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Original Research

Assessment of radiological findings in patients with osteoarthritis of knee

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Abstract

Background: Knee osteoarthritis (OA), often referred to as degenerative joint disease, primarily arises from the cumulative effects of wear and tear, leading to a gradual deterioration of articular cartilage. Hence; the present study was conducted for assessing radiological findings in patients with osteoarthritis of knee.

Materials & methods:A total of 40 individuals suspected of having knee osteoarthritis were recruited for the research. Prior to participation, informed consent was secured from all subjects or their guardians. A comprehensive clinical history detailing the onset of symptoms was collected. The range of findings was documented according to a predefined format. Anteroposterior radiographs of the knee were captured in a weight-bearing extended position utilizing a standardized radiographic technique. Each radiograph was scored using the Kellgren-Lawrence grading system, which categorizes findings as follows: grade 0 indicates normal; grade 1 suggests doubtful osteoarthritis; grade 2 reflects minimal osteoarthritis; grade 3 denotes moderate osteoarthritis; and grade 4 signifies severe osteoarthritis. Subsequently, MRI of the knee was conducted. The radiographic and MRI findings were compiled according to the established format and analyzed using suitable statistical methods.

Results:A total of 40 patients with OA were analyzed. Mean age of the patients was 53.4 years. 80 percent of the patients were females while 20 percent of the patients were males. According to Kellgren-Lawrence score (on Radiography), Grade 0, Grade 1, Grade 2 and Grade 3 were seen in 60 percent, 15 percent, 12.5 percent and 12.5 percent of the patients respectively. On MRI examination of the cartilage abnormality, 30 percent of the patients were of Grade 0, 25 percent of the patients were of Grade 1, 32.5 percent of the patients were of Grade II and the remaining 12.5 percent of the patients were of Grade III. Significant results were obtained while correlating distribution of patients according to Kellgren-Lawrence score (On Radiography) and according to cartilage abnormality (On MRI).

Conclusion: Knee osteoarthritis (KOA) is a chronic, disabling condition with multiple causes that impacts the entire knee joint, representing the most frequently affected area in osteoarthritis. A notable relationship has been observed between radiographic findings and cartilage abnormalities in individuals suffering from knee osteoarthritis.

Key words: Kellgren-Lawrence score, Osteoarthritis, Cartilage abnormality

Introduction

Knee osteoarthritis (OA), often referred to as degenerative joint disease, primarily arises from the cumulative effects of wear and tear, leading to a gradual deterioration of articular cartilage. This condition is predominantly observed in older adults. Knee osteoarthritis can be categorized into two forms: primary and secondary. Primary osteoarthritis occurs without any identifiable cause, while secondary osteoarthritis results from factors such as abnormal force distribution across the joint due to post-traumatic events or underlying conditions like rheumatoid arthritis (RA) that affect the cartilage.[1-3]Osteoarthritis is generally a progressive condition that can ultimately result in disability. The severity of clinical symptoms can differ significantly among individuals, but they typically intensify, become more frequent, and increasingly debilitating over time. The rate at which the disease progresses also varies from person to person. Common symptoms include a gradual onset of knee pain that worsens with activity, stiffness and swelling in the knee, discomfort

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following extended periods of sitting or resting, and pain that exacerbates over time. Initial treatment for knee osteoarthritis focuses on conservative approaches, with surgical options considered if these methods prove ineffective. Although medications may help slow the progression of rheumatoid arthritis and other inflammatory disorders, there are currently no established disease-modifying treatments specifically for knee osteoarthritis.[4- 6]Hence; the present study was conducted for assessing radiological findings in patients with osteoarthritis of knee.

