/10-20 ms, slice thickness=3 mm) of the joint were taken. The Gd- DTPA was administered intravenously at a concentration of 0.1 mmoles/kg body weight. Joint pathologies, as determined on MRI, were defined in accordance with the OMERACT international recommendations[13] and marked as present or absent. The observer was blinded to the USG findings of the patients.

Synovitis was defined as an area in the synovial compartment that shows above-normal post-gadolinium enhancement of a thickness greater than the width of the normal synovium. For tenosynovitis, thickening of the synovial sheath with marked enhancement on fat-suppressed gadolinium-enhanced T1-weighted images was considered diagnostic. Joint effusion was defined as an intraarticular area, with water signal characteristics, that is not enhanced on post-gadolinium sequences and is surrounded by the synovial membrane.

STATISTICAL ANALYSES: The data obtained was compiled and subjected to analysis and a comparative evaluation of High Resolution USG with Colour Doppler and MRI was performed. Taking MRI as reference method, we calculated the sensitivity, specificity and accuracy of USG with Colour Doppler for synovitis, tenosynovitis, effusion and erosions.

Fisher exact test was used to assess the association between RF positivity and presence of synovitis on MRI. Students independent t test was used to assess the correlation between values of ESR and presence of synovitis on MRI and Wilcoxon Mann Whitney U test was used to assess the correlation between CRP level and synovitis on MRI.

We analysed our data with the help of Cohen's kappa test to assess the agreement between the two modalities, i.e., USG and MRI. The value of kappa lies between 0 and 1. Degree of agreement was categorized as follows: kappa values of 0.00-0.20 were considered to indicate poor agreement; kappa values of 0.21-0.40, fair agreement; kappa values of 0.41-0.60, moderate agreement; kappa values of 0.61-0.80, good agreement; and kappa values of 0.81-1.00, excellent agreement.

RESULTS AND OBSERVATIONS
Patient profile:There were 25 (62.5%) female patients and 15 (37.5%) male patients in our study.There were 2 patients (5.0%) in 0-20 year age group, 10 (25%) in 21-40 year age group, 19 (47.5%) in 41-60 year age group, 9 (22.5%) in 61-80 year age group.

Our study included 30 (75%) patients of rheumatoid arthritis (RA), 7 (17.5%) patients of gouty arthritis, 1 (2.5%) patient of systemic lupus erythematosus (SLE) and 2 (5.0%) patients of spondyloarthropathy (SpA). Among the 30 RA patients, 21 (70.0%) were positive for rheumatoid factor and 9 (30.0%) were negative. 20 (66.6%) of the 30 RA patients were also positive for anti-ccp and 10 (33.3%) were negative. Among the 21 RF positive patients, 4 (19.0%) had no evidence of synovitis on MRI; and among the 9 RF negative patients, 2 (22.2%) showed no evidence of synovitis on MRI. There was no statistically significant difference in the RF positive and RF negative patients with respect to presence of synovitis (p=1.00) as shown in table 1.

6. COMPARISON OF USG AND MRI FINDINGS:
1.Synovitis: Synovitis was detected on USG with Colour Doppler in 28 (70.0%) patients while MRI showed synovitis in 34 (85%) patients. USG showed 1 patient with synovitis not seen on MRI (false positive). USG showed no evidence of synovitis in 7 patients who showed synovitis on MRI (false negatives) as in table 2

Synovial thickening was detected in 37 (92.5%) of our patients on grey scale USG without addition of Colour Doppler and MRI showed synovitis in 34 (85%) of patients. Synovitis was seen in 2 of patients with no synovial thickening on USG (false negatives) and 5 patients showed synovial thickening on USG with no synovial enhancement (synovitis) on post contrast MRI (false positives) as shown in table 3.

2.Tenosynovitis: The tenosynovitis was seen in 17 (42.5%) patients on USG and 21 (52.5%) patients on MRI. 2 patients showed tenosynovitis on USG who were not detected on MRI (false positives). USG could not detect tenosynovitis in 6 patients who showed tenosynovitis on MRI (false negatives).

