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Original Research Article

Is Indian osteoarthritis different? Emerging scenarios of disease pattern and implications for diagnosis and treatment of osteoarthritis in India

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ABSTRACT

Background: There are many studies to show comparative cartilage wear of medial and lateral compartment of knee. However, there are no studies in Indians that compare relative cartilage loss between femur and tibia.
Methods: 44 patients with osteoarthritic knee at our center were posted for operative intervention in the form of partial or total knee arthroplasty and included in this study. Each patient had a magnetic resonance imaging (MRI) (cartogram) and weight bearing X-rays of the same knee. Intraoperative qualitative cartilage loss both femoral and tibial surfaces was observed and confirmed with preop findings of cartilage loss on X-ray or MRI.
Results: The wear or loss of cartilage in 44 patients in femur is approximately twice that of tibia.
Conclusions: Femoral cartilage loss is significantly more than tibia in Indians. These findings carry significance of not waiting for bone on bone arthritis to consider active treatment for Indian osteoarthritis patients. Bone on bone arthritis has so far been considered the litmus test for any intervention for osteoarthritis, even in India. Specific attention should rather be given to the femoral condyle clinically and radiologically. The authors have already described "The Dervan RIM sign" for the same purpose. The wear pattern is different from Caucasians and focus cannot be on joint space narrowing which is only with equally prevalent tibial and femoral cartilage wear.

Keywords: Knee osteoarthritis, Cartogram, Radiology, Wear, Femoral, Tibial, Cartilage

INTRODUCTION

Osteoarthritis of the knee represents a major burden on the quality of life of elderly people and on the economics of today's healthcare systems.[1,2] The disease is characterized by a loss of articular cartilage and changes in non-cartilage tissues, such as bone, ligaments, menisci and synovium. As cartilage tissue could not be quantified by non-invasive means until recently, information on cartilage loss in osteoarthritis has been sparse and has been based primarily on indirect evidence from joint space width measurements in radiographs. Several studies have now established that quantitative magnetic resonance imaging (MRI) allows measurement of the morphology of articular cartilage with high accuracy and precision.[3,4] Along with appropriate clinical (tenderness-over the femur, tibia, medial/ lateral/anterior joint line), radiological (X-ray viz the Dervan Rim Sign and MRI), and intraoperative assessment of cartilage loss .

Adequate accuracy and precision has also recently been confirmed for patients before knee arthroplasty.[4,5] Epidemiological research has identified numerous risk factors associated with osteoarthritis in various joints of

the body.[6,7] In the knee, mal-alignment (valgus/varus) appears to be associated with a higher prevalence and progression of osteoarthritic changes in the relevant compartment particularly in association with obesity.[8,9] This probably reflects the alteration in load distribution in the knee, with higher loads being transmitted across the medial femoro-tibial compartment in varus malalignment, and higher loads across the lateral femorotibial compartment in valgus malalignment.[10] On the basis of measurements of joint space width in radiographs, patients with varus osteoarthritis appear to show a four-fold greater rate of progression of cartilage loss in the medial femoro-tibial compartment, and patients with valgus osteoarthritis show a five-fold greater progression rate in the lateral femoro-tibial compartment.[8] A recent MR imaging study has found greater cartilage volume loss in the medial femoro-tibial compartments of patients with moderate symptomatic osteoarthritis and varus malalignment, and a greater loss in the lateral compartment in patients with valgus malalignment.[9]

However, racial cultural or custom or habits to drive importance to get early knee symptoms of OA Knee. However, this is a generalization, no paper has quantified and compared femoral vs tibial cartilage wear. Further every culture races its own effects on this differential wear due to its specialized subset of activities. That is knee bending, squatting, cross legged sitting has different impact on knees. Unfortunately, in India, we still continue to follow the diagnostic and radiological criteria. as followed in the west viz Lawrence and Kellegren classification etc. These criteria have been developed more than fifty years ago and for patient groups which have completely different habits and knee use cultures. The western criteria rely on loss of joint space as the primary criteria, which with a patent tibial cartilage and menisci (commonly present even in moderately affected Indian knees), will fail to show early or even moderate changes of osteoarthritis of the Indian knees.

