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Correlation Between Infrapatellar Fat Pad Area and The Severity of Knee Joint Osteoarthritis On MRI.

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Abstract

Background: Knee osteoarthritis is a progressive whole-joint disorder involving articular cartilage, subchondral bone, synovium and periarticular soft tissues. The infrapatellar fat pad is a metabolically active and mechanically important intra-articular structure that may undergo morphological alteration during osteoarthritis. Magnetic resonance imaging permits accurate evaluation of the infrapatellar fat pad and associated structural abnormalities of the knee joint. Aim: To assess the area of infrapatellar fat pad on magnetic resonance imaging and determine its correlation with the severity of knee joint osteoarthritis and associated radiographic and MRI findings. ***Materials and Methods***: This observational, cross-sectional study was conducted in the Department of Radiodiagnosis, PCMS & RC, Bhopal, in between April 2024 to September 2025. A total of 52 patients aged 45–70 years who underwent MRI for suspected knee osteoarthritis were included. Standing anteroposterior and lateral knee radiographs were assessed for osteophytes, joint-space narrowing and osteoarthritis severity. MRI was performed using a 1.5-Tesla 8-channal siemens magnetom system. The infrapatellar fat pad area was measured on fat-saturated mid-sagittal T2-weighted images. Cartilage defects and bone marrow lesions were graded using standard MRI sequences. Statistical analysis was performed using SPSS version 27.0, with $p<0.05$ considered statistically significant. ***Results***: The mean age was 56.75±8.83 years, and 53.85% of participants were females. The mean BMI was 26.38±3.27 kg/m^2. Mild, moderate and severe osteoarthritis were present in 48.08%, 34.62% and 17.31% of patients, respectively. Mean IPFP area decreased from 7.52±1.31 in normal-weight patients to 6.12±1.30 in obese patients ($p=0.038$), whereas no significant gender difference was observed ($p=0.88$). IPFP area declined significantly with increasing osteophyte grade, joint-space narrowing, osteoarthritis severity, bone marrow lesion grade and cartilage defect grade (all $p<0.0001$). Significant negative correlations were observed with age ($r=-0.41$), BMI ($r=-0.28$), joint-space narrowing ($r=-0.53$), osteophytes ($r=-0.69$), osteoarthritis grade ($r=-0.71$), bone marrow lesions ($r=-0.37$), cartilage defects ($r=-0.49$) and subcutaneous fat thickness ($r=-0.31$). ***Conclusion***: Infrapatellar fat pad area decreases significantly with increasing structural severity of knee osteoarthritis. MRI-based measurement of IPFP area may serve as a useful supplementary imaging marker for evaluating disease severity and associated joint abnormalities.

Keywords: Infrapatellar fat pad; Knee osteoarthritis; Magnetic resonance imaging; Cartilage defects; Bone marrow lesions.

