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## Dervan rim sign new, simple radiological sign for unique Indian medial femoral condylar osteoarthritis

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### Abstract

**Introduction:** OA knee is most common form of arthritis in Asian population. The medial compartment of knee is most commonly involved. Most X-ray studies have been from the Western Caucasian patients with different genetic pool, habitus and lifestyle. The accepted norm for surgical intervention like unicondylar knee replacement or High Tibial Osteotomy is bone on bone Arthritis which has simultaneous affection of both medial Tibial & Femoral compartments. We however noted a different radiological pattern also causing severe pain on medial side of knee, without bone on bone arthritis. This was labeled DERVAN RIM SIGN.

**Materials and Method:** This pilot Study describes a new radiological sign based on standard Anteroposterior X-ray of knee joint, taken in standing weight bearing position with toes and patella pointing forwards in 15 degrees of flexion.

The findings of this sign and correlation to selective medial condylar femoral cartilage loss in 25 patients are confirmed with

1 MRI of knee joint 17 patients

2 Arthroscopy of knee joint 3 patients

3 Open Arthrotomy during Unicondylar knee Arthroplasty 5 patients

**Results:** 100 percent correlation is seen in all 25 cases between the Dervan RIM sign & Eburnation and loss of Medial femoral cartilage in the three modalities of visual confirmation viz MRI, Arthroscopy or Visual examination in open surgery. Mild involvement of the Tibial condyle was noted in all cases and this was the cause of absence of bone on bone Arthritis.

**Keywords:** knee osteoarthritis, radiology, Dervan RIM sign, distal medial femoral arthritis, New

### Introduction

OA knee is most common form of arthritis in Asian population among which medial compartment of knee most commonly involved <sup>[1, 2]</sup>. With increasing health awareness, patient now present with recent onset knee pain to clinician. Clinicians most commonly advice Anteroposterior X-ray of knee joint as initial diagnostic tool but we have found that there are limitations in current diagnostic criteria.

The most commonly used radiographic classification for knee joint is Kellegrn, Lawrence classification and Ahlbachs classification <sup>[3, 4]</sup>.

### Lawrence Classification

#### 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

### Ahlbachs

**grade 1:** joint space narrowing (less than 3 mm)

**grade 2:** joint space obliteration

**grade 3:** minor bone attrition (0-5 mm)

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**grade 4:** moderate bone attrition (5-10 mm)

**grade 5:** severe bone attrition (more than 10 mm)

Both the above classifications are useful when there is joint space narrowing mostly pointing toward bone on bone disease. We have seen many patients at our centre who presented without bone on bone disease on x-ray but with medial joint pain and social and functional limitation in their activities.

Hypothesis for this radiological sign is distal femoral medial condyle cartilage was more affected and most often the upper end tibial cartilage was unaffected or affected late. Thus if looked at with the traditional radiological criteria which rely primarily on joint space narrowing, only early or no arthritis would be deduced, thus prolonging the suffering of the patient. After looking at many such findings during Arthroscopy and Open surgeries like Unicompartmental Knee Replacement, a retrospective review of X-rays revealed a common finding of a "Distal Femoral Condylar Rim" of normal cartilage over eburnated exposed bone below. These exposed bone & nerve endings is what probably caused the severe pain & effusion with a normal or close to normal joint space.

Standard practice of reviewing knee arthritis by looking only at joint space may therefore be inadequate in Indian patients. The presence of Rim sign uncovers a different disease pattern affection of the medial femoral condyle.

This also paves way for a specific and Region centric classification of Indian patients X-ray findings which are different from Caucasian patients. There are limitations in current radiological diagnostic criteria on X-ray as described in Kellgren and Lawrence classification and Ahlback's classification which rely primarily on Joint Space narrowing.<sup>[3, 4]</sup> These are mostly suitable for bone on bone type of arthritis which may be common in Caucasian patients who have limited knee flexion activities as compared to Indian patients.<sup>[5]</sup>

It was on minutely observing these patients we have observed radiological sign "RIM SIGN" on X-ray. Which we confirmed with the help of following diagnostic tools,

1 MRI of knee joint

2 Arthroscopy of knee joint

3 open arthrotomy during joint replacement

Visual analogue scale pain in all patients was 6-7 or more necessitating treatment in all.

## Materials and Method

This pilot Study describes a new radiological sign based on standard Anteroposterior X-ray of knee joint taken in standing weight bearing position with toes and patella pointing forwards in 15 degrees of flexion.

