Prevalence of Erosions in Metacarpophalangeal Joints and Proximal Interphalangeal Joints in Rheumatoid Arthritis Patients

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ABSTRACT:

BACKGROUND:

Bone erosion is a central pathophysiological process and an important outcome parameter in rheumatoid arthritis (RA).

OBJECTIVE:

To assess prevalence of erosions in metacarpophalangeal joints (MCPJs) & proximal interphalangeal joints (PIPJs) in RA using ultrasonography and to evaluate the associates if present.

PATIENTS AND METHODS:

Ninety two patients with RA diagnosed according to The ١٩٨٧ American College of Rheumatology (ACR) classification criteria for RA were compared with ١٥٨ healthy individuals matched for age and sex. Disease activity score ٢٨ joints (DAS٢٨), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and rheumatoid factor (RF) were measured. Ultrasonography was performed using Seimens Elegra with ٧,٥ MHz linear array transducer by radiologist for MCPJs and PIPJs.

RESULTS:

Erosions in RA were significantly more than those of controls (٤٤ (٤٧,٨٪) versus ٠(٠٪) (p = ٠,٠٠٠). Erosions in MCPJs were more than PIPJs and both MCPJs & PIPJs (٣٣(٧٥٪) versus ٤(٩,١٪) versus ٧(١٥,٩٪) respectively) (p=٠,٠٠٥). High ESR, positive CRP, and positive RF were significant associates with the erosions (p= ٠,٠٠٨, p= ٠,٠٠٠, p= ٠,٠٠٢ respectively).

CONCLUSION:

Prevalence of erosions in MCPJs and PIPJs of RA patients was high (٤٧,٨٪).High ESR, positive CRP, and positive RF were significant associates with erosions.

KEYWORDS: rheumatoid arthritis, ultrasonography, metacarpophalangeal joints, proximal interphalangeal joints.

INTRODUCTION:

Rheumatoid arthritis (RA) is a systemic inflammatory polyarthropathy characterized by progressive joint damage and non-articular complications such as osteoporosis [١] and associated with an increased risk of premature morbidity and mortality, predominantly due to increased cardiovascular disease (CVD) due to accelerated atherosclerosis [٢]. The earliest appropriate initiation of treatment after disease onset offers the best chance of permanent remission and a normal lifespan so early diagnosis is essential [٣].

Joint erosions identified by conventional radiography (CR) are late findings indicating a poor prognosis [٤]. More sensitive diagnostic tools for the early detection of joint damage include magnetic resonance imaging (MRI) and ultrasound (US) [٥،٦]. MRI provides excellent details for articular defects but it is expensive and less accessible to rheumatologists compared with US, which can be used at the bedside or in the clinic [٧].

Previous studies have revealed high prevalence of erosions in RA detected by US more than those detected by CR [٨،٩] . This study was designed to assess the prevalence & associates of erosions in MCPJs & PIPJs in Iraqi patients with RA using ultrasonography.

PATIENTS AND METHODS:

A cross-sectional study was conducted at Baghdad Teaching Hospital / Rheumatology Unit, Medical Department; and Ultrasonography Unit from January ٢٠١٠ till June ٢٠١١.

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Ninety two randomly selected RA patients diagnosed according to The ١٩٨٧ American College of Rheumatology (ACR) classification criteria for RA[١٠] were compared with ١٥٨ healthy individuals matched for age and sex recruited from healthy accompanying persons of another patients attending to the Ultrasonography Unit as a control group.

Patients with RA only included in the study & those with other inflammatory arthritis or comorbid diseases were excluded.

We assessed RA activity using Disease Activity Score ٢٨ (DAS٢٨ score) [١١]. A blood sample was taken for the measurement of Erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and rheumatoid factor (RF).

Ultrasonography of the MCPJs and PIPJs was performed using Seimens Elegra with ٧,٥ MHz linear array transducer by same radiologist with expertise in musculoskeletal ultrasonography without knowing the clinician's assessment or X-rays data [١٢].

A signed consent was taken from patients and controls to enroll in the study and ethical approval was obtained from the Ethics Committee of Baghdad University, College of Medicine, Medical Department.

Statistical analysis was done using statistical package for social sciences software (SPSS١٩) for Windows. Association between different categorical variables was measured using Chi-square test or Fisher's exact test where appropriate. Difference between continuous variables was measured using t-test. Odd ratio (OR) was measured to find the predictors of erosions in RA patients. P-values<٠,٠٥ were considered significant.