INTRODUCTION

Knee osteoarthritis (KOA) is a progressive musculoskeletal disorder characterized by deterioration of the knee joint. It is no longer considered merely age-related "wear and tear"; rather, it is understood as a whole-joint disease involving articular cartilage, subchondral bone, synovium, menisci, ligaments, muscles and intra-articular adipose tissues. Mechanical stress, metabolic dysfunction, inflammation and impaired tissue repair interact to produce joint degeneration. Clinically, KOA commonly presents with pain, stiffness, crepitus, restricted movement and limitation of daily activities, making structural assessment important for disease characterization and management.[1] Ageing, female gender, obesity, previous joint injury, altered alignment, occupational loading and genetic susceptibility are major factors associated with KOA. Excess body weight contributes through increased mechanical loading across the tibiofemoral and patellofemoral compartments and systemic metabolic-inflammatory pathways. Disease progression varies because the relative involvement of cartilage, bone, synovium and periarticular tissues differs across phenotypes. Consequently, clinical symptoms may not always correspond closely with conventional radiographic changes, creating a need for imaging methods capable of evaluating the knee as an integrated organ.[2] The pathological process includes extracellular matrix degradation, chondrocyte dysfunction, subchondral bone remodelling, osteophyte formation, synovial inflammation and changes in local adipose tissue. Pro-inflammatory cytokines, adipokines, matrix-degrading enzymes and pain mediators participate in a cycle of tissue injury and abnormal repair. Cartilage loss and joint-space narrowing are central structural features, but bone marrow lesions, synovitis and alterations within the infrapatellar fat pad may also contribute to symptoms and progression. Recognition of these interconnected mechanisms has shifted research toward imaging biomarkers that reflect multiple joint tissues.[3] The infrapatellar fat pad (IPFP), or Hoffa's fat pad, is an intracapsular but extrasynovial structure located posterior to the patellar tendon and anterior to the femoral condyles and tibial plateau. Its deformable architecture permits adaptation during knee flexion and extension, while its location enables it to distribute forces, fill changing intra-articular spaces and support joint lubrication. The IPFP is richly vascularized and innervated and contains adipocytes, fibroblasts, immune cells and mesenchymal stromal cells. It therefore functions as both a mechanical cushion and a metabolically active tissue capable of influencing the synovium, cartilage and subchondral bone.[4] Magnetic resonance imaging provides multiplanar visualization of the IPFP and simultaneously demonstrates cartilage defects, bone marrow lesions, meniscal abnormalities, effusion and synovial changes. Unlike plain radiography, which mainly depicts joint-space narrowing and osteophytes, MRI can identify soft-tissue and bone-marrow abnormalities before advanced radiographic changes become evident. Quantitative evaluation of IPFP morphology, including area, volume, signal intensity and texture, has therefore emerged as a method for characterizing local tissue changes and developing imaging biomarkers associated with KOA.[5] The biological role of the IPFP in osteoarthritis is complex. In a healthy knee, it may absorb load and help maintain local tissue homeostasis. During ageing, obesity or osteoarthritis, however, it may undergo inflammation, fibrosis, vascular alterations and changes in cellular composition. These processes can modify its size and mechanical properties and promote secretion of inflammatory cytokines and adipokines. Because the IPFP lies close to the synovium and adjacent cartilage surfaces, its pathological changes may influence local inflammation, cartilage catabolism and pain generation.[6]

MATERIALS AND METHODS

This observational, cross-sectional study was conducted in the Department of Radiodiagnosis, People's College of Medical Sciences and Research Centre (PCMS & RC), Bhopal, in between April 2024 to September 2025. The study was designed to assess the infrapatellar fat pad area on magnetic resonance imaging and determine its correlation with the severity of knee joint osteoarthritis. Patients referred to the department for radiological evaluation of knee pain, knee deformity, clicking movements, restricted joint movement or clinical suspicion of knee osteoarthritis were considered for participation in the study. A total of 52 patients who fulfilled the predefined eligibility criteria were enrolled in the study. Patients were selected using a consecutive sampling method from those referred for MRI examination of the knee joint during the study period. Both male and female patients between 45 and 70 years of age were included. Before imaging, a detailed clinical history was obtained, including the duration and severity of knee pain, swelling, stiffness, restriction of movement, history of trauma, previous treatment and associated medical conditions. The clinical examination findings recorded in the patients' case files were also reviewed. Body weight was measured in kilograms and height in metres, and body mass index was calculated using the formula: weight in kilograms divided by the square of height in metres.

Eligibility Criteria

Patients aged 45–70 years of either gender who were referred for MRI examination of the knee joint because of suspected knee osteoarthritis were included in the study. Patients with a history of previous knee surgery, severe knee trauma, inflammatory arthritis, infective arthritis, neoplastic lesions or other conditions likely to significantly alter the normal anatomy of the knee joint were excluded. Patients with contraindications to MRI, including incompatible metallic implants, cardiac pacemakers, cochlear implants or other non-MRI-compatible electronic devices, were also excluded. Patients with unmanageable claustrophobia and those unwilling to provide consent or undergo MRI examination were not included.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee. Written informed consent was obtained from every participant before enrolment, and the confidentiality of all clinical and radiological information was maintained throughout the study.