Materials & methods

This study aimed to evaluate MRI findings in patients diagnosed with knee osteoarthritis. A total of 40 individuals suspected of having knee osteoarthritis were recruited for the research. Prior to participation, informed consent was secured from all subjects or their guardians. A comprehensive clinical history detailing the onset of symptoms was collected. The range of findings was documented according to a predefined format. Anteroposterior radiographs of the knee were captured in a weight-bearing extended position utilizing a standardized radiographic technique. Each radiograph was scored using the Kellgren-Lawrence grading system, which categorizes findings as follows: grade 0 indicates normal; grade 1 suggests doubtful osteoarthritis; grade 2 reflects minimal osteoarthritis; grade 3 denotes moderate osteoarthritis; and grade 4 signifies severe osteoarthritis. Subsequently, MRI of the knee was conducted. The radiographic and MRI findings were compiled according to the established format and analyzed using suitable statistical methods.

Results

A total of 40 patients with OA were analyzed. Mean age of the patients was 53.4 years. 80 percent of the patients were females while 20 percent of the patients were males. According to Kellgren-Lawrence score (on Radiography), Grade 0, Grade 1, Grade 2 and Grade 3 were seen in 60 percent, 15 percent, 12.5 percent and 12.5 percent of the patients respectively. On MRI examination of the cartilage abnormality, 30 percent of the patients were of Grade 0, 25 percent of the patients were of Grade 1, 32.5 percent of the patients were of Grade II and the remaining 12.5 percent of the patients were of Grade III. Significant results were obtained while correlating distribution of patients according to Kellgren-Lawrence score (On Radiography) and according to cartilage abnormality (On MRI).

Table 1: Distribution of patients according to Kellgren-Lawrence score (on Radiography)

Kellgren-Lawrence score (on Radiography)	Parameter	Number of patients	Percentage of patients
Grade 0	Normal	24	60
Grade 1	Doubtful Osteoarthritis	6	15
Grade 2	Minimal Osteoarthritis	5	12.5
Grade 3	Moderate Osteoarthritis	5	12.5
Grade 4	Severe Osteoarthritis	0	0

Table 2: Distribution of patients according to Kellgren-Lawrence score (on MRI)

Grade (On MRI)	MRI Findings	Number of patients	Percentage of patients
Grade 0	Normal	12	30
Grade I	Intense signal intensity alteration	10	25
Grade II A	Defect of cartilage of less than 50%	8	20
Grade II B	Defect of cartilage of 50% to 99%	5	12.5
Grade III A	100% defect of cartilage with no bone ulceration	3	7.5
Grade III B	100% defect of cartilage with subjacent bone ulceration.	2	5

Table 3: Correlation of radiographic findings with MRI findings

Variable	r-value	p-value
Correlation of radiographic findings with MRI findings	2.335	0.001 (Significant)

Discussion

Knee osteoarthritis (KOA) is a chronic, multifactorial condition that leads to significant disability and primarily affects the knee joint, which is the most frequently impacted area in osteoarthritis. KOA can be categorized as either primary or secondary based on its underlying causes. The development of primary KOA is influenced by a variety of factors, including mechanical stress, inflammation, metabolic processes, immune responses, and genetic predispositions, with age, genetics, body mass, gender, and ethnicity serving as notable risk factors. In contrast, secondary KOA typically arises from specific causes such as trauma, congenital joint abnormalities, or injuries resulting from medical interventions. The pathological alterations associated with KOA are not merely passive degenerative changes or the result of wear and tear; rather, they represent active processes stemming

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from a disruption between the damage to articular tissues and their repair mechanisms. These changes often involve lesions in the articular and subchondral bones, ligaments, synovial membrane, joint capsule, and surrounding muscular structures. The primary symptoms include pain and restricted movement, which significantly diminish the quality of life for affected individuals.[7- 10] Hence; the present study was conducted for assessing radiological findings in patients with osteoarthritis of knee.

