



ROLE OF ULTRASOUND AND MRI IN EARLY DIAGNOSIS OF RHEUMATOID ARTHRITIS

Radiodiagnosis

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ABSTRACT

Rheumatoid arthritis is one of the commonest type of arthritis after osteoarthritis in present world . Most common cause of treatment failure is found to be the late diagnosis of the disease when the complications or deformities has occurred . Hence , early diagnosis of the disease plays a crucial role in the prognosis and the outcome of the patient . Modalities like MRI can very well evaluate the changes of RA early in the disease but is not feasible for all as the examination is expensive . The recent advances in the probes and the resolution of the USG machines has revolutionised the Musculoskeletal USG. The ultrasound examination not only shows the changes of the arthritis with good resolution but also show some features quite early then MRI.

Methodology :- The examinations were performed in New civil Hospital ,surat from a time period of January 2019 to march 2019 .Study was performed on the patients those were referred from medicine , orthopaedics or rheumatology OPD. The patients has been explained about the procedures they will undergo and the written consent was taken for the same with proper explanation given to them in the language they understood.

KEYWORDS

INTRODUCTION :-

The role of ultrasonography in the management of patients with early RA is discussed with regard to diagnostic properties, assessment of treatment responses and future developments. Ultrasound plays an important role in the early diagnosis of the RA and hence early treatment and good outcome of the patient . Patients most frequently present with pain and stiffness in one or multiple joints. The wrists, metacarpophalangeal (MCP) and proximal interphalangeal (PIP) joints are the most commonly affected joints, but any synovial joint can be affected. Involvement is usually bilateral and symmetric, and women are more commonly affected than men. In the hands, characteristic deformities may be seen. Spinal involvement is also common, and the atlantoaxial junction is an area frequently affected. In addition to joint-based pathology, patients may present with extraarticular manifestations of the disease, such as rheumatoid nodules, enthesopathy, bursitis, tenosynovitis, and tendon rupture. Rheumatoid factor (RF) is an immunoglobulin commonly found in patients with rheumatoid arthritis and is usually routinely measured in patients presenting with symptoms and signs of rheumatoid disease. It is not, however, specific to rheumatoid arthritis and may be elevated in other autoimmune disorders. Some patients with rheumatoid arthritis may remain negative for RF throughout the course of their condition, and these patients are described as having seronegative rheumatoid arthritis. Classification criteria have been devised for diagnosing rheumatoid arthritis to differentiate patients with this condition from those with undifferentiated inflammatory synovitis. Along with clinical criteria blood tests including RF, anticitrullinated protein antibodies and acute phase response measures—erythrocyte sedimentation rate and C-reactive protein tests will usually be performed to aid and confirm the diagnosis

There are few parameters that has been used to compare the findings in the MRI as well as USG .

1. Joint effusion :- It was evaluated by directly visualizing fluid in the joint cavity on USG as hypoechoic to the anechoic collection and on MRI as a hyperintense area on T2 fat sat and short-tau inversion recovery (STIR) sequence images. Joint effusion was mainly seen in radiocarpal joints (RCJs), followed by intercarpal joints (ICJs), distal radioulnar joints (DRUJs), and MCP joint. Effusion at many instances get confused with synovial thickening .Displacement of the fluid with probe indicates effusion however if it doesnot moves synovial thickening appears likely.

2. Detection of the bone erosions :- Ultrasound has been used in the diagnosing the early bony changes in the humeral head. According to the study done by Allassarela et al MRI , CT and USG were all more sensitive than CR with MRI and USG superior to CT in detecting small bone erosions .



Figure 1. MRI showing signs of bone erosions

According to another study done by Backhaus et al. (1) compared CR, MRI, scintigraphy and US in the finger joints (wrists, metacarpophalangeal (MCP) joints, proximal interphalangeal (PIP) joints) of 60 inflammatory arthritis patients, 36 of whom had RA and did not demonstrate a superiority of US over CR, a finding which may possibly reflect the analogue technology used (2) or the assessment of the wrists and PIP joints which may also have degenerative changes , making interpretation of bone damage difficult sometimes .

3. Detection of synovitis and tenosynovitis :- Proliferative synovitis is the earliest pathologic change seen in rheumatoid arthritis and is usually but not exclusively bilateral and symmetric. Both ultrasound and MRI can detect preerosive synovitis and each has merits and disadvantages. Both have been shown to be superior to clinical assessment in detecting the presence of synovitis

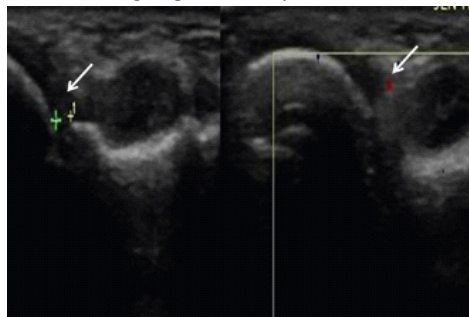


Figure 2. Ultrasonography shows distal radioulnar joint synovium thickened with increased vascularity



