DOES KNEE EXTERNAL ROTATION DIFFER ACCORDING TO FRONTAL PLANE KNEE ALIGNMENT AND THE PRESENCE OF PATELLOFEMORAL OSTEOARTHRITIS AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION?

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Purpose: Patellofemoral (PF) osteoarthritis (OA) and anterior cruciate ligament reconstruction (ACLR) have both been shown to be associated with frontal plane knee malalignment and greater tibial external rotation. However, little is known about frontal plane malalignment and knee external rotation in people with PF OA after ACLR. The aim of this study was to evaluate the association between frontal plane knee alignment and tibial rotation angle during walking and running in people with and without PF OA after ACLR.

Methods: Thirty-six individuals from an ACLR database who were 9 years after hamstring graft ACLR with either radiographic PF OA (with no, or less, concomitant tibiofemoral OA; n=18; 56% male; age 47±10 years; BMI 27.3±3.8kg m-2) or no OA (n=18; 61% male; age 40±9 years; BMI 26.6±4.1kg m-2) participated in a cross-sectional study. Knee rotation in the ACLR knee was measured in a gait laboratory using a point-cluster technique and a three-dimensional motion analysis system (VICON) during gait (2 speeds: walking at self-selected speed and running at 2.5-3.5 m.sec-1). Weight-bearing frontal plane knee alignment was measured with a digital inclinometer, and participants were classified as having either varus or valgus alignment using a previously validated formula. Repeated-measures analysis of covariance (covariates: age, gender, BMI) with speed (walk, run) and event (initial contact, point of maximum knee flexion during stance, toe-off) as within-subject factors, and OA status (PF OA, no OA) and frontal plane alignment (varus, valgus) as between-subject factors, was used to assess the interaction between PF OA and frontal plane alignment on tibial external rotation angle. Post-hoc tests were conducted where indicated (α=0.05).

Results: Significant interactions were found between PF OA and frontal plane alignment on tibial rotation angle during walking and running (F(1,29) = 9.32, p = 0.005). Post-hoc tests revealed that in individuals with valgus alignment, those with PF OA demonstrated a mean 5° (95% CI: 0 to 10) more tibial external rotation than those without OA across both gait speeds (Figure 1) with a moderate effect size (standardised mean difference (SMD)=0.53). For individuals with varus alignment, those with PF OA had a mean 3° (-1 to 6) less tibial external rotation than those without OA with a smaller effect size (SMD=0.38).

Conclusions: Nine years after ACLR a significant interaction effect between PF OA and frontal plane alignment on tibial external rotation angle exists during walking and running. Greater tibial external rotation in those with PF OA with valgus aligned knees may be clinically important, given that a rotational shift of similar magnitude has been suggested to be sufficient to cause acceleration of cartilage degeneration. Further prospective studies are required to determine if this relationship indicates altered movement patterns due to PF OA, or if it may be a risk factor for PF OA development after ACLR.

DIFFERENT ALTERATIONS IN THE SIT TO STAND MOVEMENT PATTERN IN WOMEN WITH EARLY AND ESTABLISHED MEDIAL COMPARTMENT KNEE OSTEOARTHRITIS

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Purpose: Several gait alterations including a greater loading of the medial compartment have been documented in patients with moderate to severe knee osteoarthritis (OA), but not in knee OA patients with beginning joint degeneration (early knee OA). The Sit to Stand (STS) movement is a mechanically more demanding task, requiring greater joint forces and moments, and is considered as one of the most difficult activities of daily life for patients with knee OA. Therefore, the aim of this study was to assess whether early knee OA patients did show an altered movement strategy in the more demanding STS movement compared to established knee OA patients and healthy controls.

Methods: A novel classification system, incorporating Magnetic Resonance Imaging, was used to identify patients with early knee OA. Thirteen female subjects with symptomatic early medial compartment knee OA, 16 female subjects with established medial compartment knee OA (Kellgren and Lawrence grade ≥2*) and 16 asymptomatic female control subjects volunteered for the study. A 3D motion analysis system and force platform were used to capture the movement pattern during the STS task. Outcome measures included spatiotemporal variables (duration of movement - angular velocity), kinematic variables (joint angles) and kinetic variables (joint moments). Differences between these groups were analyzed using a one-way analysis of variance.

Results: The duration of the STS movement and the knee angular flexion velocity were not significantly different between the three groups. Early OA subjects showed no significant differences in kinetic variables during the STS movement. In contrast, the established OA group had a smaller knee flexion range of motion (61.0 degrees versus 67.4 degrees), related to significant more remaining knee flexion after reaching the final standing posture (15.7 degrees versus 9.9 degrees). They also showed significantly less knee abduction (11.5 degrees versus 14.4 degrees) and a significantly higher maximal knee adduction angle (6.7 degrees versus 1.9 degrees). Both OA groups showed different alterations in kinetic variables during the STS movement. Early OA patients showed a significantly higher peak hip flexion moment (0.28 Nm/kg versus 0.17 Nm/kg) and established OA patients showed a significantly larger KAM impulse (0.04 Nm/kg versus -0.02 Nm/kg) compared to controls.

Conclusions: Differences in the STS movement kinematics and kinetics that were only present in patients with established knee OA and not in patients with early knee OA are most likely a consequence of structural degeneration in medial compartment knee OA and reflect mechanical overload of the medial compartment. On the other hand, the higher peak hip flexion moment during the STS movement that was present in the early stage of knee OA could reflect a compensatory mechanism in order to avoid an increase in peak knee flexion forces or on their diseased knee. Higher knee flexion moments would entail higher force demand for the quadriceps, higher overall joint compression forces and, subsequently, an increase in pain. In contrast with the findings in gait analysis, early OA patients did show an adaptation in their STS movement strategy compared to healthy controls which supports the relevance of classification of early knee OA.

BIOMECHANICAL FACTORS RELATED TO RESPONSE TO LATERAL WEDGE INSOLES

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Purpose: Lateral wedge insoles reduce the external knee adduction moment (EKAM), however approximately 30% of patients have a paradoxical increase in EKAM. Identifying and understanding why these patients increase EKAM is critical for prescribing the correct treatment for these patients. Evidence suggests ankle biomechanics may play a key role in reducing EKAM as lateral wedge insoles have been shown to shift the centre of foot pressure (COFP) laterally, increasing ankle eversion moment and subsequently decreasing the ground reaction force (GRF) from knee thus reducing the EKAM. To date, patients have...