A total of 40 patients with OA were analyzed. Mean age of the patients was 53.4 years. 80 percent of the patients were females while 20 percent of the patients were males. According to Kellgren-Lawrence score (on Radiography), Grade 0, Grade 1, Grade 2 and Grade 3 were seen in 60 percent, 15 percent, 12.5 percent and 12.5 percent of the patients respectively. On MRI examination of the cartilage abnormality, 30 percent of the patients were of Grade 0, 25 percent of the patients were of Grade 1, 32.5 percent of the patients were of Grade II and the remaining 12.5 percent of the patients were of Grade III. Significant results were obtained while correlating distribution of patients according to Kellgren-Lawrence score (On Radiography) and according to cartilage abnormality (On MRI).Kunze KN et al. developed a deep learning (DL) algorithm designed to measure limb length and knee alignment, while also investigating the relationship between limb-length discrepancy (LLD), coronal-plane alignment, the severity of osteoarthritis (OA), and patient-reported knee pain. The study included 1,011 patients (2,022 knees, 52.3% female) with a mean age of 61.2 ± 9.0 years. The algorithm executed 12,312 measurements over a duration of 5.4 hours. The intraclass correlation coefficients (ICC) for hip-knee-ankle (HKA) and LLD measurements ranged from 0.87 to 1.00 when compared to assessments made by trained radiologists. Knees that experienced pain on most days of the month exhibited significantly greater varus (mean HKA: -3.9° ± 2.8°) or valgus (mean HKA: 2.8° ± 2.3°) alignment compared to those without pain ($p < 0.05$). In the case of varus knees, those that were painful most days were associated with the shorter limb, in contrast to non-painful knees ($p < 0.05$). The baseline Kellgren-Lawrence grade showed a significant correlation with the magnitude of HKA, LLD, and the frequency of pain at the 12-month follow-up. Increased knee pain frequency was linked to more pronounced coronal plane deformities, with valgus deviations averaging one degree less than varus, indicating that the knee can tolerate less valgus deformity before pain becomes more prevalent. Additionally, knee pain frequency was correlated with greater LLD and baseline KL grade, highlighting a relationship between observable joint degeneration and pain frequency.[11] Magnusson K et al explored whether magnetic resonance imaging (MRI) features suggestive of knee osteoarthritis (OA) are associated with presence of knee pain in possible early-stage OA development. They included 294 participants from the Osteoarthritis Initiative (mean ± SD age 50 ± 3 years; 50% women) with baseline Kellgren/Lawrence grade of 0 in both knees, all of whom had received knee MRIs at 4 different time points over 6 years (baseline, 24, 48, and 72 months). Using a linear mixed model (knees matched within individuals), we studied whether MRI features (meniscal body extrusion [in mm], cartilage area loss [score 0-39], cartilage full thickness loss [range 0-16], osteophytes [range 0-29], meniscal integrity [range 0-10], bone marrow lesions [BMLs] including bone marrow cysts [range 0-20], Hoffa- or effusion-synovitis [absent/present], and popliteal cysts [absent/present]) were associated with knee-specific pain as reported on the Knee Injury and Osteoarthritis Outcome Score (KOOS) questionnaire using a 0-100 scale (worst to best).The differences in KOOS knee pain score for a knee with a 1 unit higher score on MRI were the following: meniscal extrusion -1.52 (95% confidence interval [95% CI] -2.35, -0.69); cartilage area loss -0.23 (95% CI -0.48, 0.02); cartilage full thickness loss -1.04 (95% CI -1.58, -0.50); osteophytes -0.32 (95% CI -0.61, -0.03); meniscal integrity -0.28 (95% CI -0.58, 0.02); BMLs including potential cysts -0.19 (95% CI -0.55, 0.16); synovitis 0.23 (95% CI -1.14, 1.60); and popliteal cysts 0.86 (95% CI -0.56, 2.29).Meniscal extrusion, full thickness cartilage loss, and osteophytes are associated with having more knee pain.[12]

Conclusion

Knee osteoarthritis (KOA) is a chronic, disabling condition with multiple causes that impacts the entire knee joint, representing the most frequently affected area in osteoarthritis. A notable relationship has been observed between radiographic findings and cartilage abnormalities in individuals suffering from knee osteoarthritis. However; further studies are recommended for better exploration of results.

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