Figure 3. Ultrasound examination showing synovial thickening and effusion

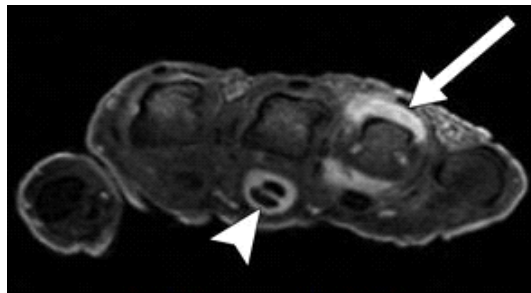


Figure 5. MRI showing florid synovitis at fourth MCP joint

Definitions for synovitis on imaging have been produced by the Outcome Measures in Rheumatoid Arthritis Clinical Trials (OMERACT) initiative. As per OMERACT, synovitis is a thickened area of synovial compartment that shows greater than normal enhancement on gadolinium-enhanced T1-weighted images (3) synovitis is often less bright on fluid-sensitive sequences compared with joint fluid, without contrast administration, joint fluid and proliferative synovitis cannot be easily differentiate. There is emerging evidence to suggest that dynamic contrast-enhanced MRI (DCE-MRI) is a more sensitive marker of disease activity than volumetric measurement of synovium.

Core areas & Domains that could be included in a core set	CORE OUTCOME SETS (AND INSTRUMENT IF MENTIONED) BY DISEASE GROUP										Goal
	Rheumatoid Arthritis Bassett, 1984 Peters, 1993 Wells, 1995 Kosmos, 2007 Berlett, 2012	Osteoarthritis Sternberg, 1997	Osteoarthritis Bullough, 1997	SLE Sternberg, 1999 Sternberg, 1999	Ankylosing Spondylitis van der Heijde, 1999	Psoriatic Arthritis Gladman, 2003 Gladman, 2007	Vasculitis Merkel, 2009 Merkel, 2011	Fibromyalgia Nelson, 2009 Cheng, 2009	Acute Chronic	Chronic	
Death											
Life Impact											
Quality of life	R (Loddy)	R (A)	R								
Symptoms	R (Pain) R (Fatigue)	R (Pain)*	✓ Pain	R (Fatigue)	✓ Pain ✓ Fatigue	✓ Pain ✓ Fatigue			✓ Pain ✓ Fatigue	✓ Pain ✓ Fatigue	
Physical Function	✓ Disability	R*	✓	R	✓	✓			✓ Pain ✓ Fatigue	✓ Pain ✓ Fatigue	
Psychosocial	R			R	✓	✓			✓ Pain ✓ Fatigue	✓ Pain ✓ Fatigue	
Role participation											
Resource Use/Economic Impact											
Core-MRI (R)	R	R*		R							
Work Disability as cost (R)											
Adverse events	R	✓		✓							
Pathophysiological manifestations											
Appropriate index	✓ (ESLAR) (MS)			✓ (MS) R (Frequency)	pending	✓	✓ (MS) (MS)				
Biomarkers	✓ Biochemical										
Joint tenderness	✓ 20 or 60 joints				✓ (Pain) (R) ✓ (Pain) (R)						
Joint swelling	✓										

Figure 5. Overview of the Omeract

DCE-MRI is predictive of future erosive change and progression [4,5] and response to treatment. OMERACT definition of synovitis using ultrasound is abnormal hypoechoic (relative to subdermal fat but sometimes isoechoic or hyperechoic) intraarticular tissue that is non-displaceable and poorly compressible and that may exhibit Doppler signal. The non-displaceable nature of synovitis on ultrasound is important because this characteristic distinguishes joint fluid from synovial thickening; however, these two entities frequently coexist within one joint. More recently power Doppler (PD) has become increasingly popular with the advantage of being able to assess synovial vascularity. Validation of PD has been assessed by comparison with histopathology in the knee in RA and OA (6,7) and dynamic MRI in the MCP joints in RA (28) with encouraging results. PD has also been successfully used to assess inflammatory disease activity in RA (8) and monitor response to treatment. use of US and MRI in the detection of synovitis has been highlighted by Brown et al. (9). In their study of patients with RA in clinical remission as defined by the ACR criteria (8), almost half the patients had signs of sub-clinical synovitis in joints not thought to have any clinical synovitis.

4. Detection of bone marrow edema :- Bone marrow edema is not normally detected on usg and is one of the drawback of the ultrasound which is easily overcome by the MRI. Stir images are used in MRI to diagnose Bone marrow edema.

DISCUSSION :-

The earliest imaging abnormalities in RA are synovial thickening with vascularity, effusion, and Bone marrow edema. Approx 25 patients were examined with usg and MRI in the age group of 20 – 70 years . in most of the patients involvement of the right hand was found to be predominant . 2nd most common was the involvement of bilateral hands and least common was the isolated involvement of the left hand .Most of the patients were females .Radiocarpal joint was the most common joint involved followed by intercarpal joint.

The involvement of the synovium is well appreciated on ultrasound as well as MRI but early involvement of the synovium is early diagnosed in USG. Also when the synovium is not thickened Doppler evaluation showing the high vascularity indicated the early inflammatory changes .Flexor tenosynovitis is the most powerful predictor of early RA. Bone marrow edema was seen in most of the bones of the wrist and MCP joints except 3rd MC base, 3rd proximal and distal MCP joint, and 4th proximal MCP joint area. Bone erosion is most common showed involving the distal articulating surface of the ulna .

CONCLUSION :-

Ultrasound plays an important role in diagnosing early changes of rheumatoid arthritis by demonstrating the effusion, synovial thickening and hypervascularity of synovium on doppler. MRI has its own role in diagnosing RA and mostly outrages the Ultrasound in diagnosing bone marrow edema mainly . Follow up with ultrasound do play an important role in treatment and follow up of the patients with RA.

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