

ORIGINAL ARTICLE

Evaluation of cartilage abnormalities in patients with osteoarthritis of knee: A Magnetic Resonance Imaging Study

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ABSTRACT:

Background: Magnetic resonance imaging (MRI) has become the imaging modality of choice in both clinical and research settings of musculoskeletal diseases, in particular osteoarthritis (OA), a chronic joint disease characterized by destruction and progressive loss of articular cartilage and clinical symptoms including pain, stiffness and impaired function. Hence; the present study was conducted with the aim of evaluating cartilage abnormalities in patients with osteoarthritis of knee. **Materials & methods:** Sample size for the present study included 15 OA of knee patients. A self-framed questionnaire was made and complete demographic details and clinical data of all the patients were analysed. Also, complete clinical examination of all the patients was carried out. MRI was done in all the patients. Grading of Cartilage abnormalities was done as follows: Grade 0 → normal; Grade I → internal signal intensity alteration only; Grade IIA → defect of cartilage of less than 50%; Grade IIB → defect of cartilage of 50%–99%; Grade IIIA → 100% defect of cartilage with no bone ulceration; and Grade IIIB → 100% defect of cartilage with subjacent bone ulceration.. **Results:** 33.33 percent of the patients each were of Grade III A and II B respectively. 13.33 percent of the patients were of grade II A. Therefore; majority of the patients, on MRI examination were of Grade IIB and IIIA. **Conclusion:** For assessing the bony and soft tissues of knee as a whole organ, MRI plays an important role.

Key words: Cartilage, MRI, Osteoarthritis

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This article may be cited as: Kumar A, Khandelwal A. Evaluation of cartilage abnormalities in patients with osteoarthritis of knee: A Magnetic Resonance Imaging Study. J Adv Med Dent Sci Res 2017;5(3):150-153.

INTRODUCTION

Magnetic resonance imaging (MRI) provides high-spatial-resolution, multiplanar imaging and excellent tissue contrast. This enables a three-dimensional assessment of all components of the joint simultaneously, allowing direct visualization of articular cartilage.^{1,2} With the advances in techniques and development of dedicated sequences, MRI has become the imaging modality of choice in both clinical and research settings of musculoskeletal diseases, in particular osteoarthritis (OA), a chronic joint disease characterized by destruction and progressive loss of articular cartilage and clinical symptoms including pain, stiffness and impaired function.³

Several studies comparing the value of cartilage diagnostics on MRI to intra-operative findings present very different results. In a large part of the studies, diagnostic values of MRI were assessed by collapsing several grades of cartilage disorders into a disease positive and a disease negative status. This simplification mostly does not correspond to surgeons' demands of an exact staging of cartilage disorders.⁴⁻⁶

Hence; the present study was conducted with the aim of evaluating cartilage abnormalities in patients with osteoarthritis of knee.

MATERIALS & METHODS

The present study was conducted with the aim of evaluating cartilage abnormalities in patients with osteoarthritis of knee. Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol. Sample size for the present study included 15 OA of knee patients. A self-framed questionnaire was made and complete demographic details and clinical data of all the patients were analysed. Also, complete clinical examination of all the patients was carried out. MRI was done in all the patients. Grading of Cartilage abnormalities was done as follows:⁷

Grade 0 → normal;
Grade I → internal signal intensity alteration only;
Grade IIA → defect of cartilage of less than 50%;
Grade IIB → defect of cartilage of 50%–99%;

Grade IIIA → 100% defect of cartilage with no bone ulceration; or

Grade IIIB → 100% defect of cartilage with subjacent bone ulceration.

