

## ADDUCTION MOMENT DURING GAIT IN PATIENTS WITH MODERATE & END-STAGE KNEE OSTEOARTHRITIS

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### INTRODUCTION

Osteoarthritis (OA) is a progressive degenerative joint disease that often results in significant disability and loss of function. This chronic joint disorder can be particularly debilitating in the knee because it is stressed in activities of daily living including walking. There is a distinctly higher prevalence of medial compartment OA within the diseased population [1]. The adduction moment of the knee is considered to be the mechanical factor most highly correlated with knee OA. However, not all studies have found higher adduction moments in OA patients [2]. In the latter case, the patient severity level was unknown, and comparisons were made at the peak adduction moment only. The purpose of this study was to characterize the changes in adduction moment that are associated with different severities of knee OA. Principal component analysis was used to detect differences in adduction moment waveform magnitude and shape.

### METHODS

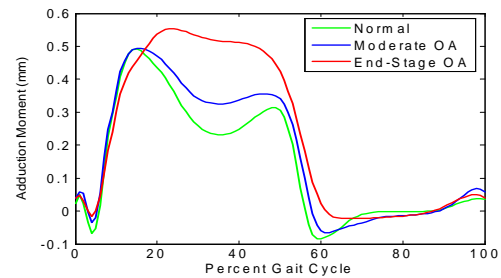
Fifty patients affected with moderate OA, 32 end-stage OA patients and 37 asymptomatic controls underwent a complete 3D kinematic, kinetic and electromyographic (EMG) analysis of the lower limb, with only the kinetic findings being discussed in this abstract. Patient severity levels were established through the Kellgren-Lawrence radiographic grading system [3] (Mod=1-3; End-stage=4). A Joint space narrowing grade [4] difference  $\geq 1$  (medial-lateral) was used to establish predominantly medial compartment OA. The subjects were required to walk along a 5-meter walkway in the laboratory a total of five times at a self-selected pace. The lower limb kinetics were calculated using the three dimensional orientation and position of the markers and the force plate data. The joint moment data was normalized with respect to bodyweight to Newton-meter/kilogram. All adduction moment waveforms were analyzed for group differences using principal component analysis (PCA) [5].

### RESULTS AND DISCUSSION

Descriptives comparing the subject groups indicated that the control group was slightly younger and lighter than the patient groups, while the end-stage OA group walked significantly slower than the other two groups (Table 1).

**Table 1:** Descriptives for moderate OA, end-stage OA and normal subject groups. Values are mean (STD).

	Normals (N)	Moderate OA (M)	End-Stage OA (S)	Significant Diff (p<0.05)
Age (yrs)	50.5 (10.5)	59.7 (8.2)	64.1 (7.7)	N < (M = S)
Weight (kg)	72.9 (14.2)	94.7 (19.1)	94.3 (16.3)	N < (M = S)
Height (m)	1.7 (0.1)	1.7 (0.1)	1.7 (0.1)	NONE
BMI (kg/m <sup>2</sup> )	24.8 (4.0)	31.1 (5.7)	33.2 (5.0)	N < (M = S)
Speed (m/s)	1.3 (0.1)	1.2 (0.2)	0.9 (0.2)	S < (M = N)



**Figure 1:** Mean adduction moment gait waveforms for moderate OA, end-stage OA, and control groups.

Using PCA to compare the adduction moment waveforms between the groups revealed that all three groups were significantly different ( $p < 0.05$ ) with respect to the overall magnitude of the curve during the stance phase (0-60%) (Figure 1). This magnitude difference ( $S > M > N$ ) was represented by PC1. PC2 represented the shape of the adduction moment curve during the first 20% of the gait cycle. The end-stage OA group was significantly different than the other two groups with respect to PC2 ( $p < 0.01$ ). PC3 represented the variation found in the curve during the latter half of the stance phase (20-60%). The shape of the loading vector revealed that this PC was a difference operator contrasting mid-stance to late stance. The end-stage OA group was significantly different than the other two groups with respect to PC3 ( $p < 0.05$ ).

### CONCLUSIONS

The overall magnitude of the adduction moment waveform during gait increases with both disease presence and severity level. End-stage OA patients exhibit a modified adduction moment curve shape when compared to moderate OA patients and asymptomatic controls.

### REFERENCES

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