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Osteoarthritis in MRI Knee Joint in Hail Region

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Abstract: ***Increasing duty in knee joint has been reported in patients with knee osteoarthritis (OA) as a strategy to improve knee joint stability. However, presence of self-reported knee instability in a large group of patients with knee OA may be a sign of high duty in knee joint. The objective of this work was Role of MRI to evaluate Knee joint osteoarthritis and knee instability in Hail region with and without self-reported instability and examine the relationship between duty knee joint osteoarthritis with, knee joint laxity, and knee malalignment. The data at a self-selected was collected for 15Patient with knee OA without self-reported instability (stable group) and 5patients with knee OA and episodic self-reported instability (unstable group). Knee joint duty was examined by MRI as the change in the normal knee joint signals divided by the change in the knee Abnormality. The unstable group duties with lower knee joint stiffness, mainly due to smaller heel-contact knee abnormality) and greater knee compared to their knee stability. No significant relationships were observed between knee joint osteoarthritis and knee instability, knee joint laxity or Varus knee malalignment. Reduced duty in knee joint appears to be associated with knee instability and independent of quadriceps muscle weakness, knee joint laxity or Varus malalignment. Further investigations of relationship between self-reported knee joint instability and walking knee joint stiffness are warranted.***

Keywords: MRI Knee joint. osteoarthritis Knee joint. and knee instability in Hail region

1. Introduction

Knee instability in Hail region, described as pain, weakening, or loss of sensation of the knee joint is a complaint in as high as 50–70% of patients with knee osteoarthritis (OA)]. While knee joint swelling has been identified as a risk factor associated with knee OA, evidence suggests that joint laxity does not necessarily play a role in self-reported knee instability in this patient population. Previous attempts at exploring the potential relationships between other OA-related risk factors such as quadriceps strength, Varus knee malalignment, and radiographic disease severity with self-reported instability have also been inconclusive

Although passive measures of knee joint function appear to be inadequate in predicting self-reported knee instability in patients with knee OA, dynamic evaluation of knee joint function may provide more relevant insight. For example, it was recently reported that patients with knee OA and self-reported instability exhibit excessive medial compartment joint contact point translations and velocities during the weight-acceptance phase of downhill gait when compared to patients with knee OA without complaints of instability. Increased levels of medial compartment muscle co-contraction involving the medial quadriceps, medial hamstrings, and medial gastrocnemius have also been reported in knee OA patients with self-reported instability during the weight-acceptance phase of level ground gait. This increase in muscle co-contraction is presumably an attempt at stabilizing the unstable medial compartment, albeit unsuccessfully as episodic instability often persists.

In order to compensate for the increased laxity of the knee joint, it has been suggested that patients with knee OA often adopt a knee-stiffening gait strategy. In support of this premise, increased levels of walking knee joint stiffness, which is a measure of increased resistance to movement provided by the muscles and the soft tissues of the knee joint, have been reported in patients with knee OA Given the lack of differences in passive knee joint laxity between knee OA patients with and without self-reported instability it stands to reason that in the absence of adequate knee joint instability, knee joint laxity could play a more significant role in causing dynamic episodes of instability.

The main objective of the current study was to compare knee joint instability during the weight-acceptance phase of gait between patients with knee OA with and without self-reported instability. We hypothesized that patients with self-reported instability would have reduced walking knee joint stiffness due to greater knee flexion excursions compared to their counterparts without reports of instability. In addition, a secondary aim of the current study was to evaluate the associations between knee joint instability with quadriceps strength, passive medial compartment joint laxity, and Varus knee malalignment. It was hypothesized that quadriceps strength, passive medial compartment joint laxity, and Varus knee malalignment would not be associated with knee joint instability.

2. Materials and Methods

Subjects

Sample of 20randomized clinical trial of exercise therapy for knee OA were in this study. They were included in the study if they met the 3hospitals in Hail of Rheumatology clinical criteria for knee OAand had primarily medial compartment disease of greater than II on the King Khalid Hospital and radiology department Hail University ,the disease severity scale Participants with radiographic disease severity of grade II or greater in the lateral tibiofemoral compartment were excluded. Additionally, all Pt were excluded if they had a history of lower extremity total joint arthroplasty, cardiovascular disease, uncontrolled hypertension, or neurological disorders that could affect their gait. For all Pt, the knee in which they reported symptoms of instability was designated as the test knee. In cases where both knees experienced instability, the more problematic knee as chosen by the participant was designated as the test knee.