RESULTS:

Ninety two patients with RA, ٦٤ (٦٩,٦٪) females & ٢٨ (٣٠,٤٪) males, their mean ages was ٤٣,٤١± ١١,٢٤ years, and ١٥٨ healthy control group, ١١٦ (٧٣,٤٪) females & ٤٢ (٢٦,٦ %) males, their mean ages was ٤٢,٨٦ ± ١٠,٣٤ years ,were included in this study (p>٠,٠٥, Table ١).

Erosions detected by US in RA patients were significantly more than those detected in the controls (٤٤ (٤٧,٨٪) versus ٠(٠٪) (p =٠,٠٠٠) (Table٢).

MCPJs erosions were significantly more than those in PIPJs and both MCPJs & PIPJs (٣٣ versus ٤ versus ٧ respectively) (p=٠,٠٠٥, Table٣)

High ESR, positive CRP, and positive RF were significant associates with the erosions (p= ٠,٠٠٨, p= ٠,٠٠٠, p= ٠,٠٠٢ respectively),(Table ٤).

There was no significant association between the erosions and: patients age, disease duration, smoking status, DAS٢٨, and medications taken (P>٠,٠٥, Table ٤)

Table ١: Demographic distribution of ٩٢ RA patients and ١٥٨ controls.

Variables	Patients=٩٢	Controls=١٥٨	P-value
Age ±SD, years	٤٣,٤١± ١١,٢٤	٤٢,٨٦ ± ١٠,٣٤	٠,٦٩٤
Sex Males n.(%) Females n.(%)	٢٨ (٣٠,٤٪) ٦٤ (٦٩,٦٪)	٤٢ (٢٦,٦ %) ١١٦ (٧٣,٤٪)	٠. ٥٦٠

n., number; %, percentile

Table ٢: Comparison of distribution of erosions detected by US in ٩٢ RA patients and ١٥٨ controls.

Variables	Erosion present n.(%)	Erosion absent n.(%)	P-value
Patients=٩٢	٤٤(٤٧,٨)	٤٨(٥٢,٢)	٠,٠٠٠ *
Controls=١٥٨	٠(٠)	١٥٨(١٠٠)	

*, p-value is significant; n., number; %, percentile

Table ٣: Distribution of erosions detected by US according to the site and number.

Erosions site	Erosion number =١	Erosion number>١	Total number of erosions	p-value
MCPJ	١٥(٤٥,٥٪)	١٨(٥٤,٥٪)	٣٣(١٠٠٪)	٠,٠٠٥*
PIPJ	٤(١٠٠٪)	٠(٠٪)	٤(١٠٠٪)	
Both(MCPJ+PIPJ)	٠(٠٪)	٧(١٠٠٪)	٧(١٠٠٪)	
Total	١٩(٤٣,٢٪)	٢٥(٥٦,٨٪)	٤٤(١٠٠٪)	

*, p-value is significant

Table ٤: Risk factor for erosions detected by US in ٩٢ RA patients.

