



## A Prospective Observational Magnetic Resonance Imaging Study in Early Osteoarthritis of Knee in Middle Aged Patients.

## KEYWORDS

Knee Osteoarthritis, MRI scan, early diagnosis

**Dr Pranav Kumar**Department of Radiodiagnosis, KGMU, Lucknow, India  
PIN-226003**Dr Anit Parihar**Department of Radiodiagnosis, KGMU, Lucknow, India  
PIN-226003**Dr Saurabh Kumar**Department of Radiodiagnosis, KGMU, Lucknow, India  
PIN-226003**Dr Neera Kohli**Department of Radiodiagnosis, KGMU, Lucknow, India  
PIN-226003**ABSTRACT**

**Background and objective of the study:** Osteoarthritis (OA) is one of the most prevalent chronic conditions affecting older adults (1). Magnetic resonance (MR) imaging provides a unique capability to detect early changes of osteoarthritis (2). The aim was to study the early changes in osteoarthritis on MR as defined by a Kellgren-Lawrence score (KL) of  $\leq 3$ .

**Materials and Methods:** This prospective study included 50 cases of early osteoarthritis (Kellgren-Lawrence score  $\leq 3$ ) upto 50 years of age. Each knee was assessed globally according to Whole Organ Magnetic Resonance Imaging Scoring Method (WORMS)

**Results :** Medial Femoro-tibial (MFT) compartment showed abnormalities in 96% of the knees. 88% of knees showed cartilage abnormalities.. Ninety-six percent of knees showed osteophytes. Eighty-four percent of the knees showed meniscal abnormalities.

**Conclusion:** Medial femoro-tibial compartment was most frequently involved in early osteoarthritis of knee joint rather than the patellofemoral compartment as reported in western literature. There was high incidence of meniscal changes in patients of osteoarthritis.

**Introduction**

Osteoarthritis (OA) is one of the most prevalent and disabling chronic conditions affecting older adults (1). Radiographically observed abnormalities in OA often correlate imperfectly with clinical symptoms. Recent focus on the development of disease-modifying therapeutic agents for OA has emphasized the need for imaging techniques capable of depicting relevant early abnormalities of OA. The cross-sectional image display, spatial resolution, and tissue contrast of magnetic resonance (MR) imaging provide a unique capability to display bone, cartilage, and soft-tissue abnormalities that is necessary for whole-organ assessment of the knee (2).

The aim was to study the early changes in osteoarthritis on MR as defined by a Kellgren-Lawrence score (KL) of  $\leq 3$  (3).

**Materials and Methods**

This prospective study was conducted over one year period in 50 clinico-radiologically diagnosed cases of early osteoarthritis (Kellgren-Lawrence score  $\leq 3$ ) upto 50 years of age according to American Rheumatism Association Criteria, which is as follows (4).

Osteophytosis

Knee pain

Age &gt;40 yrs

Joint stiffness &lt;30 minute

Crepitus

For diagnosing osteoarthritis presence of 1, 2 and one of 3, 4 or 5 is essential. Institutional ethics committee approval

was obtained.

**Exclusion criteria:****Patient with at least one absolute contraindication-**

- Claustrophobia.
- Noncooperative patient
- Patients with obvious inflammation
- Secondary osteoarthritis e.g. trauma, operated knee joint
- Inflammatory arthritis eg. rheumatoid arthritis
- Morning stiffness >1 hr in hand joints
- Diseased ipsilateral hip joint
- Fibromyalgia
- Depression
- Local wound/ulcer around knee joint
- Peripheral neuropathy

In all patients, radiographs of the knee were obtained in PA view. Our study population was graded by KL scores according to the severity of osteoarthritis as diagnosed on X-ray features. 3 patients (6%) were diagnosed as having a KL score of 1, 27 patients (54%) had a KL score of 2 and rest 20 patients (40%) of study population had a KL score of 3.

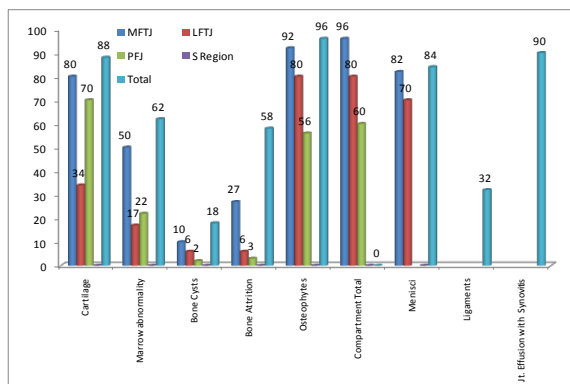
In addition, MR imaging of the knee was performed with a 1.5-T MR imager (Signa; GE Medical Systems, by using a quadrature receiver knee coil for signal reception. Each **knee** was assessed globally according to Whole Organ Magnetic Resonance Imaging Scoring Method (WORMS) (4)

**Results:**

Medial Femoro-tibial(MFT) compartment showed abnormalities in 96% of the knees. 88% of knees showed cartilage abnormalities. This was most frequent (80%) in the MFTJ, but involvement of the Patello femoral joint (PFJ) was also very common (70%). In Lateral Femorotibial joint (LFTJ) osteophyte formation was the most common abnormality. Synovitis and effusion were noted in 90% of patients including the Spinous (S) compartment. (Table 1 about here) **Table 1**

	MFTJ	LFTJ	PFJ	Total
Cartilage	80	34	70	88
Marrow abnormality	50	17	22	62
Bone Cysts	10	6	2	18
Bone Attrition	27	6	3	58
Osteophytes	92	80	56	96
Compartment Total	96	80	60	0
Menisci	82	70		84
Ligaments				32
Jt. Effusion with Synovitis				90
Total				100

**Figure 1**  
**PERCENT INVOLVEMENT**



Ninety-six percent of knees showed osteophytes. It was most common in MFTJ about 92%. Sixty two percent of knees showed bone marrow abnormality, most commonly in the MFTJ (50%). Bone cysts were present in 18% of knees, most commonly in the MFTJ (10%), and bone attrition was present 58 % of the time, most commonly in the MFTJ (27%) (Figure 1 about here).