3.Joint effusion: The joint effusion was seen in 16 (40.0%) patients on USG and in 22 (55%) patients on MRI. No effusion was seen on USG in 6 patients who showed the same on MRI (false negatives). All 16 patients with effusion on USG also showed effusion on MRI (no false positive case).

Table 1: Association of RF positivity and presence of synovitis on MRI in RA patients:

		Synovitis-MRI		Total(n)
		Present (n)	Absent(n)	
RF	Positive (n)	17	4	21
	Negative (n)	7	2	9
Total (n)		**24**	**6**	**30**

p=1.00
RF: rheumatoid factor

Table 2: Comparison of Synovitis on HRUS with Colour Doppler and MRI.

		Synovitis-MRI		Total(n)
		Absent (n)	**Present (n)**	
Synovitis-USG	Absent (n)	5	7	12
	Present (n)	1	27	28
Total (n)		**6**	**34**	**40**

Table 3:Comparison of Synovial thickening on USG and synovitis on MRI.

		Synovitis-MRI		Total(n)
		Absent (n)	**Present(n)**	
Synovial Thickening-USG	Absent (n)	1	2	**3**
	Present (n)	5	32	**37**
Total (n)		**6**	**34**	**40**

Table 4: Comparison of tenosynovitis on USG and MRI.

		Tenosynovitis-MRI				Total (n)
		Absent (n)	Flexor (n)	Extensor (n)	BothFlexor&Extensor (n)	
Tenosynovitis-USG	Absent (n)	17	3	1	2	**23**
	Flexor (n)	1	10	0	1	**12**
	Extensor (n)	1	0	1	0	**2**
	Both Flexor & Extensor (n)	0	0	0	3	**3**
Total (n)		**19**	**13**	**2**	**6**	**40**

Table 5: Comparison of joint effusion on USG and MRI.

		Effusion-MRI		Total(n)
		Absent (n)	Present(n)	
Effusion-USG	Absent (n)	18	6	24
	Present (n)	0	16	16
Total (n)		18	22	40

Table 6: Sensitivity, specificity, accuracy and level of agreement of USG with Colour Doppler for various findings with MRI as reference method.

Finding	Sensitivity (%)	Specificity (%)	Accuracy (%)	Level of Agreement (kappa)
Synovial Thickening (Grey Scale USG)	94.10	16.60	82.50	0.13
Synovitis (Colour Doppler)	79.0	83.30	77.50	0.44
Tenosynovitis	71.40	89.40	80.0	0.60
Effusion	72.70	100.0	85.0	0.70

The sensitivity, specificity and accuracy of grey-scale USG without Colour Doppler for synovitis was 94.1%, 16.6% and 82.5% respectively with MRI as reference method and with kappa value of 0.13 suggestive of poor agreement.On addition of Colour Doppler, the sensitivity, specificity and accuracy for synovitis was 79.0%, 83.3% and 77.5% respectively with kappa value of 0.44 suggestive of moderate agreement.

The sensitivity, specificity and accuracy of USG with Colour Doppler for tenosynovitis with MRI as reference method was 71.4%, 89.4% and 80% respectively with kappa value of 0.60 suggestive of moderate agreement.

The corresponding values for effusion on USG with MRI as reference method were 72.7%, 100.0% and 85.0% with kappa value of 0.71 suggestive of good agreement.

DISCUSSION

The present study was conducted to evaluate the efficacy of USG with Colour Doppler in detecting various inflammatory features of inflammatory arthritis in comparison with MRI. In the present study, a qualitative estimate of inflammatory changes in the joints of 40 inflammatory arthritis patients was performed by USG and MRI. Inflammation on MRI is seen as an enhanced, thickened synovium. Enhancement is caused by an increased presence of gadolinium in the synovium, which is primarily caused by hyperemia as well as by increased vessel permeability. We used the MRI methods recommended by OMERACT[14].

Gray-scale US gives valuable information about accessible bone surfaces, tendons, and joints. This method can reveal synovial hypertrophy and synovial fluid[14], but inactive and active synovial hypertrophy cannot be distinguished. When Colour Doppler is added to the US technique, information about the vascularization of the synovium can be obtained, and it may help in depicting the areas of synovial inflammatory activity[40]. The presence of colour was interpreted as representing the active synovitis in this study.