We felt that the Indian sub group of patients had completely different cultural habits with activities like sitting cross legged, squatting and use of the Indian toilet, and therefore should have different wear patterns. The objective of this prospective study is to use quantitative MR imaging for analyzing cartilage loss of tibial and femoral surfaces as well as the measurement of radiological height in the femoral and tibial articular surfaces in patients with osteoarthritis before knee arthroplasty, and verifying the same during arthroplasty, in the hope that it will provide guidance to proper diagnosis and hence management.

Lawrence and Kellgren classification is the primary radiological-based classification of osteoarthritis of knee.[11,12] Based on joint space narrowing (JSN) Grade 0: no radiographic features of OA are present. Grade 1: doubtful joint space narrowing (JSN) and possible osteophytic lipping. Grade 2: definite osteophytes and possible JSN on anteroposterior weight-bearing radiograph. Grade 3: multiple osteophytes, definite JSN, sclerosis, possible bony deformity. Grade 4: large osteophytes, marked JSN, severe sclerosis, and definite bony deformity.

METHODS

This was a prospective study. The study period was from March to November 2019. 44 patient subjects (male and female in equal number) with an age range between 56 to 74 years, with a spectrum of radiological knee osteoarthritis (OA) at our center (which is a tertiary-health care setup attached to a BKL Walawlar Rural Medical College situated in Western Maharashtra, India) who were planned for operative intervention in the form of partial or total knee arthroplasty, were included in this study. Each subject had an MRI (cartogram) and a radiographical examination performed with a weightbearing antero-posterior view in extension on the same knee. In the cartogram, femoral and tibial wear was measured and in the antero-posterior knee radiographs, we measured the height of the "Dervan rim sign" (femoral cartilage loss and tibial cartilage loss).[13] The findings were then tabulated. And microsoft excel was used to compute data and calculate value accordingly.

The study also observed the cartilage loss for both femoral and tibial surfaces intraoperatively.

Inclusion criteria

Non traumatic osteoarthritic knees, radiographs which had a positive "Dervan Rim Sign", and Indian ethnicity.

Exclusion criteria

Post-traumatic osteoarthritis knees, inflammatory, and infective arthropathy.

Figures 1 and 2 are showing T2 weighted MR images (cartogram) showing femoral and tibial cartilage mapping (cartilage wear or loss).

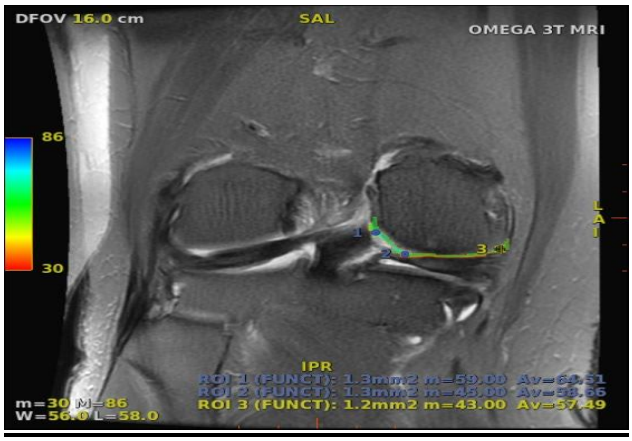

Figure 1: Femoral cartilage wear.

Figure 2: Tibial cartilage wear.

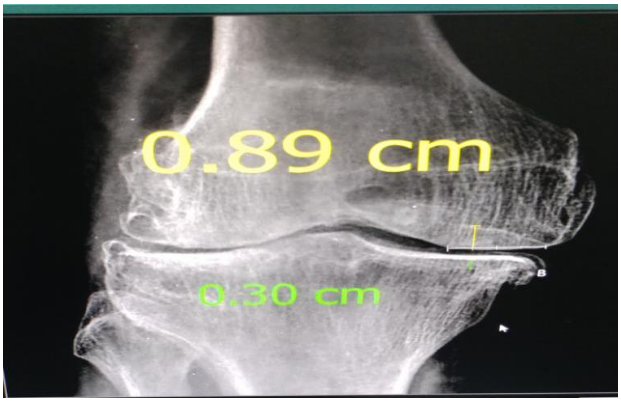

Figure 3: Radiographic height of Dervan rim sign measurement (subchondral lucency).

