EFFECTS OF DIFFERENT PROFILES OF LATERAL WEDGING ON KNEE ADDUCTION MOMENTS DURING THE LOADING PERIOD OF THE GAIT CYCLE

[1] Richard K Jones, [1] Christopher Nester and [2] Jim Richards
[1] Centre for Rehabilitation and Human Performance Research, University of Salford, UK
[2] Allied Health Professions Unit, Faculty of Health, University of Central Lancashire, UK
email: r.k.jones@salford.ac.uk, web: www.healthcare.salford.ac.uk/crhpr

INTRODUCTION

The aim of lateral wedging is to force the foot into pronation. This will have the effect of altering the centre of pressure and the ground reaction force line of action, which will theoretically modify the loading at the knee joint. This is especially important in conditions such a medial compartment osteoarthritis where off loading of the affected medial compartment is desirable by moving the knee into this position will relieve the pain in this compartment.

The use of lateral wedging has been reported since the first study by Yasuda and Sasaki in 1987[1]. However, there is still a dearth of literature available on biomechanical variables during walking with lateral wedging. A recent study [2] investigated the effects of different elevations of wedging in a group of individuals with no pathologies. They found that laterally wedged insoles significantly reduced the knee joint adduction moment compared with the no wedged insole. However, it is not known if the insoles were inside the shoe or attached to the outside, and also a very simple marker set were used which could bring errors into the calculation of frontal plane motion and moments. It has been clinically shown that wearing a laterally wedged insole provides some perceived pain and function benefit for OA patients, although the guidelines for prescription of the insole such as the degree of incline to use has not been thoroughly studied in respect of controlled shoes and insoles.

The purpose of this study was to assess the effect of wearing two different degrees of lateral wedging on the knee joint adduction moment during loading in healthy adults.

METHODS

Twelve, healthy, male subjects participated in the study. Subjects performed ten walks whilst wearing standard shoes (ECCO Zen) and standard insoles (slimflex). Three conditions were investigated: a) no wedge b) 5 degree wedge, c) 8.5 degree wedge. The insoles were all manufactured by a podiatrist with a full sole up to the metatarsal heads on the lateral border of the insole. Data was collected using eight camera Qualisys Proreflex MCU240 system with bilateral force collected using two Kistler force platforms. Markers were located on the calcaneus, 1st metatarsal, fifth metatarsal, 2nd metatarsal, with clusters of four on the shank, thigh and pelvis. Anatomical reference frames were based on the ISB stardardisation protocol [3]. Hip joint centre was calculated with the functional hip joint method [4].

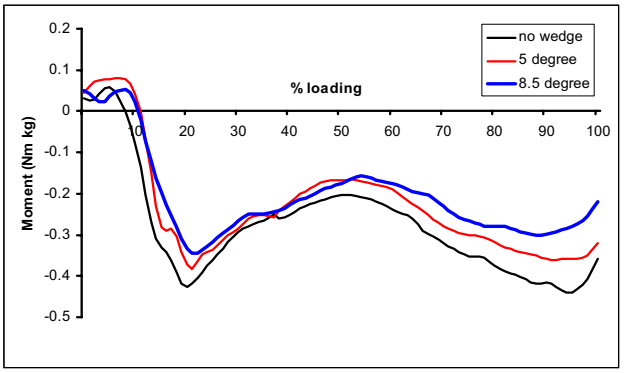

Figure 1: Knee adduction moment in the three wedges N=12)

Data were exported to Visual 3D where 3-dimensional coordinates were interpolated, and low pass filtered using a Butterworth 4th order filter at 6 Hz. Analog data was filtered at 25 Hz. The knee adduction moments were calculated and the peak moments during loading were identified between heel strike and the contralateral heel strike. A one way analysis of variance was performed with an alpha level of 0.05 with a Bonferroni adjustment.

RESULTS AND DISCUSSION

The data for the knee adduction moment was significantly lower for both the 5 degree and 8.5 degree lateral wedging in both limbs during the loading period of both limbs.

CONCLUSIONS

It can be seen from the data presented in this paper that lateral wedging on a standard insole changes the adduction moment of the knee joint during walking. This has implication for the future study on medial compartment osteoarthritis where three conservative treatment options will be evaluated against standard surgical procedures in the aim at reducing pain and increasing functional independence.

REFERENCES

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Variable	Degree of Wedge Profile		
	No wedge	5 degree wedge	8.5 degree wedge
Knee Adduction Moment (Nm / kg)	0.425	0.384	0.345

Table 1: Knee adduction moment data for the different wedge