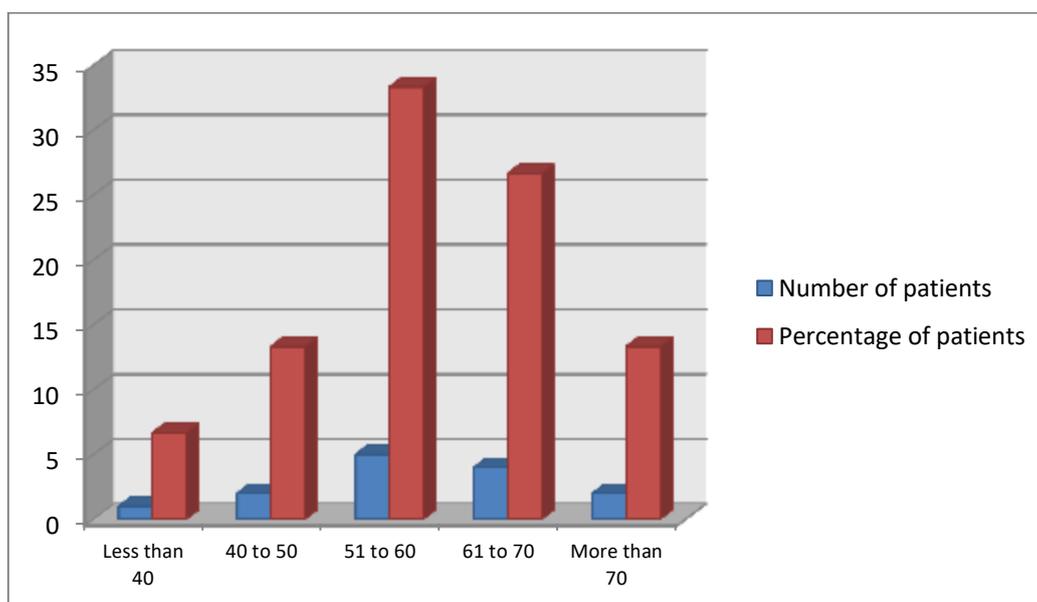
All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. Chi- square test was used for assessment of level of significance.

RESULTS

In the present study, assessment of 15 OA knee patients was done. MRI was carried in all the patients.

Majority of the patients (33.33 percent) belonged to the age group of 51 to 60 years. 26.67 and 6.67 percent of the patients belonged to the age group of 61 to 70 years and less than 40 years. Mean age of the patients was found to be 55.9 years. 60 percent of the patients of the present study were males while the remaining were females. 33.33 percent of the patients each were of Grade III A and II B respectively. 13.33 percent of the patients were of grade II A. Therefore; majority of the patients, on MRI examination were of Grade IIB and IIIA.

Graph 1: Age-wise distribution of patients



Graph 2: Gender-wise distribution of patients

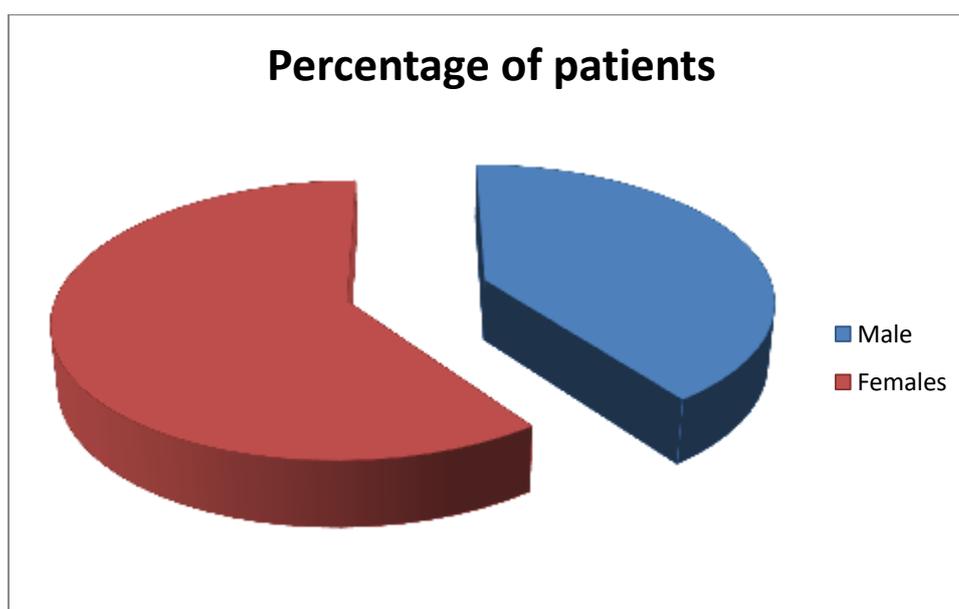


Table 1: Distribution of patients according to cartilage abnormality (On MRI)