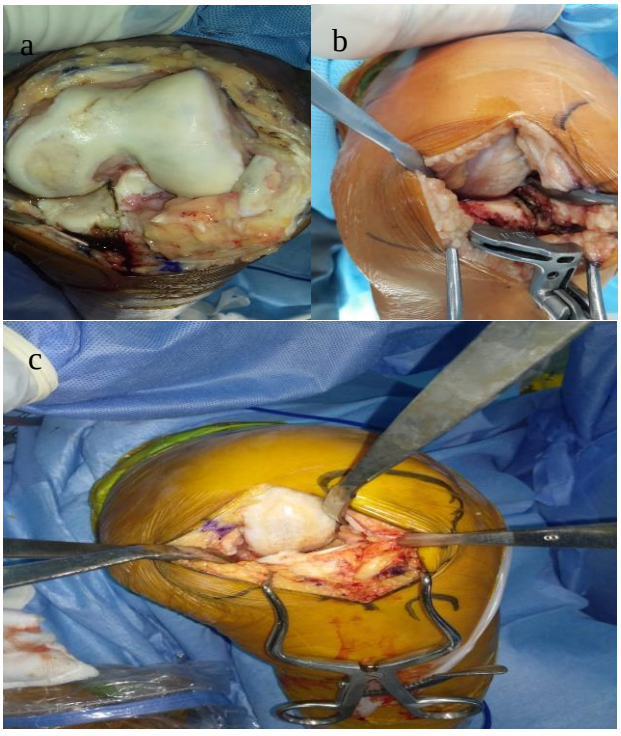

Figure 4 (a-c): Intraoperative pictures showing femoral cartilage wear more than tibial.

RESULTS

In our study of 44 patients with osteoarthritic knees, we observed that there were 22 males and 22 females. The mean femoral cartilage loss/wear as measured by the MRI cartogram was 86.04 whereas that of tibial cartilage was 73.22 which shows that femoral wear in our cross-section of patients was more. The mean radiographic height of subchondral lucency (Dervan rim sign) of the femoral surface in our group of patients was 0.87 cm whereas that of tibial was 0.27 cm which showed that femoral wear was more.

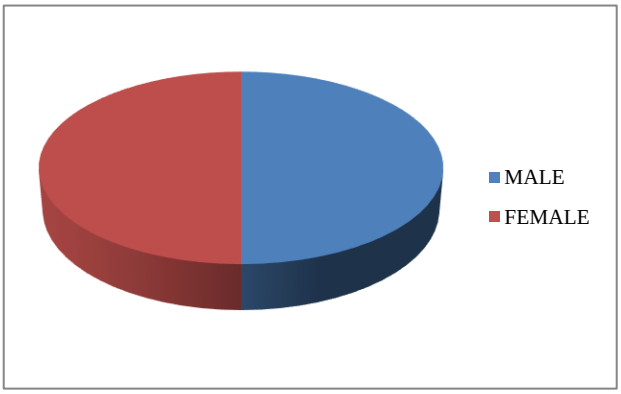

Figure 1: Sex distribution.

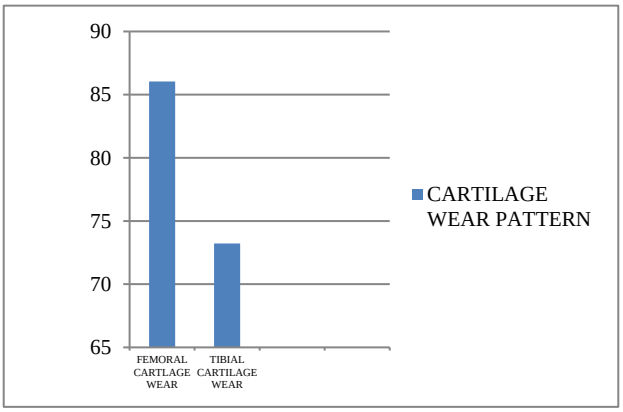

Figure 2: On cartogram cartilage wear pattern.