variables	Erosion present	Erosion absent	OR(٩٥٪CI)	P-value
Age (mean±SD) years	٤٤,٨٩±١١,٤٠	٤٢,٢٧±١٠,٩٧	-	٠,٢٧
Sex Males n(%) Females n(%)	 ١١(٦٠,٧٪) ٣٣(٥١,٦٪)	 ١٧(٣٩,٣٪) ٣١(٤٨,٤٪)	 ١,٦٥(٠,٦٧-٤,٠٦)	 ٠,٣٧
Duration (Mean ±SD) years	٧,٣٥±٦,٢٩	٦,١٣±٥,٩٥	-	٠,٣٤٣
DAS٢٨ Remission n (%) Active n (%)	 ٧(٣١,٨٪) ٣٧(٥٢,٩٪)	 ١٥(٦٨,٢٪) ٣٣(٤٧,١٪)	 ٢,٤٠ (٠,٨٧-٦,٦١)	 ٠,٠٩
Smoking Never n (%) Ex-smoker n (%) Current n (%)	 ٢٩(٤٤,٦٪) ٢(٤٠٪) ١٣(٥٩,١٪)	 ٣٦(٥٥,٤٪) ٣(٦٠٪) ٩(٤٠,٩٪)	 -	 ٠,٤٧
RF +Ve	٣٩(٥٨,٢٪)	٢٨(٤١,٨٪)	٥,٥٧(١,٨٧-١٦,٦٣)	٠,٠٠٢*
CRP Increased	٤١(٥٨,٦٪)	٢٩(٤١,٤٪)	٨,٩٥(٢,٤٢-٣٣,٠٩)	٠,٠٠٠*
ESR mm/h	٥٩,٣٦±١٧,٨١	٤٥,٥٠±٢٩,٢٦	-	٠,٠٠٨*
Drugs HCQ n.(%) SSZ n.(%) AZT n.(%) MTX n.(%) Prednisolon n.(%) NSAIDS n.(%)	 ١١(٣٧,٩٪) ٣٦(٤٩,٣٪) ٤٣(٤٧,٣٪) ٣٠(٥٣,٦٪) ١٧(٤٣,٦٪) ٣٥(٥٠,٧٪)	 ١٨(٦٢,١٪) ٣٧(٥٠,٧٪) ٤٨(٥٢,٧٪) ٢٦(٤٦,٤٪) ٢٢(٥٦,٤٪) ٣٤(٤٩,٣٪)	 ٠,٥٦ (٠,٢٣-١,٣٦) ٠,٧٥ (٠,٢٧-٢,٠٧) ٠,٤٧ (٠,٣٨-٠.٥٩) ١,٨١ (٠,٧٧-٤,٢٥) ٠,٧٤ (٠,٣٢٤-١,٧١) ١,٦٠ (٠,٦١-٤,١٩)	 ٠,٢٦٢ ٠,٦١٥ ٠,٤٧٨ ٠,٢٠٣ ٠,٥٣ ٠,٤٧

*, p-value is significant; n., number; %, percentile; DAS٢٨,disease activity score; RF, rheumatoid factor; CRP, c-reactive protein; ESR, erythrocyte sedimentation rate; HCQ, hydroxychloroquine; SSZ, sulfasalazine; AZT, azathioprine; MTX, methotrexate; NSADIDS, non-steroidal anti-inflammatory drugs

DISCUSSION:

This study showed high frequency of erosions detected by US in Iraqi patients with RA. Positive RF, positive CRP, and increased ESR were significant associates with erosive RA. Possible explanation of erosions in RA may be a chronic inflammatory arthritis that leads to damage of articular cartilage and development of bone erosion [١٣].

Up to the best of our knowledge this is the ١st time to report prevalence of erosive changes in Iraqi patients with RA by ultrasonography.

Our findings agreed with Lopez-Ben R et al [٩] and Marcin S et al [١٢] who found significant erosions detected by US in RA compared to controls. Also Sonia Bajaj et al [١٤] found that US detected erosions more at baseline and on follow up than those detected by radiography in RA patients.

In our study, the erosions were more common in MCPJs. This contrasted Marcin et al [١٢] who found PIPJs were more common sites of erosions. This difference may be explained by different study sample size, different ultrasonographer expert, and to the variation of view of detecting erosions.

The presence of positive RF and increased CRP were significant associates with erosive RA in our study .This agreed with Katherine et al [١٣] and Hilde et al [١٥] who found that both positive RF and increased CRP were significant predictors of erosive RA.

Increased ESR was a significant predictor for RA erosions in our study which disagreed with Hilde BH et al study [١٥] .This may be explained by variation of laboratory methods.

Limitation of our study were small sample size and short period of the study which can be improved by large prospective study with long duration of follow up.

Early detection of erosive changes in RA may improve the management of patients by monitoring disease activity and aggressive therapeutic adjustment, which has emerged as an approach to improve long-term outcomes for patients with rheumatoid arthritis [١٦].

In summary**,** our study found that the frequency of erosions detected by US of MCPJs & PIPJs was high in Iraqi RA patients. Also High ESR, positive CRP, and positive RF were significant predictors of presence of erosions. These findings can improve early diagnosis and treatment of Iraqi RA patients.

REFERENCES:

١. Haugeberg G, Uhlig T, Falch JA, et al. Bone mineral density and frequency of osteoporosis in female patients with rheumatoid arthritis: results from ٣٩٤ patients in the Oslo County rheumatoid arthritis register. Arthritis Rheum ٢٠٠٠; ٤٣:٥٢٢–٣٠.