The study included 30 (75%) patients with rheumatoid arthritis, 7 (17.5%) patients with gouty arthritis, 1 (2.5%) patient with systemic lupus erythematosus and 2 (5.0%) patients with spondyloarthropathy.

Among the 30 RA patients, 21 (70%) were positive for rheumatoid factor (RF) and 9 (30%) were negative. 20 (66.6%) of the RA patients were positive for Anti-ccp and 10 (33.3%) were negative. 2 (22.2%) patients had no evidence of synovitis out of 9 RF negative patients and 4 (19.0%) out of 21 RF positive patients showed no synovitis on MRI and there was no statistically significant difference between the two groups with regard to presence of synovitis (p=1.00) as also reported by C. Weidekamm et al[15].

The mean value of ESR in the 34 patients with synovitis on MRI was 36.91±12.60mm/hr and the mean value was 22.00±9.8mm/hr in those 6 patients with no synovitis on MRI. The median CRP level was 10mg/L with interquartile range of 8 in patients with synovitis and the median was 5mg/L with interquartile range of 2 in patients without synovitis on MRI. The difference in mean values between the two groups (with and without synovitis) for ESR and median values for CRP was statistically significant ($p \leq 0.05$). Similar results were also reported by E Noreddo et al[16] and K Elligaard et al[17].

DIAGNOSTIC VALUE OF HRUS WITH COLOUR DOPPLER WITH MRI AS REFERENCE METHOD

SYNOVITIS:

In our study, synovitis was detected on USG with Colour Doppler in 28 (70.0%) patients while MRI showed synovitis in 34 (85%) patients. USG showed 1 patient with synovitis in whom no synovitis was seen on MRI (false positive). USG showed no evidence of synovitis in 7 patients who showed synovitis on MRI (false negatives). The reason for high prevalence of synovitis in our study may be because of the reason that mostly patients were referred to us with clinically active disease.

With MRI as reference method, the sensitivity, specificity, and accuracy of USG for detection of synovitis was 79.0%, 83.3% and 77.5% respectively. Similar results were reported by M Szkudlarek et al[18] who found sensitivity, specificity, and accuracy of 87.0%, 74.0% and 79.0% respectively in their study on MTP joints of 40 rheumatoid arthritis and concluded that US enables detection and grading of destructive and inflammatory changes in RA patients. R J Wakefield et al[19] in their study reported synovitis in 48% joints on USG compared with 64% joints on MRI which is comparable to our results. Similar results were also reported by Marcio Navalho et al[20] who reported synovitis in 86% patients on MRI in early rheumatoid arthritis and in 63.3% patients on USG.

The value of kappa for synovitis was 0.44 suggestive of moderate agreement. Similar level of agreement was found by L Terslav et al[21] in their study on 29 patients using both USG and MRI. They concluded that estimates of synovial inflammatory activity by Colour Doppler and MRI were comparable and showed agreement for 75% of joints with kappa value 0.45 suggestive of moderate agreement. Charlotte Weill et al[22] also reported moderate absolute agreement for inflammatory pathologies between USG and MRI in their study on 20 patients and 5 control subjects.

The reason for the false positivity in our study may be because of lack of cut-off value for the amount of color flow which needs to be present for diagnosing synovitis. Even if a single flow signal was found in thickened synovium on Colour Doppler it was considered that inflammation is present. L. Terslev, S. Torp-Pedersen et al[21] in their study also found 11 false positive cases on Colour Doppler and they found that in 6 of those patients only minute amount of flow was detected on Colour Doppler, however, they could not account for the discrepancy in 5 other patients who showed definite hyperemia on Colour Doppler.

ROLE OF COLOUR DOPPLER

Grey scale USG showed synovial thickening in 37 (92.5%) patients without addition of Colour Doppler and MRI showed synovitis in 34 (85%) patients. Synovitis was seen in 2 patients on MRI in whom no synovial thickening was noted on USG (false negatives), and 5 patients showed synovial thickening on USG with no synovial enhancement (synovitis) on post contrast MRI (false positives). The sensitivity, specificity and accuracy of grey scale USG without addition of Colour Doppler was 94.1%, 16.6% and 82.5% respectively. The level of agreement was poor with value of kappa 0.13.