Methodology

Radiographic and MRI Examination: All participants underwent plain radiographic examination of the affected knee in weight-bearing anteroposterior and lateral views. The radiographs were evaluated for joint-space narrowing, marginal osteophyte formation, subchondral sclerosis and bony deformity. The radiographic severity of osteoarthritis was graded according to the Kellgren–Lawrence classification system. MRI examination of the knee joint was performed using a siemens magnetom 1.5 Tesla MRI system with a dedicated knee coil. The standard MRI protocol included sagittal T1-weighted, sagittal T2-weighted, sagittal T2-weighted fat-saturated and proton-density-weighted sequences, axial T2-weighted images and coronal short tau inversion recovery images. Participants were examined in the supine position with the knee placed in a neutral or slightly flexed position to minimise motion and ensure adequate visualisation of the infrapatellar fat pad and other intra-articular structures. The acquired images were transferred to a dedicated workstation for detailed evaluation.

MRI Assessment and Measurement of Infrapatellar Fat Pad: The infrapatellar fat pad, also known as Hoffa's fat pad, was identified as the intracapsular but extrasynovial adipose structure located posterior to the patellar tendon and anterior to the femoral condyles and tibial plateau. Its cross-sectional area was measured on the fat-saturated mid-sagittal T2-weighted image where the fat pad was most clearly visualised. The boundaries of the infrapatellar fat pad were manually outlined using the region-of-interest measurement tool available on the workstation, and the area was recorded in square millimetres. Care was taken to exclude the patellar tendon, synovial fluid, adjacent ligaments and surrounding soft tissues from the outlined region. All measurements were performed by an experienced musculoskeletal radiologist using a consistent anatomical plane and measurement technique.

Articular cartilage abnormalities were evaluated in the medial tibiofemoral, lateral tibiofemoral and patellofemoral compartments using sagittal and axial T2-weighted or proton-density fat-saturated images. Cartilage damage was graded from 0 to 4 according to the depth and extent of the defect, where grade 0 represented normal cartilage and grade 4 represented full-thickness cartilage loss with exposure of the underlying subchondral bone. Subchondral bone marrow lesions were identified as ill-defined areas of increased signal intensity in the subarticular bone on fluid-sensitive sequences, particularly coronal STIR images, and were graded from 0 to 3 according to their extent. Associated MRI findings, including joint effusion, synovial changes, osteophytes, meniscal degeneration and ligament abnormalities, were also documented wherever present. Particular attention was given to the use of uniform coil positioning, field strength, voxel size and fat-suppression techniques because variations in these technical parameters could affect the visualisation and measurement of the infrapatellar fat pad.

Statistical Analysis

The collected data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 27.0. Continuous variables such as age, body mass index and infrapatellar fat pad area were expressed as mean and standard deviation or median and interquartile range, depending on the distribution of data. Categorical variables, including gender, Kellgren–Lawrence grade, cartilage-defect grade and bone-marrow-lesion grade, were presented as frequencies and percentages. The normality of continuous variables was assessed using the Shapiro–Wilk test. Differences in mean infrapatellar fat pad area across osteoarthritis severity groups were analysed using one-way analysis of variance with an appropriate post-hoc test for normally distributed data or the Kruskal–Wallis test for non-normally distributed data. The correlation between infrapatellar fat pad area and the severity of knee osteoarthritis was assessed using Pearson's or Spearman's correlation coefficient, as appropriate. The independent-samples t-test or Mann–Whitney U test was used for comparisons between two groups, while the chi-square test or Fisher's exact test was used to determine associations between categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1: Demographic and Anthropometric Characteristics of the Study Population

Table 1 summarizes the baseline demographic and anthropometric characteristics of the study population. The majority of patients belonged to the 45–55 years age group (30 patients; 57.69%), followed by 56–65 years (15 patients; 28.84%), while only 7 patients (13.46%) were older than 65 years. The overall mean age was 56.75 ± 8.83 years, indicating that knee osteoarthritis was predominantly observed among middle-aged and elderly individuals. With respect to gender distribution, 28 patients (53.85%) were females, whereas 24 patients (46.15%) were males, showing a slight female predominance in the study population. Anthropometric assessment demonstrated a mean height of 157.38 ± 13.23 cm, mean body weight of 67.66 ± 7.24 kg, and mean body mass index (BMI) of 26.38 ± 3.27 kg/m², indicating that, on average, the study participants were overweight according to standard BMI classification.

