ROLE OF MRI VERSUS US IN ASSESSMENT OF SKELETAL EFFECTS OF RHEUMATOID ARTHRITIS

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بسم الله الرحمن الرحيم

(وقل اعملوا فسيرى الله
عملكم ورسوله والمؤمنون)

Contents

List of abbreviations

• RA:	Rheumatoid arthritis
• MRI:	Magnetic Resonance Imaging
• US:	Ultrasonography
• MSKUS:	Musculoskeletal ultrasound
• RF	Rheumatoid factor
• HLA	Human leukocyte antigens
• Anti-CCP	Anti-cyclic citrullinated peptide
• TNF-α	Tumor necrosis factor alpha
• IL	interleukin
• GM-CSF	Macrophage colony-stimulating factor
• FLS	Fibroblast-like synoviocytes
• RANKL	Receptor activator of NF-κB ligand
• FOV	Fields of view
• TFC	Triangular fibrocartilage
• TR	Repetition time
• TE	Echo time

• DRUJ	Distal radio-ulnar joint
• FSE	Fast Spin-Echo
• STIR	Short time inversion recovery
• MPGR	Multiplanar gradient recalled acquisition
• UCL	Ulnar collateral ligament
• PIN	Posterior interosseous nerve
• UCL	Ulnar collateral ligament
• DBT	Distal bicipital tendon
• RCL	Radial collateral ligament
• LUCL	Lateral ulnar collateral ligament
• PIN	Posterior interosseous nerve
• CSF	Cerebrospinal fluid
• WI	Weighted image
• OMERACT	Outcome measures in rheumatology clinical trials
• Gd-DPTA	gadolinium-diethylenetriamine penta-acetic acid
• RAMRIS	Rheumatoid arthritis magnetic resonance imaging score
• AAS	Atlantoaxial subluxation

• AA	Atlanto-axial
• CVJ	Carnio-cervical junction
• PD	Power Doppler
• PDUS	Power Doppler ultrasound
• RI	Resistive index
• PIP	Proximal inter-phalangeal joint
• MCP	Metacarpo-phalangeal joint

List of Figures

Key words: rheumatoid arthritis, ultrasound, magnetic resonance imaging.

Rheumatoid arthritis is a predominantly joint-based disease affecting approximately 1% of the world's population. This article will address the increasing use of both US and MRI in diagnosis and monitoring of rheumatoid arthritis and will highlight both the strengths and weaknesses of these two imaging modalities. Future studies with increased patient numbers will be necessary if one of these two modalities is to emerge as a clear winner as the imaging modality of choice.

الكلمات الداله: (راس عظم الفخذ، تنخر العظم، اسيتات ميثيل البريدنيزولون، فيتامين هـ)

التهاب المفاصل الروماتويدي يوثر غالبا على المفاصل كما انه يصيب ما يقرب من 1٪ من سكان العالم. و سوف يناقش هذا البحث زياده استخدام كل الاشعه التلفزيونيه والتصوير بالرنين المغناطيسي في تشخيص ورصد التهاب المفاصل الروماتويدي كما سوف يسلط الضوء على كل نقاط القوة والضعف في كلا منهما. و هناك حاجه ضروريه للدراسات المستقبلية مع تزايد أعداد المرضى المصابين بهذا المرض لاثبات امكانيه ان تظهر أحد هذه الطرائق كأنها فائز كاداه للتصوير.

Introduction and Aim of the Work

Rheumatoid arthritis (RA) is a chronic and progressive inflammatory disease of the joints. It affects approximately 1% of the general population, with incidence being three times higher in women than men. The areas most commonly involved are the metacarpophalangeal joints, the proximal interphalangeal joints and the feet ***(Schueller-Weidekamm, 2010)***.

Functional outcome in rheumatoid arthritis is influenced by the extent of structural damage to bones, joints and tendons plus the severity of joint inflammation ***(Scott et al., 2000).***

Sensitive and reproducible tools for diagnosis, monitoring of disease activity, damage and prognostication are essential in the management of patients with rheumatoid arthritis. Magnetic Resonance Imaging (MRI) and Ultrasonography (US) allow direct visualization of early inflammatory and destructive joint changes, and have several documented and potential applications in RA patients ***(Østergaard et al., 2008).***

MRI allows for earlier detection of the joint synovitis, erosions and bone marrow edema present in inflammatory arthritis, facilitating earlier diagnosis and treatment. MRI shows promise as a mean of monitoring disease progression over time and identifying treatment non-responders sooner in the treatment cycle ***(Mak and Hunter, 2009).***

Musculoskeletal ultrasound (MSKUS) applications continue to show considerable expansion mainly because of technical improvements (development of high-frequency broadband transducers, refined focusing , sensitive colour and Power Doppler technology) allows the detection of normal anatomic details and identification of a variety of pathologic conditions ***(McNally, 2005) .***

The structures most commonly imaged with diagnostic MSUS, include tendon, muscle, nerve, joint and some osseous pathology ***(Lento and Primack, 2007).***

Both of these imaging modalities have advantages and disadvantages ***(Bianchi and Martinoli, 2007).***

Aim Of The Work

The aim of this work is to spot the light on the differences between the role of Ultrasonography and Magnetic Resonance Imaging in assessment of skeletal effects of rheumatoid arthritis.