On addition of Colour Doppler, the sensitivity, specificity and accuracy of USG compared to MRI for detection of synovitis became 79.0%, 83.3% and 77.5% and level of agreement became moderate with value of kappa 0.44 as already discussed. There was significant improvement in specificity (83.3% vs 16.6%) on addition of Colour Doppler as well as in the level of agreement (kappa=0.44 vs 0.13). This signifies the value of Colour Doppler in assessing the inflammatory activity in joints of inflammatory arthritis patients. The probable reason is that simple presence of synovial thickening does not signify the presence of active synovitis and may represent fibrous inactive pannus. On the other hand, Colour Doppler and post contrast MRI measure the same thing, that is, the presence of vascularity within the inflamed synovium, thereby, having a better correlation.

TENOSYNOVITIS

Tendon disease which encompasses tenosynovitis, tendinopathy and tendon rupture is a well recognized consequence of RA with tenosynovitis being the primary event. Tendon disease is associated with the development of many RA related deformities. It is, therefore, essential that tendon disease be accurately assessed particularly in early disease.

In our study, tenosynovitis was seen in 17 (42.5%) patients on USG and 21 (52.5%) patients on MRI. 2 patients showed tenosynovitis on USG but were not detected on MRI (false positives). USG could not detect tenosynovitis in 6 patients who showed tenosynovitis on MRI (false negatives). The sensitivity, specificity and accuracy of USG with MRI as reference method for tenosynovitis was 71.4%, 89.4% and 80.0% respectively.

The reason for the false positivity in case of tenosynovitis may be because of lack of cut-off value of flow on Colour Doppler as is the case with synovitis and even minute amount of flow was considered to represent active inflammation.The level of agreement for tenosynovitis between USG with Colour Doppler and MRI was moderate with kappa value 0.60.

M Backaus et al[23] in a larger study on hand joints of 60 patients reported almost similar results with flexor tenosynovitis in 71 fingers on USG and 102 fingers on MRI.

Marcio Navalho et al[20] in their study on 45 patients with untreated recent-onset (<1 year) polyarthritis using an US and MRI approach detected tenosynovitis in 86.7% patients on MRI and 50% patients on USG with a sensitivity slightly lower compared to our study. They used 3 T MRI in their study which might account for increased sensitivity of MRI for detection of tenosynovitis compared to our study.

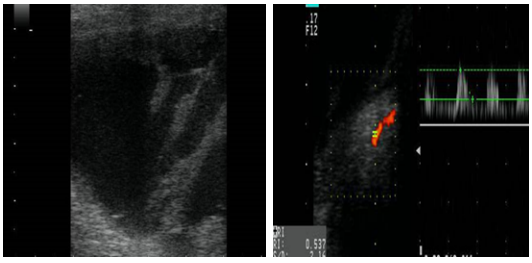
EFFUSION

On US images, synovial tissue is hypoechoic and effusion is generally anechoic, but the differentiation is not always easy and confusion might occur as synovium may be very hypoechoic, nearly anechoic, and effusion containing particles may be hypoechoic. In anatomical areas where compression with the transducer is easily performed, e.g. the suprapatellar recess, differentiation between synovial tissue and effusion is facilitated. Doppler US examination, displaying vascularization, and dynamic US examination, during active or passive mobilization of the soft tissues examined, may also facilitate such differentiation.

In our study, joint effusion was seen in 16 (40.0%) patients on USG and in 22 (55%) patients on MRI. No effusion was seen on USG in 6 patients who showed the same on MRI (false negatives). All 16 patients with effusion on USG also showed effusion on MRI (no false positive case). The sensitivity, specificity and accuracy of USG with MRI as reference method was 72.7%, 100% and 85.5% respectively. The level of agreement for detection of effusion between USG and MRI was good with kappa value of 0.71.