Table 2: Distribution of Osteoarthritis Severity and Association of BMI and Gender with Infrapatellar Fat Pad Area

Table 2 depicts the severity of osteoarthritis and its association with BMI and gender in relation to the infrapatellar fat pad (IPFP) area. Nearly half of the study population had mild osteoarthritis (25 patients; 48.08%), while 18 patients (34.62%)

had moderate disease and 9 patients (17.31%) had severe osteoarthritis, suggesting that early-stage disease constituted the largest proportion of cases. Analysis of BMI categories revealed a significant association between BMI and IPFP area (p = 0.038). Patients with normal BMI had the largest mean IPFP area (7.52 ± 1.31), which progressively decreased in overweight patients (6.76 ± 1.38) and was lowest among obese patients (6.12 ± 1.30). Gender-wise comparison showed no statistically significant difference in IPFP area between males (6.87 ± 1.26) and females (6.92 ± 1.26) (p = 0.88), indicating that gender had no measurable influence on infrapatellar fat pad size in the present study.

Table 3: Association of Osteophyte Grade and Joint-Space Narrowing with Infrapatellar Fat Pad Area

Table 3 demonstrates the relationship between radiographic osteoarthritic changes and IPFP area. A highly significant association was observed between osteophyte grade and IPFP area ($p < 0.0001$). Patients with Grade 1 osteophytes demonstrated the largest IPFP area (7.72 ± 1.48), followed by Grade 0 (7.32 ± 0.39). The IPFP area showed a marked decline with increasing osteophyte severity, measuring 5.89 ± 0.70 in Grade 2 and 5.62 ± 0.79 in Grade 3, suggesting progressive reduction in fat pad area with advancing osteophyte formation. Similarly, joint-space narrowing demonstrated a statistically significant association with IPFP area ($p < 0.0001$). Patients without joint-space narrowing (Grade 0) had the largest mean IPFP area (7.88 ± 1.50). A gradual reduction in IPFP area was observed with increasing grades of joint-space narrowing, decreasing to 6.68 ± 1.28 in Grade 1, 5.59 ± 0.60 in Grade 2 and 5.37 ± 0.81 in Grade 3.

Table 4: Association of Osteoarthritis Grade, Bone Marrow Lesions and Cartilage Defects with Infrapatellar Fat Pad Area

Table 4 evaluates the relationship between MRI-based disease severity and IPFP area. A highly significant association was observed between overall osteoarthritis severity and IPFP area ($p < 0.0001$). Patients with mild osteoarthritis demonstrated the largest mean IPFP area (7.78 ± 1.42), whereas patients with moderate disease had a lower value (5.95 ± 0.68), and those with severe osteoarthritis had the smallest IPFP area (5.33 ± 0.71). A similar trend was observed for bone marrow lesions. Patients without bone marrow lesions (Grade 0) exhibited the highest IPFP area (7.61 ± 1.56), followed by Grade 1 (7.32 ± 1.47), Grade 2 (6.25 ± 0.91) and Grade 3 (5.26 ± 0.72). The association was statistically highly significant ($p < 0.0001$), indicating that worsening bone marrow abnormalities were accompanied by progressive reduction in IPFP area. Likewise, cartilage defects demonstrated a highly significant inverse association with IPFP area ($p < 0.0001$). Patients with Grade 0 cartilage defects had an average IPFP area of 7.58 ± 1.45, while Grade 1 showed 7.51 ± 1.78, Grade 2 measured 6.22 ± 0.89, Grade 3 measured 5.92 ± 0.72, and Grade 4 demonstrated the smallest value (5.49 ± 0.70).

Table 5: Correlation of Infrapatellar Fat Pad Area with Patient Characteristics and X-ray Findings

Table 5 presents the correlation between IPFP area and patient characteristics as well as radiographic findings. Age demonstrated a moderate negative correlation with IPFP area ($r = –0.41$, $p = 0.002539$), indicating that IPFP area decreases significantly with advancing age. Body mass index also showed a weak but statistically significant negative correlation with IPFP area ($r = –0.28$, $p = 0.04485$), suggesting that increasing BMI is associated with a reduction in IPFP size. Among radiographic parameters, joint-space narrowing showed a moderate negative correlation with IPFP area ($r = –0.53$, $p < 0.0001$), whereas osteophyte grade demonstrated a strong negative correlation ($r = –0.69$, $p < 0.0001$). The strongest inverse relationship was observed between overall osteoarthritis grade and IPFP area ($r = –0.71$, $p < 0.0001$), indicating that worsening radiographic osteoarthritis is strongly associated with progressive reduction in infrapatellar fat pad area.