The definitions of the levels of instability are provided in the study. The knee unstable group included patients indicating that the symptom of instability affects their ability to perform activities of daily living, while the knee stable group consisted of patients who reported no evidence of instability or did not perceive the symptom to affect their daily activities. All data reported in this study were collected at baseline and prior to receiving any intervention.

Self-reported symptoms and functional status

The 24-item Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was used to gather knee-specific information on symptoms and limitations during performance of functional tasks. The WOMAC is a valid and reliable disease-specific measure of pain, stiffness, and physical function for individuals with knee OA .Higher scores on the WOMAC indicate increased severity of symptoms or functional limitations.

Radiographic Knee Alignment

Knee alignment was determined using a single full-leg, anteroposterior, weight-bearing radiograph . The mechanical axis of the femur was found by drawing a line from the center of the femoral head to the center of the knee. To determine the mechanical axis of the tibia, a second line was drawn from the center of the tibia to the center of the ankle. Knee alignment was then taken to be the angle of intersection between the femoral and tibial axes. Varus and valgus knee malalignment were indicated.

Statistical Analysis

Independent sample t-tests and chi-square tests were used to determine group differences in subject characteristics and OA-related risk factors were determined using Analysis of Covariance (ANCOVA), adjusting for the effects of gender. Before performing the ANCOVA tests, all variables were evaluated for the assumption of normal distribution using the Shapiro-Wilk test. The only variable not meeting this assumption was our primary variable of walking knee joint stiffness. Therefore, a log transformation was applied to the walking knee joint stiffness data to meet the assumption of normal distribution. A multiple regression analysis model was also used to determine the contribution of knee flexion angle at heel contact, along with peak knee flexion angle and the peak external knee flexion moment to walking knee joint stiffness in the entire cohort. Separate multiple regression models were used to evaluate the strength of association between walking knee joint stiffness with each OA-related risk factor for the entire cohort. All multiple regression analyses were adjusted for the potential confounding effects of gait speed and gender. A significance level was selected for all statistical tests.

3. Results

The knee unstable group was shorter compared to the knee stable group and had significantly worse (higher) WOMAC subscale scores for pain physical function and stiffness. The knee unstable group also walked with a slower walking knee joint stiffness was significantly lower in the knee unstable group compared to the knee stable group Additionally, the knee unstable group walked with significantly smaller knee flexion angles at heel contact but had similar peak knee flexion angles, which together contributed to a significantly greater knee flexion excursion.

Table 1

	Stable (n=35)	Unstable (n=17)	Significance (p-value)
Knee Flexion Angle at Heel Contact (°)	6.9 ± 5.1	4.6 ± 5.9	<0.02
Peak Knee Flexion Angle (°)	18.9 ± 5.8	20.1 ± 6.8	0.60
Knee Flexion Excursion (°)	13.3 ± 5.1	16.6 ± 6.0	<0.02
Peak Knee Extension Moment (% BW·HT)	−2.8 ± 0.6	−2.7 ± 0.6	0.93
Peak Knee Flexion Moment (% BW·HT)	4.3 ± 1.9	4.7 ± 1.7	0.71
Change in Sagittal Plane Knee Moment (% BW·HT)	6.1 ± 1.7	6.4 ± 1.4	0.62
Knee Joint Stiffness (% BW·HT/°)	0.9 ± 0.4	0.7 ± 0.2	0.02
	Stable (n=35)	Unstable (n=17)	Significance (p-value)
Knee Flexion Angle at Heel Contact (°)	6.9 ± 5.1	4.6 ± 5.9	<0.02

Summary of group differences in knee joint angle, external knee joint moment and walking knee joint stiffness during the weight-acceptance phase of gait. All analyses were adjusted for the group differences in gender.

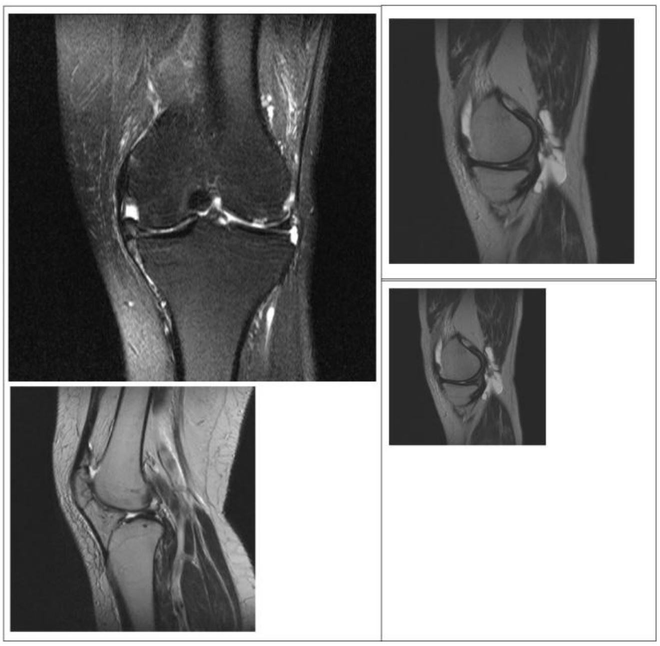
Regression analysis further revealed that the knee flexion angle at heel contact, along with peak knee flexion angle and the peak external knee flexion moment explained about 75.0% of the variance in walking knee joint stiffness after adjusting for the potential effects of gait speed and gender. The nature of this relationship was such that a greater knee flexion angle at heel contact, a smaller peak knee flexion angle or a greater peak external knee flexion moment were associated with greater walking knee joint stiffness. associated with walking knee joint stiffness.

