

HIP ABDUCTOR STRENGTH MAY BE CRITICAL FOR SUCCESSFUL GAIT COMPENSATION IN PATIENTS WITH MEDIAL COMPARTMENT KNEE OSTEOARTHRITIS

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INTRODUCTION

The external adduction moment at the knee during walking has been shown to be a strong predictor for medial compartmental knee osteoarthritis (OA) severity (1) and rate of progression (2). A recent study (3) showed that the knee adduction moment is only elevated compared to matched control subjects for patients with more severe knee OA. The reasons for differences in the adduction moments based on severity are not well understood. It has been suggested (4) that hip musculature could be an important factor in a patient's ability to reduce the knee adduction. However, this study did not segregate patients of different disease severity. The purpose of this study was to test the hypothesis that a reduction in the knee adduction moment is related to the hip adduction moment during walking and that this relationship is dependent on the severity of the disease.

METHODS

Forty-two patients (22 female, 65.1 ± 10.2 yrs, 169.1 ± 10.1 cm, 79.2 ± 13.3 kg) with OA in the medial compartment of the knee participated in this study after giving written consent in accordance with the Institutional Review Board. Inclusion criteria have been defined previously (3). Patients were classified as less or more severe based on the K-L grades of both knees (less severe: K-L grade ≤ 2 ; more severe: K-L grade ≥ 3). For each patient, an asymptomatic control subject matched for gender, age, height and weight (62.8 ± 10.6 yrs, 169.3 ± 8.5 cm, 76.6 ± 12.9 kg) was selected after giving written consent in accordance with the Institutional Review Board. All control subjects had no clinical diagnosis of OA or rheumatoid arthritis or a history of knee trauma or pain.

All patients and control subjects performed walking trials walking at their self-selected normal speed. Kinematics and kinetics were collected using a previously described method (5). A MANOVA was used to detect an overall significant difference in gait pattern between groups. Upon a significant result of the MANOVA, separated repeated measures ANOVAs were used to detect significant differences in discrete variables describing the intersegmental angles, moments and forces between groups ($\alpha \leq 0.05$).

RESULTS

Patients with less severe knee OA had normal hip adduction moments while patients with more severe knee OA had substantially lower hip adduction moments compared to their control subjects (-29.0% ; $P < 0.001$; Figure 1). In contrast, patients with more severe knee OA had greater knee adduction moments ($+11.4\%$; $P = 0.039$). Irrespective of severity, all patients had a more rapid increase in the ground reaction force ($+50.1\%$; $P < 0.001$), greater medial ground reaction forces ($+54.0\%$; $P < 0.001$) and greater hip abduction moments

immediately following heel-strike ($+100.7\%$; $P < 0.001$; Figures 1 and 2) combined with the knee in a more extended position at landing ($+5.3^\circ$; $P = 0.003$) suggesting a tendency for a rapid shift of the body's load to the contralateral limb.

DISCUSSION

The results support the conclusion that the hip adduction moment could influence the patient's ability to reduce the knee adduction moment, suggesting that patients with less severe knee OA have sufficiently strong hip abductor muscles to maintain a position of the trunk associated with a lower adduction moment whereas more severe patients may lack sufficient hip adductor strength (Figure 2).

Gait Changes Secondary to Knee OA

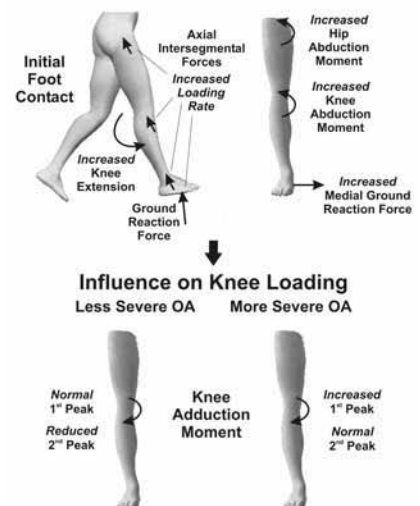


Figure 2: Similar compensation mechanisms lead to different knee adduction moments in patients with less and more severe knee OA.

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ACKNOWLEDGEMENTS

This project was funded in part by NIH grant # AR 39239 and VA grant # A02-2577R.