Table 6: Correlation of Infrapatellar Fat Pad Area with MRI Findings

Table 6 illustrates the correlation between IPFP area and MRI-derived structural abnormalities. Bone marrow lesions demonstrated a moderate negative correlation with IPFP area ($r = –0.37$, $p = 0.006938$), indicating that increasing bone marrow lesion severity was associated with a reduction in infrapatellar fat pad area. Cartilage defects showed an even stronger moderate negative correlation ($r = –0.49$, $p = 0.000227$), suggesting that greater cartilage loss is associated with smaller IPFP area. Subcutaneous fat thickness also demonstrated a weak but statistically significant negative correlation with IPFP area ($r = –0.31$, $p = 0.02531$).

Table 1. Demographic and Anthropometric Characteristics of the Study Population

Characteristics	Category/Variable	No. of cases	Percentage/Mean ± SD
Age distribution	45–55 years	30	57.69%
	56–65 years	15	28.84%
	>65 years	7	13.46%
	Total	**52**	**100.00%**
	Mean age	—	56.75 ± 8.83 years
Gender distribution	Male	24	46.15%
	Female	28	53.85%
	Total	**52**	**100.00%**
Anthropometric characteristics	Height (cm)	—	157.38 ± 13.23

	Weight (kg)	—	67.66 ± 7.24
	BMI (kg/m²)	—	26.38 ± 3.27

Table 2. Distribution of Osteoarthritis Severity and Association of BMI and Gender with Infrapatellar Fat Pad Area

Study parameter	**Category**	**No. of cases**	**Percentage/IPFP area, Mean ± SD**	**p-value**
Distribution of osteoarthritis severity	Mild	25	48.08%	—
	Moderate	18	34.62%	—
	Severe	9	17.31%	—
	Total	**52**	**100.00%**	—
BMI category	Normal (18.50–24.99 kg/m²)	16	7.52 ± 1.31	**0.038**
	Overweight (25.00–29.99 kg/m²)	26	6.76 ± 1.38	
	Obese (≥30.00 kg/m²)	10	6.12 ± 1.30	
Gender	Male	24	6.87 ± 1.26	**0.88**
	Female	28	6.92 ± 1.26	

Table 3. Association of Osteophyte Grade and Joint-Space Narrowing with Infrapatellar Fat Pad Area

Radiographic finding	**Grade**	**No. of cases**	**IPFP area, Mean ± SD**	**p-value**
Osteophytes	Grade 0	5	7.32 ± 0.39	**<0.0001**
	Grade 1	11	7.72 ± 1.48	
	Grade 2	21	5.89 ± 0.70	
	Grade 3	15	5.62 ± 0.79	
Joint-space narrowing	Grade 0	6	7.88 ± 1.50	**<0.0001**
	Grade 1	15	6.68 ± 1.28	
	Grade 2	21	5.59 ± 0.60	
	Grade 3	10	5.37 ± 0.81	

Table 4. Association of Osteoarthritis Grade, Bone-Marrow Lesions and Cartilage Defects with Infrapatellar Fat Pad Area

Disease characteristic	**Grade/Severity**	**No. of cases**	**IPFP area, Mean ± SD**	**p-value**
Osteoarthritis grade	Mild	27	7.78 ± 1.42	**<0.0001**
	Moderate	17	5.95 ± 0.68	
	Severe	8	5.33 ± 0.71	
Bone-marrow lesions	Grade 0	8	7.61 ± 1.56	**<0.0001**
	Grade 1	13	7.32 ± 1.47	
	Grade 2	21	6.25 ± 0.91	
	Grade 3	10	5.26 ± 0.72	
Cartilage defects	Grade 0	8	7.58 ± 1.45	**<0.0001**
	Grade 1	12	7.51 ± 1.78	
	Grade 2	16	6.22 ± 0.89	
	Grade 3	11	5.92 ± 0.72	
	Grade 4	5	5.49 ± 0.70	