Eighty-four percent of the knees showed meniscal abnormalities. Abnormalities were more common in the medial meniscus (82%). Lateral meniscal injury were noted in (70%) of knees. Ligament injuries were seen in 32 % of knees most commonly in Anterior Cruciate Ligament (ACL).

Synovial distension was present in 90% of the patients, two subjects had popliteal cysts. Both of these were of grade 2. Loose bodies were observed in only three patients out of fifty patients. Synovial cysts were noted in 18% of patients. Edema in medial head of gastrocnemius muscle was noted in one patient. We also assessed the synovitis separately and it was found in 40% of total patients of OA.

**Discussion**

MRI is an excellent diagnostic modality for evaluation of patients of osteoarthritis of knee joint. It accurately defines the extents of bony and soft tissue changes in knee joint.

With the help of MRI we were able to correlate objective imaging findings in osteoarthritis and clinical subjective symptoms of the patients. Different grades and types of structural abnormality in the various anatomical compartments of the knee can be comprehensively analyzed, and associated with pertinent clinical features (4).

About 88% patients of our study group showed presence of cartilage defects, the medial tibiofemoral compartment being more commonly involved than the patellofemoral compartment. Hayes et al reported that maximum number of cartilage defects was seen in patellofemoral (4). Study done by Peterfy et al showed that cartilage defect was more prevalent in patello femoral compartment and next common site was the medial tibio femoral compartment(4).

In other studies described in literature which were conducted in western population, it was the patellofemoral compartment which was more frequently and more severely involved. This difference could be explained, since Indian population is accustomed for sitting in squatting posture. Prolong squatting, kneeling and climbing stairs have been associated as a risk factor for osteoarthritis of knee joint. Squatting has been described as a risk factor for tibiofemoral osteophytosis. Prolonged squatting has been associated with development of osteoarthritis of knee joint in tibiofemoral compartment but only slightly associated with development of osteoarthritis in patellofemoral compartment (5). There are atleast two mechanisms to support this –prolonged squatting or kneeling predisposes to meniscal and ligamentous damage which is again a risk fact for osteoarthritis of knee joint(5).

Ninety six percent of knees included in this study had osteophytes most commonly in Medial femoro tibial compartment (92% cases) where as the Lateral femoro tibial compartment was involved in 80% of cases. In previous study done by Peterfy et al that showed the most common site of osteophytes was medial femoro tibial compartment (4). Our study also showed the similar results but second most common site of occurrence of osteophytes was the Lateral femorotibial compartment in our study instead the patellofemoral compartment noted in the study done by Peterfy et al (4).

We assessed areas of the abnormal MRI signals in subarticular marrow of osteoarthritic knees. The most common site of bone marrow abnormality in our study was medial femoro tibial compartment and 50% of total patients showed bone marrow abnormality in medial femoro tibial compartment. The next most common site was patella femoral compartment it was found to be involved in 22% of patients. In the study conducted by the Peterfy et al; the distribution of BMA in the medial, lateral, and patellofemoral compartments was 35%, 17%, and 16%, respectively and medial femoro-tibial compartment was the most common site showing bone marrow abnormality (4). Felson reported that these changes were highly predictive of subsequent ipsilateral cartilage loss in the knee, and that their presence identify most knee as risk for progression. In our study also showed the significant association between cartilage loss and ipsilateral bone marrow abnormalities (6).

In our study we have assessed the joint effusion and synovial thickening together, in WORMS Joint effusion and synovial thickening are graded together). In the literature a controversy exists about the association between joint effusion and knee pain. Hill et al. found that moderate and

severe effusions (grade 2 and 3) were significantly more common among those with knee pain compared to those without in patients with knee OA (6) but Link et al. reported no significant association between the presence or the amount of joint effusion and clinical features. They did, however, find a trend toward higher pain scores in patients with joint effusion (2).

In our study the mediotibiofemoral joint showed more incidences of subchondral cysts and bone attrition. Peterfy et al reported that majority of subchondral bone cysts were seen in patellofemoral joint and bone attrition was noted in patellofemoral compartment (3).

Medial meniscus injury was observed in 82% of total cases and Lateral meniscus injury was seen in 70% of total cases. Thus we found that meniscal injuries are also common in osteoarthritis and our study showed that medial meniscal injury was more common than lateral meniscal injuries. The same finding has been reported by Hayes et al (7)

In our study the ligament injuries were noted in (64% of total cases), and in 50% of the patients Anterior Cruciate ligament injury was seen whereas posterior cruciate ligament injury seen in 14% total cases. There were no collateral ligament injuries seen in study population.

Synovial cysts were noted in 18% of patients .the grade 1 subchondral cysts were noted in 12% of patients and grade 2 in 6% of patients. Loose bodies were observed in only three patients out of fifty patients.

### Conclusion

Medial femoro-tibial compartment was most frequently involved in early osteoarthritis of knee joint rather than the patellofemoral compartment as reported in western literature. There was high incidence of meniscal changes in patients of osteoarthritis.

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