Anatomical Considerations

Gross anatomy of the mostly affected joints in rheumatoid arthritis

❍ Small joints of the hand:

CARPAL JOINT:

The intercarpal joints interconnect the carpal bones **(fig.1)**. They may be summarized as the joints between the proximal and distal rows of carpal bones and the midcarpal joint, as a complex joint between the rows ***(Johnson, 2009)***.

Articulating surfaces:

Joints of the proximal carpal row: plane synovial joints exist between the distal parts of the adjacent surfaces of the scaphoid, lunate and triquetral bones **(fig.1)**. The pisiform rests on the palmar surface of the triquetral and has a separate synovial joint, which is completely enclosed by a thin but strong fibrous capsule. The pisiform is also anchored to the hook of the hamate by the pisohamate ligament and to the base of the fifth metacarpal by the pisometacarpal ligament ***(Palastanga et al., 2002)***.

Joints of the distal carpal row: between the trapezium, trapezoid, capitate and hamate **(fig.1)**. There is virtually no movement at these joints ***(Johnson, 2009)***.

Midcarpal joint: between the scaphoid, lunate and triquetrum (proximally) and trapezium, trapezoid, capitate and hamate (distally) is a compound articulation that may be divided descriptively into medial and lateral parts **(fig.1)**. Throughout most of the medial compartment the convexity formed by the head of the capitate and hamate articulates with a reciprocal concavity formed by the scaphoid, lunate and much of the triquetrum. However, most medially the curvatures are reversed, forming a compound sellar joint. In the lateral compartment the trapezium and trapezoid articulate with the scaphoid, forming a second compound articulation, often said to be plane, but which is also sellar (saddle) ***(Johnson, 2009)***.

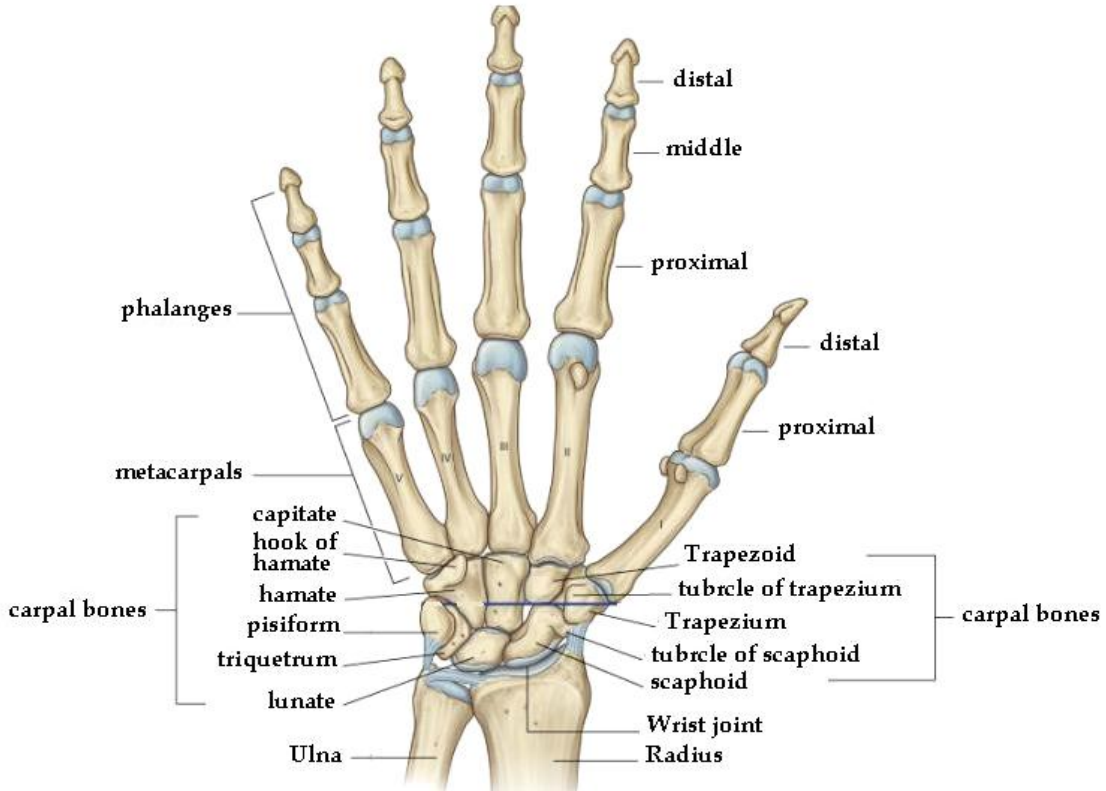

Fig. (1): Bones and joint of hand and wrist ***(Quoted from Drake et al., 2009).***

Carpal synovial membrane and Cavity: The carpal synovial membrane is most extensive and lines an irregular articular cavity. Its proximal part is between the distal surfaces of the scaphoid, lunate and triquetrum and the proximal surfaces of the second carpal row **(fig.3)**. It