Table 5. Correlation of Infrapatellar Fat Pad Area with Patient Characteristics and X-Ray Findings

Variable category	**Variable**	**r-value**	**p-value**
Patient characteristics	Age (years)	−0.41	0.002539
	BMI (kg/m²)	−0.28	0.04485
X-ray findings	Joint-space narrowing	−0.53	<0.0001
	Osteophytes	−0.69	<0.0001
	Osteoarthritis grade	−0.71	<0.0001

BMI: Body mass index.

Table 6. Correlation of Infrapatellar Fat Pad Area with MRI Findings

MRI finding	r-value	p-value
Bone-marrow lesions	−0.37	0.006938
Cartilage defects	−0.49	0.000227
Subcutaneous fat thickness	−0.31	0.02531

Figure - The infrapatellar fat pad (IPFP) area was measured on fat-saturated mid-sagittal T2WI FSE by manually tracing its borders

Figure-The infrapatellar fat pad (IPFP) area was measured on fat saturated mid-sagittal T2WI FSE which was 5.737cm2 - Moderate OA.

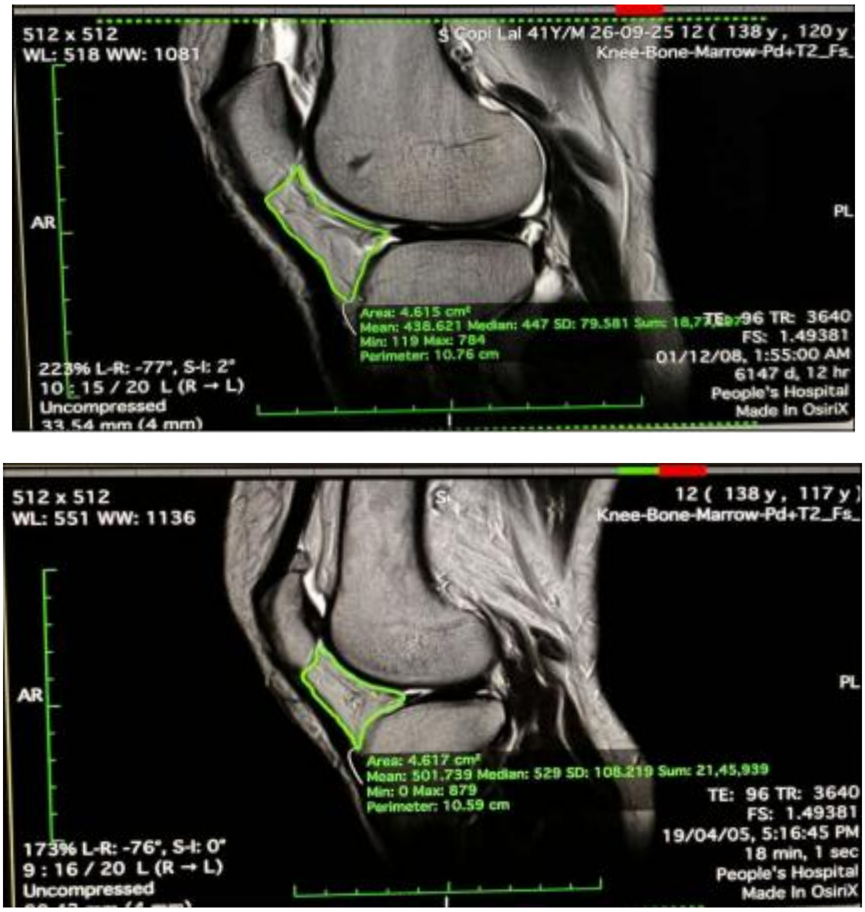

Figure-The infrapatellar fat pad (IPFP) area was measured on fat saturated mid-sagittal T2WI FSE which was 4.617cm2 - Severe OA.