٢. Marks JL, Edwards CJ. Protective effect of methotrexate in patients with rheumatoid arthritis and cardiovascular comorbidity. Ther Adv Musculoskelet Dis. ٢٠١٢;٤:١٤٩-٥٧.

٣. Visser H. Early diagnosis of rheumatoid arthritis. Best PractnRes Clin Rheumatol ٢٠٠٥;١٩: ٥٥- ٧٢.

٤. Combe B, Cantagrel A, Goupille P, et al. Predictive factors of ٥-year health assessment questionnaire disability in early rheumatoid arthritis. J Rheumatol ٢٠٠٣; ٣٠:٢٣٤٤–٤٩.

٥. Wakefield RJ, Gibbon WW, Conaghan PG, et al. The value of sonography in the detection of bone ١١٢ sions in patients with rheumatoid arthritis: a parison with conventional radiography. Arthritis Rheum ٢٠٠٠; ٤٣:٢٧٦٢–٧٠.

٦. Szkudlarek M, Narvestad E, Klarlund M, et al. Ultrasonography of the metatarsophalangeal joints in rheumatoid arthritis: comparison with magnetic resonance imaging, conventional radiography, and clinical examination. Arthritis Rheum ٢٠٠٤;٥٠:٢١٠٣–١٢.

٧. Wakefield RJ, Green MJ, Marzo-Ortega H, et al. Should oligoarthritis be reclassified? Ultrasound ١١٣ reveals a high prevalence of subclinical disease. Ann Rheum Dis ٢٠٠٤; ٦٣:٣٨٢–٨٥.

٨. Sheane B J, Beddy P, O'connor M, et al. Targeted Ultrasound of the Fifth Metatarsophalangeal Joint in an Early Inflammatory Arthritis Cohort. Arthritis Care & research ٢٠٠٩; ٦١:١٠٠٤-٨.

٩. Lopez-Ben R, Bernreuter WK, Moreland LW, Alarcón GS. Ultrasound detection of bone erosions in rheumatoid arthritis: a comparison to routine radiographs of the hands and feet. Skeletal Radiol ٢٠٠٤; ٣٣:٨٠-٨٤.

١٠. Arnett FC, Edworthy SM, Bloch DA, et al. The American Rheumatism Association ١٩٨٧ revised criteria for the classification of rheumatoid arthritis. Arthritis Rheum ١٩٨٨; ٣١:٣١٥–٢٤.

١١.Prevoo ML, van't Hof MA, Kuper HH, et al. Modified disease activity scores that include twenty-eight-joint counts. Development and validation in a prospective longitudinal study of patients with rheumatoid arthritis. Arthritis Rheum ١٩٩٥;٣٨:٤٤.

١٢.Marcin Szkudlarek, Mette Klarlund, Eva Narvestad, et al. Ultrasonography of the metacarpophalangeal and proximal interphalangeal joints in rheumatoid arthritis: a comparison with magnetic resonance imaging, conventional radiography and clinical examination. Arthritis Research & Therapy ٢٠٠٦;٨: R٥٢ (doi:١٠,١١٨٦/ar١٩٠٤). Available online at: http://arthritis-research.com/content/٨/٢/R٥٢

١٣- Katherine P L, Michael E W , Jing Cui. Clinical predictors of erosion-free status in

rheumatoid arthritis: a prospective cohort study. Rheumatology Advance Access published March ٢٩, ٢٠١١. (doi:١٠,١٠٩٣/rheumatology/ker١٢٩)

١٤-Sonia Bajaj, Robert Lopez-Ben, Robert Oster, Graciela S. Alarcón. Ultrasound detects rapid progression of erosive disease in early rheumatoid arthritis: a prospective longitudinal study. Skeletal Radiol ٢٠٠٧;٣٦:١٢٣–٢٨.

١٥- Hilde B H, Espen A H , Pernille B, and Tore KK. Bone erosions at the distal ulna detected by ultrasonography are associated with structural damage assessed by conventional radiography and MRI: a study of patients with recent onset rheumatoid arthritis. Rheumatology ٢٠٠٩;٤٨:١٥٣٠–٣٢.

١٦-Wells AF, Haddad RH. Emerging role of ultrasonography in rheumatoid arthritis: optimizing diagnosis, measuring disease activity and identifying prognostic factors. Ultrasound Med Biol ٢٠١١;٣٧: ١١٧٣-٨٤.