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Ankur Gaur
Post Graduate 2nd Year Resident, Department of Orthopaedics, G.S Medical College and Hospital, Pilkhuwa, Hapur, Uttar Pradesh, India

Nitin S Mishra
Post graduate 2nd year resident, Department of Orthopaedics, G.S Medical College and Hospital, Pilkhuwa, Hapur, Uttar Pradesh, India

Kuldeep K Gogia
Professor and HOD, Department of Orthopaedics, G.S Medical College and Hospital, Pilkhuwa, Hapur, Uttar Pradesh, India

Corresponding Author:
Ankur Gaur
Post Graduate 2nd Year Resident, Department of Orthopaedics, G.S Medical College and Hospital, Pilkhuwa, Hapur, Uttar Pradesh, India

A comparative study between non-weight bearing and Weight bearing X-rays of both knees in classification of Osteoarthritis

Ankur Gaur, Nitin S Mishra and Kuldeep K Gogia

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Abstract
Perform a comparative study of non-weight bearing and weight bearing x-ray of both knees in classification of kellgren and Lawrence (KL). This study was done in 2024 from January to June where x-ray of 50 patients having non-weight bearing compared with weight bearing both knee x-ray were classified as per KL grading system of knee osteoarthritis. Out of 50 patients, 9 who were previously diagnosed with grade0 and No joint space narrowing were found to have grade1 osteoarthritis. Of the 13 patients initially diagnosed with grade1 osteoarthritis were reclassified as having grade2, 12 were reclassified as having grade2 to grade3 osteoarthritis, while 16 patients initially diagnosed with grade3 osteoarthritis were reclassified as having grade4 osteoarthritis. The study revealed that weight-bearing X-rays are a more effective diagnostic tool than non-weight-bearing X-rays, as they show a significantly reduced intra-articular gap, particularly on the medial side.

Keywords: Osteoarthritis grading, weight bearing x-rays, non-weight bearing x-rays

Introduction
Osteoarthritis (OA) is the most prevalent medically treated arthritic condition globally [1]. Diagnosis of knee osteoarthritis mainly made on the basis of clinical examination and radiography. The knee joint, while comprising just three bones, has a complex structure designed to facilitate movement and withstand substantial forces. It consists of two primary articulations: the Tibiofemoral joint (A modified hinge joint) and the Patellofemoral joint (A saddle joint) [2].

Osteoarthritis is a common, progressive form of arthritis characterized by a variety of clinical presentations. It is often associated with aging, though it can also result from other types of arthritis or trauma. The primary sites of damage are the joint cartilage and subchondral bone [3]. The pathognomonic signs of OA on plain radiographs are joint space narrowing, osteophytes, subchondral sclerosis and subchondral cysts [4].

Several factors can contribute to osteoarthritis, including idiopathic (primary) causes as well as secondary factors such as trauma, metabolic or endocrine disorders, inflammatory diseases, neuropathic conditions, crystal deposition diseases, or anatomical abnormalities [5].

Diagnostic tools available for evaluating osteoarthritis include radiography, CT Scan, magnetic resonance imaging (MRI) and ultrasound (US). MRI provides a comprehensive view of ligaments and all intra-articular structures and pathologies [6].

Several classifications are present for knee osteoarthritis.

Table 1: Classification is available for grading osteoarthritis, which are detailed below

Grade 0	No radiographic features of osteoarthritis present
Grade 1	Doubtful joint space narrowing and possible osteophytic lipping
Grade 2	Definite osteophytes and possible joint space narrowing on AP weight bearing radiograph
Grade 3	Moderate osteophytes, definite joint space narrowing, some sclerosis and minimal bony deformity
Grade 4	Large osteophytes, marked joint space narrowing, severe sclerosis and definite deformity of bone conture

Kellgren and Lawrence (KL) system [7]

In this study, we used the Kellgren and Lawrence grading system for knee osteoarthritis to compare non-weight-bearing X-rays with weight bearing x-ray of both knees following a clinical examination of patients.