DISCUSSION

The present study included predominantly middle-aged and older adults with knee osteoarthritis, with a relatively balanced gender distribution. The mean BMI was within the overweight range, indicating that excess body weight was common in the study population. These demographic characteristics were broadly comparable with those reported by Han et al. (2014), although their participants were slightly older. Their findings also demonstrated substantial variation in IPFP area, supporting the relevance of IPFP assessment in populations at risk for degenerative knee disease.[7]

A significant inverse association was observed between BMI and IPFP area, with smaller IPFP dimensions in participants with higher BMI. This suggests that increased adiposity may be associated with structural alteration of the IPFP rather than simple enlargement. No significant gender-based difference in IPFP area was observed. Duran et al. (2015) similarly reported lower IPFP volume in patients with cartilage defects and an association with BMI, although they observed smaller IPFP volume in women. Differences in sample characteristics, MRI measurement techniques and body composition may explain this discrepancy.[8]

The principal finding of the present study was a progressive reduction in IPFP area with increasing severity of knee osteoarthritis. Patients with advanced osteoarthritis had substantially smaller IPFP areas than those with milder disease. This finding closely agrees with Ragab et al. (2021), who also demonstrated progressive reduction in IPFP area with increasing osteoarthritis severity. Reduced IPFP dimensions may reflect chronic fibrosis, structural remodelling and loss of the normal mechanical cushioning function of the fat pad.[9]

IPFP area was also inversely associated with radiographic markers of osteoarthritis, particularly osteophyte formation and joint-space narrowing. These findings indicate that reduction in IPFP size accompanies progressive structural joint damage. Cai et al. (2015) similarly reported that greater IPFP volume was associated with fewer osteophytes, cartilage defects and selected bone marrow lesions. Their lack of association with joint-space narrowing may be related to differences in methodology, particularly their use of three-dimensional IPFP volume compared with sagittal IPFP area in the present study.[10]

Increasing bone marrow lesion severity was associated with smaller IPFP area. Han et al. (2016) also demonstrated an association between IPFP signal abnormalities and bone marrow lesions, supporting a relationship between IPFP pathology and subchondral bone damage. While their study assessed signal-intensity changes, the present study evaluated IPFP size, suggesting that both qualitative and quantitative IPFP abnormalities may reflect osteoarthritis severity.[11]
A significant inverse association was also observed between IPFP area and cartilage-defect severity. This finding is consistent with Pan et al. (2015), who reported that larger baseline IPFP area was associated with better cartilage preservation and lower risk of cartilage-defect progression. Together, these findings suggest that preservation of IPFP morphology may be associated with maintenance of articular cartilage, although the cross-sectional design of the present study does not establish causality.[12]

Age and BMI were negatively associated with IPFP area, suggesting that both advancing age and increased adiposity may contribute to IPFP alteration. These findings differ from Chuckpaiwong et al. (2010), who found no significant relationship between BMI and IPFP volume and reported a different association with age. Differences in sample size, disease stage, study design and the use of IPFP volume rather than area may account for these discrepancies.[13]

Overall, the present study demonstrates that smaller IPFP area is associated with greater radiographic and MRI evidence of knee osteoarthritis, including osteophytes, joint-space narrowing, cartilage defects and bone marrow lesions. The strongest association was observed with overall osteoarthritis severity, suggesting that IPFP area may have potential as an imaging marker of structural disease burden. Lee et al. (2024) further demonstrated that changes in IPFP morphology were associated with radiographic osteoarthritis progression. Differences between their observation of IPFP enlargement during progression and the reduced IPFP area seen in advanced disease in the present study may reflect dynamic changes in IPFP morphology during different stages of osteoarthritis.[14]

In summary, reduced IPFP area appears to be closely associated with the structural severity of knee osteoarthritis. Further longitudinal studies are required to determine whether IPFP changes are a cause, consequence or parallel marker of disease progression

CONCLUSION

The present study demonstrates a significant inverse relationship between infrapatellar fat pad area and the severity of knee osteoarthritis. Progressive reductions in IPFP area were associated with increasing osteophyte grade, joint-space narrowing, cartilage defects and bone marrow lesions. Age and BMI also showed significant negative correlations with IPFP area, whereas gender had no significant influence. MRI-based measurement of IPFP area may therefore serve as a useful supplementary imaging marker for assessing structural severity in knee osteoarthritis.

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