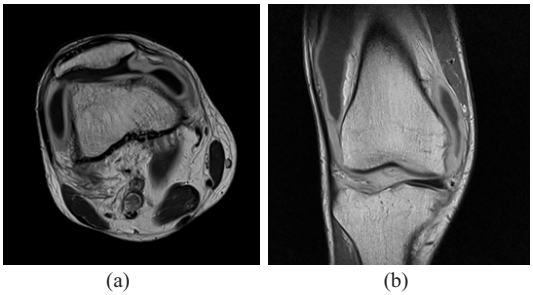
Most of the studies comparing USG with MRI have considered synovitis and effusion together as a group representing the inflammatory aspects of the disease process as effusion is secondarily to increased vascular permeability of inflamed synovium. Louise Larrel et al[24] in their study reported effusion in 10 quadrants of the examined joints on USG and in 15 quadrants on MRI, results similar to our study.. S Jank et al[25] also reported sensitivity of 81%, specificity of 100% and accuracy of 95% of USG with MRI as reference method in 200 TMJ joints.

The high specificity in our study and that in S Jank et al[25] might be explained due the OMERACT definition of effusion itself which defines it is an anechoic intraarticular area which gets displaced on compression[71].



(a) (b)

Fig. 1a &1b: USG image showing thick synovium with joint effusion in knee joint of a patient (a). Low resistance type flow seen on spectral Doppler in same patient within the thick synovium (b).



(a) (b)

Fig. 1c & 1d: Post contrast axial (c) and coronal (d) T1 weighted images in the above patient showing joint effusion with enhancing synovium.

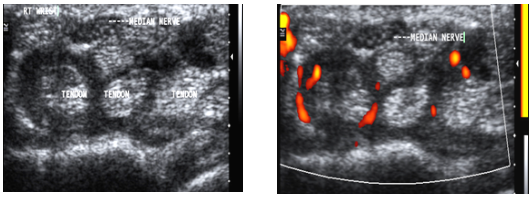
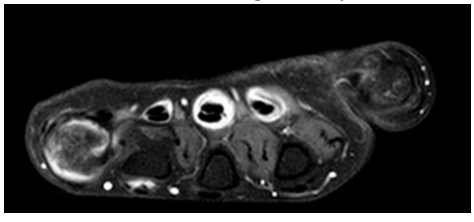


Fig 2a Fig 2b

Fig. 2a: USG image (transverse view) showing synovial thickening in flexor tendons at wrist. **Fig. 2b:** Increased vascularity seen in same patient in the tendon sheath thickening s/o tenosynovitis.



(c)

Fig. 2c: T1 post contrast image in same patient showing enhancing tendon sheath thickening in flexor tendons s/o tenosynovitis

Inflammatory arthritis, especially rheumatoid arthritis, is a potentially devastating condition affecting a large proportion of the population. Treatment has significantly progressed in recent years and outcomes, particularly when disease is diagnosed and treated at an early stage, are now significantly improved. As techniques that detect early disease, both ultrasound and MRI will become increasingly important in the diagnosis and management of this condition. Both have advantages and disadvantages, and as technology and skills develop they may continue to evolve in terms of sensitivity and availability.

USG being easily available and cost-effective compared to MRI and with a good sensitivity, specificity and accuracy for detection of active synovitis can be used as an alternative to MRI for early diagnoses, for monitoring of disease activity and for optimization of management in cases of inflammatory arthritis.

USG is a very cost-effective investigation despite a few short comings. The main advantages of USG are its easy availability, it is real time and dynamic imaging and allows examiner to undertake clinical assessment. Besides, it allows scanning of multiple joints in short span of time. Some of the disadvantages include that it is highly operator dependent, it has poor depth penetration for larger joints and difficulty in assessing parts of some joints and that it is unable to scan bone.

On the other hand, MRI provides complete assessment of whole joint including articular surfaces and also provides information about the underlying bone (bone marrow edema). It is also highly reproducible. However, it is contraindicated in certain patients (pacemaker, etc.) and is time consuming and only one body region can be scanned at a time. It is also limited by its availability. It is also susceptible to motion artifacts and there is need for contrast administration for synovitis assessment.

Although, MRI is better in the evaluation of inflammatory and destructive aspects of inflammatory arthritis, however, USG could be a reasonably efficacious and best affordable alternative. However, further validation of the sonographic technique is required with further refinement of definitions of various pathologies in musculosketal disorders.

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