Research Article

Subchondral bone changes in early versus late rheumatoid arthritis

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Abstract
Background: Bone marrow edema seen in MRI marks an important element of pathogenesis of RA, usually co-existing with synovitis, albeit it may be an isolated finding in some patients. **Aim of the work**: To detect articular subchondral bone changes by MRI in early versus late rheumatoid arthritis **Methods**: ٣٠ patients diagnosed as RA with age ranged between ٢٤-٦٠ years, the patients further subdivided into early and late RA according to disease duration, all patients subjected to through history taking and full examination, plain X ray of hand and wrist, MRI on wrist join. **Results**: BME and BME score were higher in early than late RA. **Conclusion:** Bone remodeling manifested by BME was higher in early than late RA.
Keywords: Rheumatoid arthritis – BME- MRI.

Introduction
Rheumatoid arthritis (RA) is a chronic autoimmune disease that is characterized by inflammation and destruction of joints. The disease has a major effect on health status and quality of life and imposes a substantial economic burden on patients and society[١]. Data obtained during the last decade, indicate that bone marrow is an important compartment in RA, where pathological processes from "outside the joint" can occur[٢]. These studies revealed the presence of cellular infiltrates that replace yellow adipose tissue in bone marrow of RA patients, described on magnetic resonance scans as bone marrow edema (BME). The high frequency (٦٨–٧٥٪) of BME appearance in early RA and its association with painful and aggressive disease course, indicate significance of this phenomenon for the pathogenesis of RA[٣].

Aim of the work
To detect articular subchondral bone changes by MRI in early versus late rheumatoid arthritis.

Patients and methods
٣٠ patients (٢٦ female, ٤ males) who fulfilled the ١٩٨٧ ACR classification criteria for Rheumatoid arthritis[٤] from Rheumatology outpatient clinic, Minia University Hospital in the period from April ٢٠١٤ to February ٢٠١٦ were included in the study. The mean of age was ٤١.٢٦ ± ٩.١٢years (range ٢٤-٦٠ years) and the mean of disease duration was ٥.١٦٦±٥.٢٩ years (range ٠.٢٥-٢٤ years), further subdivided into established diagnostic entities other than RA, Rheumatoid arthritis with co-morbid endocrine, metabolic or major organ impairment. The nature of the study was explained to all patients. The radiological procedures represent standard care and pose no ethical conflicts. A verbal consent was obtained from all patients.

All patients were subjected to detailed medical history and complete physical examination, assessment of disease activity using DAS-٢٨, disease severity using HAQ and functional outcome using Steinbrocker fuctional index, X ray hand and wrist PA

view were ordered in all the patients, MRI of wrist was performed for all patients using SiGNA profilex ٠.٢ tesla GE medical system machine.

Statistical analysis

Analysis of data was done by personal computer using SPSS (Statistical program for social science) version ١٦.The data of all software patients and controls were fed into an IBM personal computer. Data were expressed as mean ± SD for parametric variables and as number and percent for non-parametric variable. Comparison between groups for parametric data was done by independent samples t-test (unpaired t-test). Chi – square (X^2) test was used to compare qualitative variables. The difference was expressed as probability of value (P value). The difference was considered significant if P <٠.٠٥. Correlations done using person and sperman correlation coefficient.

Results

Demographic data of the studied population:

Rheumatoid arthritis patients were ٢٦ females and ٤ males, their age ranged between ٢٤ and ٦٠ years, the mean of age was ٤١.٢٦±٩.١٢ years and disease duration ranged between ٠.٢٥-٢٤ years, with mean of ٥.١٦٦±٥.٢٩ years**.**

Subchondral bone changes by MRI in RA patients:

Table ١ show detailed MRI findings in RA patients:

Subchondral bone changes by MRI in both groups:

As shown in table ٢, there was statistically significant difference between subgroups regarding subchondral bone changes by MRI where presence of BME and its score were higher in early than late RA while erosions were higher in late than early RA (p=٠.٠١٠, ٠.٠١٨ and ٠.٠٢٥ respectively).

Correlation of subchondral bone changes with disease activity, severity:

There was significant positive correlation between BME and both VAS and DAS ٢٨ (p=٠.٠٤٨ and p= ٠.٠٢٨ respectively). BME score also positively correlated with VAS, DAS ٢٨ and HAQ (p=٠.٠٤٤, p=٠.٠٤٦, p=٠.٠٢٠), Erosion was positively correlated with VAS, DAS ٢٨, HAQ and functional class (p= ٠.٠٠٩, p=٠.٠١٢, p=٠.٠٠٣ and p=٠.٠٠٧ respectively).

Table ١: MRI findings in RA group:

MRI findings	RA patients n=٣٠
BM edema	١٧ (٥٦.٧٪)
BME score	٢.٧٠±٣.٣٣
Erosion	١٢ (٤٠٪)
Effusion	٢٠ (٦٦.٦٪)
JSN	١٩ (٦٣.٣٪)
Cartilage lesion	١٧ (٥٦.٧٪)

Table ٢: Comparison of subchondral bone changes by MRI in both groups:

MRI findings	Group I (early RA) n=١٥	Group II (Late RA) n=١٥	t/ χ^2	P value
BM edema	١٢ (٨٠٪)	٥ (٣٣.٣٪)	٦.٦٥٢	٠.٠١٠
BME score	٠-١٣ ٣.٠٦±٣.٢١	٠-٥ ٠.٧٣±١.٥٧	٦.٩٦١	٠.٠١٨
Erosion	٣ (٢٠٪)	٩ (٦٠٪)	٥.٠٠٠	٠.٠٢٥

Table ٣: Correlation of subchondral bone changes with disease activity, severity:

		VAS	DAS ٢٨	HAQ	Functional class
BME	r	٠.٣٥١	٠.٤٠٢	٠.٣٠٩	٠.١٢٦
	p	٠.٠٤٨	٠.٠٢٨	٠.٠٩٧	٠.٥٠٨
BME score	r	٠.٠٥٦	٠.٠٣٧	٠.٢٢٢	-٠.٠١٦
	p	٠.٠٤٤	٠.٠٤٦	٠.٠٢٠	٠.٩٣٣
Erosion	r	٠.٤٦٧	-٠.٤٥٣	٠.٥٥٢	٠.٤٨٣
	p	٠.٠٠٩	٠.٠١٢	٠.٠٠٣	٠.٠٠٧

Discussion

MRI provides a means to view the subchondral trabecular bone underneath the rheumatoid joint, an area that previously was largely invisible[٥]. Considerable evidence now suggests that rheumatoid erosions may also develop 'from the inside out', and attention is now being paid to the subchondral bone as an important site of pathology. This, in turn, has raised the question of whether the bone marrow could be implicated in this disease, with the alarming but exciting prospect that a complete conceptual overhaul is required[٦].

Study population includes ٣٠ RA patients subdivided according to disease duration into group I: early RA: less than ٢ years and II: late RA: more than ٢ years.

Our results revealed higher BME score in early than late RA (P=٠.٠١٨), these results agree with Axelsen et al., ٢٠١٥[٧] who found elevated BME score in early stages of RA.

In agreement with our results McQueen et al., ٢٠٠٧ discovered that BME score was positively correlated with pain score (VAS) (p=٠.٠٤٦)[٨]. Our results agree with Tamai et al., ٢٠٠٧ that DAS ٢٨ was positively correlated with BME score[٩]. Finally, our study agrees with Burgers et al., ٢٠١٦ who found that BME score was positively correlated with HAQ[١٠].

In conclusion: this study suggests that bone resorption is higher in early stages of RA and that BME was positively correlated with VAS and DAS-٢٨.

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