Grade (On MRI)	MRI Findings	Number of patients	Percentage of patients
Grade 0	Normal	1	6.67
Grade I	Intense signal intensity alteration	1	6.67
Grade II A	Defect of cartilage of less than 50%	2	13.33
Grade II B	Defect of cartilage of 50% to 99%	5	33.33
Grade III A	100% defect of cartilage with no bone ulceration	5	33.33
Grade III B	100% defect of cartilage with subjacent bone ulceration.	1	6.67
Total		15	100

DISCUSSION

OA was conventionally deemed to be a degenerative disease driven by articular cartilage “wear and tear,” recent evidence has led to a new view that OA pathophysiology should be perceived in the context of the entire joint with involvement of several tissues. OA is now understood to be the result of an imbalance between catabolic and anabolic activities in joint tissue, eventually leading to permanent tissue degradation, pain, physical disability and psychological distress.⁶⁻⁹

In the present study, assessment of 15 OA knee patients was done. MRI was carried in all the patients. Majority of the patients (33.33 percent) belonged to the age group of 51 to 60 years. 26.67 and 6.67 percent of the patients belonged to the age group of 61 to 70 years and less than 40 years. Mean age of the patients was found to be 55.9 years. 60 percent of the patients of the present study were males while the remaining were females. Eckstein F reviewed the current status of morphological assessment of cartilage with quantitative MRI (qMRI), and its relevance for identifying disease status, and monitoring progression and treatment response in knee osteoarthritis (OA). An international panel of experts in MRI of knee OA, with direct experience in the analysis of cartilage morphology with qMRI, reviewed the existing published and unpublished data on the subject, and debated the findings at the OMERACT–OARSI Workshop on Imaging technologies (December 2002, Bethesda, MA) with scientists and clinicians from academia, the pharmaceutical industry and the regulatory agencies. Their report reviewed (1) MRI pulse sequence considerations for morphological analysis of articular cartilage; (2) techniques for segmenting cartilage; (3) semi-quantitative scoring of cartilage status; and (4) technical validity (accuracy), precision (reproducibility) and sensitivity to change of quantitative measures of cartilage morphology. Semi-quantitative scores of cartilage status have been shown to display adequate reliability, specificity and sensitivity, and to detect lesion progression at reasonable observation periods (1–2 years). Quantitative assessment of cartilage morphology (qMRI), with fat-suppressed gradient echo sequences, and appropriate image analysis techniques, displays

high accuracy and adequate precision (e.g., root-mean-square standard deviation medial tibia = 61 μ l) for cross-sectional and longitudinal studies in OA patients. Longitudinal studies suggest that changes of cartilage volume of the order of –4% to –6% occur per annum in OA in most knee compartments (e.g., –90 μ l in medial tibia). Annual changes in cartilage volume exceed the precision errors and appear to be associated with clinical symptoms as well as with time to knee arthroplasty.⁹

In the present study, 33.33 percent of the patients each were of Grade III A and II B respectively. 13.33 percent of the patients were of grade II A. Therefore; majority of the patients, on MRI examination were of Grade IIB and IIIA. Shah D et al determined the role of the magnetic resonance imaging (MRI) in patients with atraumatic knee pain. A prospective study was carried out on 150 patients over a period of 2 years from June 2011 to May 2013. Patients having fracture or dislocations of the knee joint were also excluded from the study. Detailed clinical history, physical and systemic examination findings of all patients were noted in addition to the laboratory investigations. All patients were subjected to radiograph of knee anterior-posterior and lateral view. MRI was performed with Siemens 1.5 Tesla MAGNETOM Avanto machine. In their study of 150 patients with knee pain, articular cartilage defect was found in 90 patients (60%). Out of 90 patients with articular cartilage defect, 30 patients (20%) had full thickness cartilage defects. Subchondral marrow edema was seen beneath 30 patients (20%) with articular cartilage defects. 32 patients (21.1%) had a complex or macerated meniscal tear. Complete anterior cruciate ligament tear was found in seven patients. Joint effusions were detected in 70% (105) of the knees. Large Baker cysts were observed in 6.1% of the knees. In conclusion, individual with acute or chronic knee pain without any definite history of trauma should be subjected to MRI study of the knee provided radiographs are non-informative or non-diagnostic. The study not only outlines the tendons, ligament and cartilage status, but also demonstrates subtle underlying bony pathologies causative for patient complaints.¹⁰

CONCLUSION

Under the light of above obtained results, the authors conclude that for assessing the bony and soft tissues of knee as a whole organ, MRI plays an important role.

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