OBESE KNEE OSTEOARTHRITIS PATIENTS REDUCE KNEE JOINT LOADS WITH INCREASING BODY MASS

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INTRODUCTION

Weight loss induces a reduction in knee joint compressive force (KJCF) in overweight knee osteoarthritis (KOA) patients (1) and more severe KOA patients load their knees more than less severe (2). Obesity is a risk factor for the development of KOA (3) but the relationship between body mass and knee joint loads has not been investigated. The objective of this study was therefore to evaluate the association between body mass and knee joint loads during walking in obese KOA patients of different disease severity.

METHODS

Obese (BMI>30) KOA patients referred to a dietary program were included. All measurements were performed before the dietary intervention. From 3-dimensional gait analysis, at standard walking speed (1.25 m/s), KJCF was calculated using a statically determinate knee model (4). The KJCF was calculated as the vector sum of a) the knee joint reaction force resolved along the long axis of the tibia, b) the compression component of the active muscle group and c) the axial component of the cruciate ligament tension. The predicted peak KJCF values were extracted from the first and the second half of the stance phase and normalized to body mass (N/kg). Disease severity was determined from Kellgren-Lawrence grades (K-L) in the medial compartment, scored from standard weight bearing radiographs. A 1-factor ANCOVA, using body mass as covariate plus the interaction, was performed.

RESULTS AND DISCUSSION

192 patients were included in the dietary program, gait analysis was completed on 179 patients of whom 161 were able to walk at the standard speed and 190 were K-L scored. Patients were classified according to radiographic disease severity into "severe" (K-L>2) and "less severe" (K-L≤2) groups (Table 1). Irrespective of body mass, severe patients loaded their knees significantly more than less severe patients (p=0.002) (Figure 1). A significant inverse association between the first peak KJCF and body mass (p=0.006) was observed but no association was found for the second peak KJCF (p=0.23).

This cross sectional study demonstrates that heavier patients adapt functionally to reduce KJFC in the first half of the stance phase compared to less obese patients. In the second half of the stance phase, the results show that the

peak KJCF is unaffected by body mass. Severe patients (K-L>2) load their knees more than less severe KOA patients (K-L≤2).
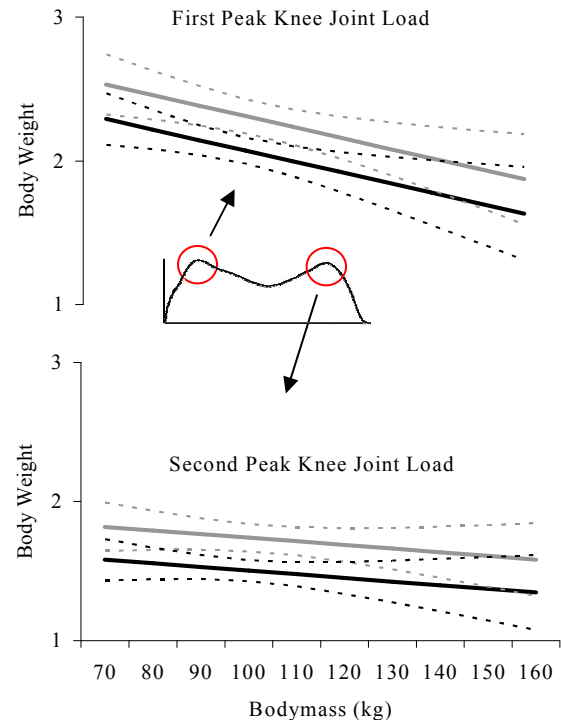
Figure 1: Peak knee joint loads. Severe group (grey), less severe group (black), 95% CI (dotted lines).

CONCLUSION

Heavier KOA patients adapt functionally to reduce knee joint loadings during walking compared to less obese KOA patients. Irrespective of body mass, severe KOA patients loaded their knees significantly more than less severe KOA patients.

ACKNOWLEDGEMENTS

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Table 1: Subject characteristics. Student's t-test for differences.

	Less Severe (n=101)	Severe (n=60)	*P*
Age (years±SD)	61.7 ± 5.7	63.1 ± 7.0	0.100
Body mass (kg±SD)	99.7 ± 12.9	103.6 ± 15.5	0.091
BMI (kg/m^2±SD)	36.5 ± 4.3	37.3 ± 43.1	0.212
K-L (grades ±SD)	1.7 ± 0.9	2.4 ± 0.7	0.000