The findings of this sign and correlation to selective medial condylar femoral cartilage loss in 25 patients are confirmed with

1 MRI of knee joint 17 patients

2 Arthroscopy of knee joint 3 patients

3 Open Arthrotomy during Unicompartmental knee Arthroplasty 5 patients

## Inclusion and Exclusion Criteria

Inclusion was medial knee pain; exclusion was infection, trauma, and neurological syndromes inflammatory joint disease.

Consent was taken from patients for study. Anteroposterior

Radiograph of knee joint was taken in standing positions with 15 degrees of knee flexion. Patients whose x-ray showing Dervan Rim Sign were included in our study.

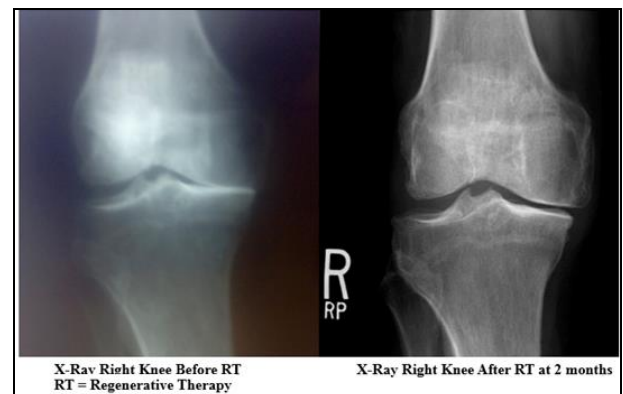
Confirmation of selective distal medial femoral cartilage wear, with little or no wear of Tibial cartilage, was done by one of the three following methods.

1. MRI OF Knee joint - suggestive of medial femoral cartilage lesion.
2. knees arthroscopy- diagnostic Arthroscopy showed medial femoral condyle lesion
3. Arthrotomy with surgery

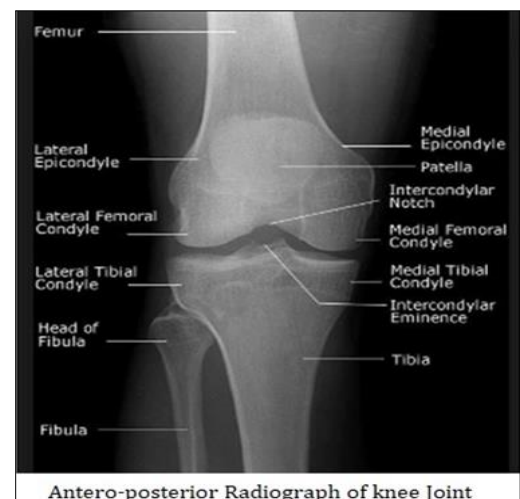
## Result

25 patients underwent above mentioned interventions at our centre, 17 patient underwent MRI of knee joint, 3 patient underwent Arthroscopy of knee joint and 5 patient got operated for severe function limitation. In all patients there was involvement of medial femoral condyle with loss of articular cartilage on femur more than that of tibial articular cartilage. It proves significant co-relation between Rim like sign on medial femoral condyle and loss of articular cartilage femoral sign.

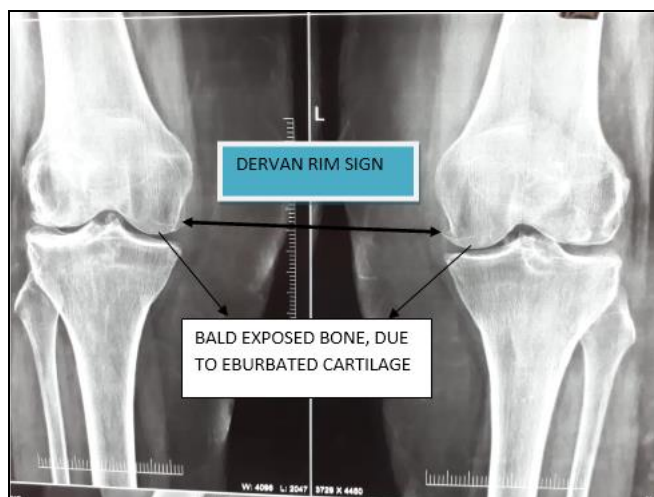
This sign can be used as simple & important diagnostic tool while treating knee pain. Furthermore it opens a new vista for diagnosis of a different form of Osteoarthritis, typical to Indian patients who have different living habits involving deep knee flexion. Standard Radiological classifications may miss this advanced Arthritis 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.