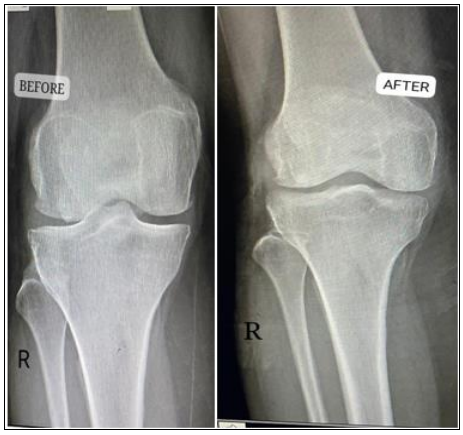
Case series study

This six-month OPD-based study, conducted from January 2024 to June 2024 in G.S Medical College and Hospital, Pilkhuwa (Hapur), compared non-weight-bearing X-rays with weight bearing X-rays of patients with both knees osteoarthritis. The study assessed the effectiveness of X-rays by measuring changes in osteoarthritis grading and the reduction in joint space, particularly medially, observed in the later X-rays.

Data were evaluated after the first stage of data collection, leading to the implementation of corrective actions. A second stage of data collection followed to assess the impact of these corrections on improving results and enhancing diagnosis.

Examples of knee X-rays taken before and after implementing corrective actions illustrate the improvements achieved.

Case 1



Case 2

Case 3

Table 2: Data collection was done as follows

Patient OPD number
Age(>40)/Sex
Complain (Pain in both knees)

Table 3: Data collection was done as follows

S. No.	Criterion	Classification of knee osteoarthritis
1.	Classification of osteoarthritis based on Non Weight Bearing X-rays of knee	Grade0 Grade1 Grade2 Grade3 Grade4
2.	Classification of osteoarthritis based on Weight Bearing X-rays of knee	Grade0 Grade1 Grade2 Grade3 Grade4

We found in our study, there was drastically change in the grading of knee osteoarthritis Classification after taken up corrective X-rays and the result changed after getting weight bearing X-ray of knees.

Results

Table 4: Transition of Patients Across KL Grades: Non Weight Bearing to Weight Bearing Stages

S. No.	Non weight bearing stage	Weight bearing stage	Number of patients
1	KL Grade 0	KL Grade 1	9
2	KL Grade 1	KL Grade 2	13
3	KL Grade 2	KL Grade 3	12
4	KL Grade 3	KL Grade 4	16

Discussion

Knee osteoarthritis cases are continuously increasing day by day. Patients are facing difficulties in daily life activities [8]. This cannot be stopped but can be managed in earlier stages with early corrective investigations. "Early the diagnosis, Early the prevention of progression of disease"

Knee osteoarthritis cannot be cured but progression of disease can be prevented [9]. Main goal of the treatment is painless active life. Knee osteoarthritis can be treated conservatively and surgically but the treatment modality depends upon the grade of osteoarthritis [10]. First, the Patient is educated about life style modifications, weight loss, muscles strengthening and flexibility improving exercises [11].

Conservatively treated with NSAIDs, Acetaminophen, Opioids, glucosamine sulfate, Chondroitin sulfate, Intra-articular corticosteroids, Intra-articular Hyaluronic acid, Supportive braces [12]. Intraarticular injections with steroids, hyaluronic acid and platelet rich plasma help in reducing pain and improving joint functioning to some extent in initial stages of disease [13].

Various surgical modalities are present for knee osteoarthritis but The Gold standard is total knee replacement. Total knee arthroplasty (TKA) is one of the most highly effective, cost-efficient, and consistently successful surgical procedures in orthopedics [14]. It is the only treatment to improve joint functions and better long term outcome [15].

In this study, Total Knee Replacement surgery was offered to those patients who conservatively failed in grade 3 and were having grade 4 Osteoarthritis.

Conclusion

As knee osteoarthritis becomes more common, early diagnosis of the radiological grade is crucial for delivering appropriate care tailored to the patient's condition and disease stage. Weight-bearing X-rays of both knees are generally more effective than non-weight-bearing of both knees because they more accurately show the intra-articular gap, especially on the medial side. An inaccurate diagnosis can compromise the success of long-term conservative treatment for knee osteoarthritis.

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