

# **DIFFERENCES IN FRONTAL PLANE MECHANICS DURING WALKING BETWEEN PATIENTS WITH MEDIAL AND LATERAL KNEE OSTEOARTHRITIS**

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## **INTRODUCTION**

Knee osteoarthritis is a disease affecting a large population of older adults. While knee osteoarthritis is most common in the medial compartment, it also occurs in the lateral compartment. A number of biomechanical studies have evaluated walking mechanics in patients with medial knee osteoarthritis. It has been reported that patients with medial knee osteoarthritis exhibit increased frontal plane moments at the knee. However, there are no studies examining the walking mechanics in patients with lateral knee osteoarthritis. As well, there is little information on what occurs at the rearfoot and hip joints as a result of changes in knee joint mechanics in patients with knee osteoarthritis.

Therefore, the purpose of this study is to evaluate the differences in frontal plane mechanics of the rearfoot, knee and hip in patients with medial and lateral knee osteoarthritis during walking. It is hypothesized that patients with lateral knee OA would have decreased abduction moments and increased abduction angles during walking. Associated with the increased knee valgus, greater peak eversion angle and inversion moment were expected in the patients with lateral knee osteoarthritis. As well, hip adduction was expected to increase leading to an increased abduction moment.

## **METHODS**

This is an ongoing study of which seven subjects (5 women and 2 men) with lateral knee osteoarthritis have been recruited. 7 subjects with medial knee osteoarthritis and matched for gender, Kellgren-Lawrence grade, BMI, and age were used for comparison. Subjects were included after being radiographically diagnosed with a Kellgren-Lawrence grade of 2-4 on an anterior-posterior flexed knee radiograph. A VICON motion analysis system and Bertec force platform were used to collect three dimensional motion analysis data.

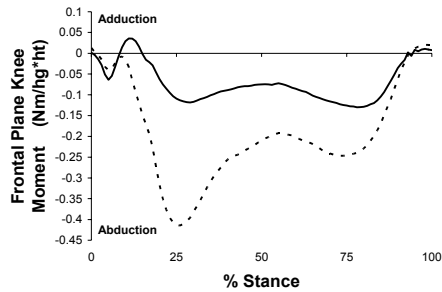
The variables of interest included the first peak knee external abduction moment, second peak knee external abduction moment, and peak knee adduction angle. Peak eversion and inversion moment in the rearfoot along with peak adduction and the first and second peak hip external adduction moment were also evaluated in order to examine changes in mechanics at adjacent joints. Statistical analyses were performed using t-tests with an alpha level of 0.05. Directional t-tests were used for the hypotheses at the knee and bi-directional t-tests were used for the hip and rearfoot since there is no data to support hypotheses at these joints.

## **RESULTS AND DISCUSSION**

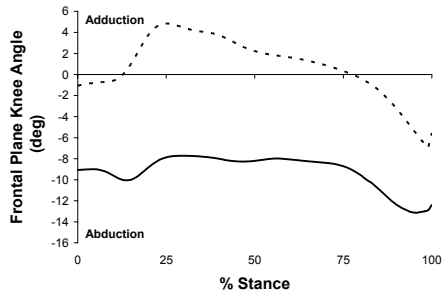
Results are reported in Table 1 and Figures 1-3.

**Table 1. Mean values for variables of interest**

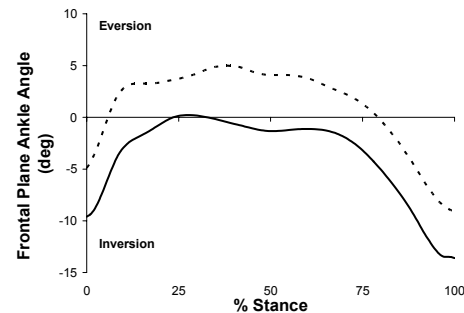
	Lat	Med	p
<b>Knee</b>			
1 <sup>st</sup> Pk Ab Mom	-0.15	-0.42	0.00
2 <sup>nd</sup> Pk Ab Mom	-0.15	-0.27	0.01
Pk Ad Angle	-6.7	5.0	0.00
<b>Hip</b>			
1 <sup>st</sup> Pk Ab Mom	-0.62	-0.61	0.77
2 <sup>nd</sup> Pk Ab Mom	-0.60	-0.53	0.19
Pk Ad Angle	6.6	5.4	0.57
<b>Ankle</b>			
Pk Inv Mom	-0.05	-0.04	0.45
Pk Eversion	1.7	6.2	0.02



**Figure 1. Frontal Plane Knee Moment in patients with lateral (solid) and medial (dashed) knee osteoarthritis**



**Figure 2. Frontal Plane Knee Angle in patients with lateral (solid) and medial (dashed) knee osteoarthritis**



**Figure 3. Rearfoot Angle in patients with lateral (solid) and medial (dashed) knee osteoarthritis**

Therefore it appears that patients with lateral knee osteoarthritis have different frontal plane lower extremity mechanics during walking compared to patients with medial knee osteoarthritis. As hypothesized, knee abduction moments and adduction motion were reduced in the lateral population. Also in support of our hypothesis, there was a trend toward an increase in the second abduction peak at the hip in the patients with lateral knee osteoarthritis. This suggests increased forces at the hip during propulsion which may lead to a more rapid joint deterioration. Also surprisingly, it was observed that patients with lateral knee osteoarthritis had approximately 5 deg less eversion in the rearfoot throughout stance. While increased eversion is often associated with genu valgus, this may be evidence of a compensation mechanism to maintain a plantigrade foot. Therefore the potential for increased foot injuries may exist.

**SUMMARY**

The results of this study suggest that patients with medial and lateral knee osteoarthritis exhibit different walking mechanics at the knee, hip and rearfoot. These differences should be taken into account when seeking interventions to slow down the progression of knee osteoarthritis in the lateral compartment.

**ACKNOWLEDGEMENTS**

This study has been supported by NIH grant# P20 RR16458.