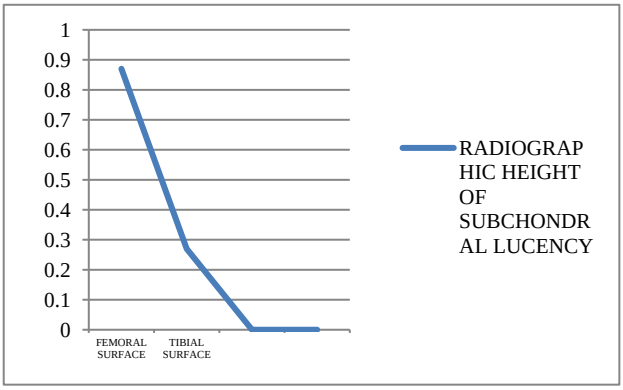

Figure 3: Radiographic height of subchondral lucency (cm).

DISCUSSION

As highlighted in above results, there is strong correlation between presence of medial femoral and tibial condyle cartilage loss and presence of radiological rim sign.[13] In our study, it has been observed that there is a difference in the cartilage loss pattern between those patients of Indian ethnicity and that of the Caucasian population. A study by Forbell et al suggests that there is more loss of cartilage over medial tibial condyle as compared to femoral condyle in the Caucasian population.[14,15] Numerous studied by Eckstein et al also have similar observation in their study which are in direct contrast to the femoral-condylar cartilage loss as observed by our study.[16-25]

The data from MRI cartogram in Indian population ultimately showed that femoral cartilage loss was more compare to tibia. Both femur and tibia have almost similar cartilage thickness although there is substantial personal variability, the loss of lower end of medial femoral cartilage is almost twice that of tibia, as seen on MRI cartograms and verified by intraoperative observations.[26,27]

Nevertheless, in all our cases, in the MRI studies as well as intraoperative assessment of cartilage loss showed a propensity towards qualitative femoral wear loss more than tibial wear loss. This presents a significant new finding to the individualization of disease patterns and modification of diagnosis and treatment. Patients can now be diagnosed earlier and physiotherapy started as soon as possible, in order to prevent progress of disease.

Standard radiological classifications may miss this arthritic sign of the medial femoral condyle if they continue to rely only on bone on bone radiological contact as the only sign of advanced arthritis and surgical intervention thus delaying treatment to needy patients.

All 44 patients are of Indian ethnicity and Indian patients have different habits involving deep knee flexion (sitting cross legged, squatting). Possible reasons for the increase in femoral wear pattern in our study could be a different genetic pool, weight (obesity) and habits of deep flexion (squatting) which involve knee bending more than 90-100° in day-to-day living. Most Asian populations have habits similar to Indians - in terms of sitting cross legged and squatting, hence in such populations in early OA, there were changes both radiologically and morphologically- in the femoral side more than the tibial side.[28]

An associated spinal affliction of forward bending at L4-5 can also cause weakness of hip abductors and added varus stress at knee during walk which could further aggravate the deformity and cause a mild Trendelenburg gait.[29]

CONCLUSION

With above results and discussion, we can conclude that on the basis of the following three parameters: radiological height in femoral and tibial wear surfaces (Dervan rim sign), femoral and tibial wear as per MRI cartogram and intraoperative assessment of patient, that the femoral wear pattern is more than tibial wear pattern in Indian population. This could be due to culture habits and deep knee bending activities. These findings carry significance of not waiting for bone on bone arthritis to consider active treatment in Indian OA patients. Specific attention should be more on the femoral condyle clinically and radiologically to start appropriate treatment as early as possible.

Our study being a single-center prospective study is limited. More randomized controlled trials at multiple centers are required to draw to a proper conclusion.

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Ethical approval: The study was approved by the institutional ethics committee

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