Table 2

	β	SE	95% CI	p-value
Knee Flexion Angle at Heel Contact	0.08	1.00	0.07,1.00	< 0.02
Peak Knee Flexion Angle	−0.09	0.009	−1.00, −0.07	< 0.02
Peak Knee Flexion Moment	0.19	0.026	0.14,0.24	< 0.02
Gait Speed	1.00	0.27	−0.45,0.63	0.75
Gender	−0.08	0.085	−0.25,0.11	0.39
Constant	−0.31	0.36	−1.03,0.43	0.42
	β	SE	95% CI	p-value

Results of the multiple regression analysis used to determine the contribution of knee joint stiffness. All analyses were adjusted for the potential effects gender.

beta = standardized coefficient; SE = standard error; CI = confidence interval



4. Discussion

The knee joint stiffness would be lower in patients with knee OA and self-reported instability compared to their knee stablility. As increased walking knee joint stiffness effects of increased knee joint laxity in patients with OA walking with lower knee joint stiffness in our knee unstable group with an absent compensatory adaptation to control medial compartment joint laxity, the observed findings was limited information regarding the temporal nature of the relationship between self-reported knee joint instability and walking knee joint stiffness. Additional studies are needed to clarify whether decreased walking knee joint stiffness is the underlying cause of episodic knee joint instability.

Also consistent with hypothesis, the significantly greater knee flexion excursions during the weight- to reduced walking knee joint stiffness in the knee unstable group. The findings of our regression analysis revealed that knee flexion angle at heel contact, along with peak knee flexion angle and peak knee flexion moment during the weight- explain about 75% of the variance in walking knee joint stiffness. Given that no group differences were observed for peak knee flexion angle or peak knee flexion moment, the smaller knee flexion angles at heel contact appears to be the primary reason for the lower walking knee joint stiffness in the knee unstable group. Alternatively, it could also be argued that smaller knee flexion angles at heel contact could be the direct cause of episodic instability that subsequently resulted in decreased walking knee joint stiffness. targets for patients with knee OA and self-reported instability.

Our study demonstrated that there were no group differences in passive medial compartment joint laxity or quadriceps strength between the knee stable and knee unstable groups. Additionally, no significant associations were observed between medial compartment joint laxity and walking knee joint stiffness. Despite a previous report of an inverse association between quadriceps strength and walking knee joint stiffness in patients after total knee arthroplasty , these findings suggest that increased walking knee joint stiffness and self-reported knee instability are most likely the result of more complex mechanisms than just increased medial compartment joint laxity or quadriceps muscle weakness. Although we did find greater varus malalignment in our knee unstable group compared to the knee stable group, varus malalignment was also not independently associated with walking knee joint stiffness. This finding is not surprising as varus malalignment is more likely to contribute to alterations in the frontal plane biomechanics during gait, while walking knee joint stiffness is a sagittal plane measure of knee joint function.

The results of this study should be interpreted in light of its limitations. Our subjects with self-reported instability walked could have contributed to their lower walking knee joint stiffness.

The knee unstable group in our study had significantly higher (worse) self-reported knee joint stiffness scores on the WOMAC despite having lower walking knee joint stiffness compared to the knee stable group. This apparent discrepancy may be due to the fact that these measures evaluate different aspects of knee joint stiffness in patients with knee OA which also merits further investigation.

5. Conclusion

Patients with knee OA and self-reported instability appear to walk with lower knee joint stiffness compared to their counterparts without instability. Additionally, walking knee joint stiffness appears to be independent of the commonly observed OA-related risk factors of quadriceps weakness, passive medial compartment joint laxity, and varus knee mal-alignment, whether increased walking knee joint stiffness is the direct cause of knee joint instability in patients with knee OA remains wanted further investigation.

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