Research Article

Subchondral Bone Changes in Early Versus Late Osteoarthritis

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Abstract

Background: Osteoarthritis (OA) is the most common joint disorder, characterized by focal loss of cartilage and increased subchondral bone remodeling at early OA stages of the disease. **Aim of the work**: To detect subchondral bone changes by MRI and level of in early versus late osteoarthritis. **Methods**: ٣٠ patients diagnosed as OA with age ranged between ٢٧-٧٥ years, the patients further subdivided into early and late OA according to Kellgren and Laurence grading, all patients subjected to through history taking and full examination, plain x ray knees PA view, MRI on the most severely affected knee joint. **Results**: there was significant difference between subgroups regarding BME, BME score, attrition and osteophytes (P =٠.٠٤٥, p<٠.٠٠٠١, p=٠.٠٠٥ and p=٠.٠١ respectively). **Conclusion:** BME presence and BME score were more common in early than late OA but present in both while attrition, subchondral cyst and osteophytes were more common in late OA.

Keywords: Osteoarthritis – BME- MRI.

Introduction

Osteoarthritis (OA) is the most common joint disorder, characterized by focal loss of cartilage and increased subchondral bone remodeling at early OA stages of the disease[١]. There are many trials demonstrated that the presence of bone marrow lesions (BMLs) are closely related for structural deterioration in knee OA. Roemer et al., attributed subchondral bone attrition to BMLs[٢]. BMLs adjacent to the subchondral plate have been shown to have increased bone volume fraction and increased trabecular thickness, but reduced tissue mineral density, consistent with OA being associated with increased bone turnover. Both subchondral bone abnormal-lities are associated with cartilage loss as well[٣]. Crema et al., also indicated that subchondral cysts arise at the same site as BMLs[٤]. Clinical studies have reported BMLs in both patients with early asymptomatic OA and in those with severe late-stage OA[٢, ٥].

Aim of the work

To detect subchondral bone changes by MRI and level of in early versus late osteoarthritis.

Patients and methods

٣٠ patients (٢٣ female, ٧ males) who fulfilling Arthritis Rheum ١٩٨٦ OA classification criteria, with permission from ACR, 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 ٥٠.٠٠±١٢.٩٤ (range ٢٧-٧٥ years) and the mean of disease duration was ٣.٧٤±٣.٣٢ years (range ٠.٢٥-١٢ years). OA patients were classified into ٢ groups: I: early OA, II: late RA according to Kellgren and laurence scale. Excluded from the study other established diagnostic entities other than OA, osteoarthritis with co-morbid endocrine, metabolic or major organ impairment. The nature of the study was explained to all patients. 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. X ray knees PA view were ordered in all the patients, MRI of knees was performed for 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.

Results

Demographic data of the studied population:

Osteoarthritis patients' age ranged between ٢٧ and ٧٥ years, the mean of age was ٥٠.٠٠±١٢.٩٤ years and disease duration ranged between ٠.٢٥-١٢ years, the mean of was ٣.٧٤±٣.٣٢ years**.**

Subchondral bone changes by MRI in OA patients:

Table ١ demonstrates MRI subchondral bone changes in knee joint in OA group where BME present in ٥٣.٣٪ of cases and BME score was ٢.٨٦±٣.٤٩ while attrition was present in ٧٠٪, osteophytes in ٧٣.٣٪ and subchondral cyst in ٤٠٪ of cases.

Subchondral bone changes by MRI in both groups:

Table ٢ demonstrates MRI findings in both groups where there was statistically significant difference regarding bone marrow edema, BME score, bone attrition, osteophytes (P =٠.٠٤٥, p<٠.٠٠٠١, p=٠.٠٠٥ and p=٠.٠١ respectively).

Table ١: Frequency of subchondral bone changes by MRI in OA group:

MRI findings	OA patients n=٣٠
BM edema	١٦ (٥٣.٣٪)
BME score	٢.٨٦±٣.٤٩
Bone attrition	٢١ (٧٠٪)
Osteophytes	٢٢ (٧٣.٣٪)
Subchondral cyst	١٢ (٤٠٪)

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

MRI findings	Group I (early OA)	Group II (late OA)	χ^2	P value
BM edema	١١ (٧٣.٣٪)	٥ (٣٣.٣٪)	٣.٣٩٤	٠.٠٤٥
BME score	٠-١٣ ٧.٤٠±٤.٤٢	٠-٤ ١.١٣±١.٥٩	٣.٠٩٦	<٠.٠٠٠١
Subchondral cyst	٤ (٢٦.٦٪)	٨ (٥٣.٣٪)	٢.٢٢٢	٠.١٣٦
Bone attrition	٧ (٤٦.٦٪)	١٤ (٩٣.٣٪)	٧.٧٧٨	٠.٠٠٥
Osteophytes	٨ (٥٣.٣٪)	١٤ (٩٣.٣٪)	٦.١٣٦	٠.٠١

Discussion

Osteoarthritis (OA) is a low-grade inflammatory disease of synovial joints and the most common form of arthritis[٦]. There are well described changes that are observed in both articular cartilage and subchondral bone in OA[٧]. Changes in the bone include sclerotic changes, thinning of articular cartilage, thickening of the subchondral plate and subchondral cortical thickness, osteophyte formation, advancement of tidemark associated with vascular invasion of the calcified cartilage and the development of bone marrow lesions and bone cysts in the subchondral compartment [٨].

Focal changes in the subchondral bone, termed bone marrow lesions (BMLs), are features detected by magnetic resonance imaging (MRI) that have been reported to be closely associated with the severity of symptoms of OA such as pain and osteochondral unit degeneration (e.g., loss of the overlying cartilage) [٩,١٠].

Study population was divided according to Kellgren and Laurence grading scale into ٢ groups: group I: early OA; grade ١ and ٢ K&L, group Π: late RA; grade ٣ and ٤ K&L

Our study revealed that there was a statistically significant difference between both groups regarding MRI findings where there was statistically significant difference regarding bone marrow edema, BME score, bone attrition, osteophytes (P=٠.٠٤٥, p< ٠.٠٠٠١, p=٠.٠٠٥ and p=٠.٠١ respectively).

In a study done by Bassiouni et al., ٢٠١٠, BME was present in ١٤ patients (٤٦٪) with OA, and this percentage is close to our percentage which is ٥٣.٣٪ of OA patients[١١].

There is no previous studies addressed the comparison between early and late OA regarding MRI subchondral bone changes.

Conclusion

This study suggests that BME and BME were higher in early than late OA while subchondral cyst, bone attrition and osteophytes were common in late than early OA.

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