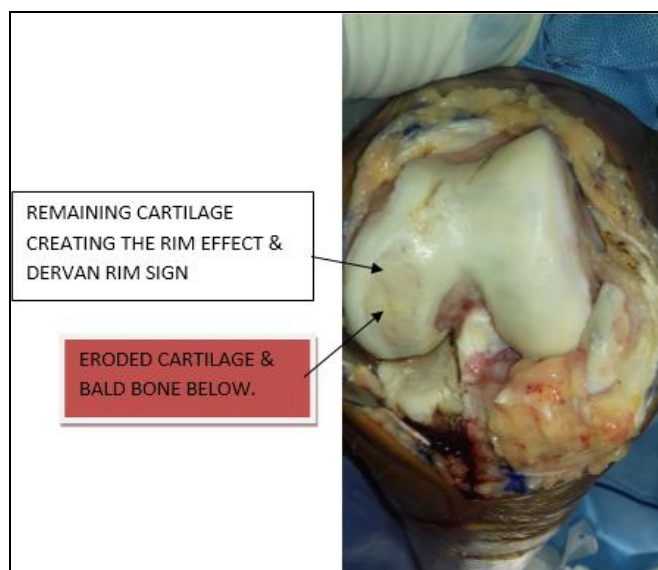
**Fig 1:** Bone on bone arthritis in a Caucasian patient without RIM sign.



**Fig 2:** Normal X ray of the knee joint



**Fig 3:** Dervan Rim sign



**Fig 4**

## Discussion

As highlighted in above results, there is strong correlation between presence of medial femoral condyle cartilage loss and presence of radiological sign. In our study we have observed that there's difference in cartilage loss pattern in Indian and Caucasian population.

This new simple, sensitive & specific sign can be used as simple & important diagnostic tool while treating knee pain. It is hereafter called the Dervan Rim Sign for diagnosis of advanced medial femoral condylar Arthritis.

This new sign can be easily differentiated from the radiological features of Spontaneous osteonecrosis of knee (SONK) which shows different radiological features and has a different treatment [6, 8].

Furthermore the “Dervan Rim Sign” opens a new vista for research & diagnosis of a different form of Osteoarthritis, typical to Indian patients who have different living habits involving deep knee flexion. Standard Radiological classifications may miss this advanced Arthritis 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.

Study by for bell *et al* suggests that there is more loss of cartilage over medial tibial condyle as compared to femoral condyle in Caucasian population [9, 10]. Numerous studied by

F. Eckstein *et al* also have similar observation in their study [11, 21]. This is contrary to the findings of our study in Indian patients. Possible reasons could be a different genetic pool, habits of deep flexion knee bending in day to day living and associated spinal affliction of forward bending at L4-5 causing weakness of hip abductors and added varus stress at knee during normal walk (Mild Trendelenburg gait) Further studies are needed to find the causative factors of this difference in radiological presentation between these two origins of patients.

Hence this sign can have great importance in detecting early arthritis in Indian population. Early diagnosis will allow clinicians to start treatment earlier and will avoid misdiagnosis and unnecessary investigation. Retrospectively, we too have seen patients without any bone and bone arthritis with severe functional limitation.

Had the Dervan Rim sign been used, the cause would have been evident.

Furthermore knowing that femoral articular cartilage loss is more helps us in better planning of surgical management. In unicondylar knee replacement which is a preferred management for medial compartment OA prior knowledge of cartilage loss pattern will allow us to plan surgical steps better, restore knee anatomy, take our cuts more precisely, resulting in better ligament balancing and a more normal knee.

The new dimension of maximal affliction of lower end femur, vis a vis Tibial cartilage, can open a door to only femoral afflicted condyle replacement in future. Hence the above sign has a huge significance in management of knee arthritis.

## Conclusion

With above results and discussion we conclude that “Dervan Rim sign” is a specific & sensitive radio logically detectable sign in medial compartment osteoarthritis in Indian population with its special pattern of femoral medial condyle affliction. It has both high specificity and sensitivity. It should be used while initial assessment of patient with knee pain especially in Indian patients without bone on bone arthritis. This sign has great importance in deciding finer modifications in technique of uni condylar knee replacement, which will help in achieving better knee kinematics and faster rehabilitation. We do hope that, it will enhance management of knee Osteoarthritis in Indian population. This is a new sign & should lead to further investigations on specific patterns of disease in Asians with deep knee bending habitus.

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