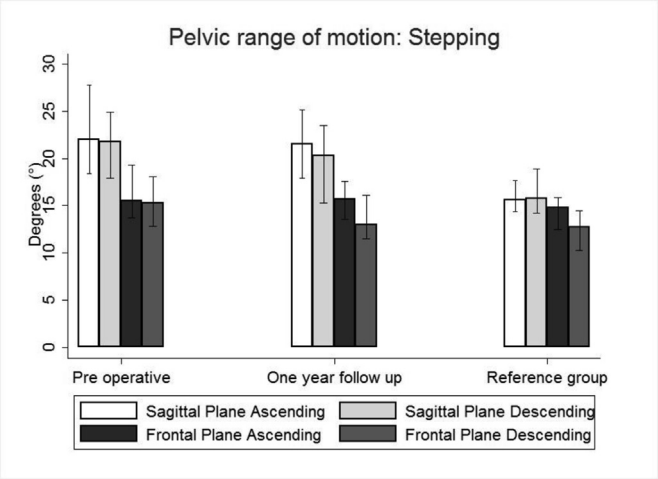


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## GAIT CHARACTERISTICS OF PATIENTS WITH LATERAL KNEE OSTEOARTHRITIS AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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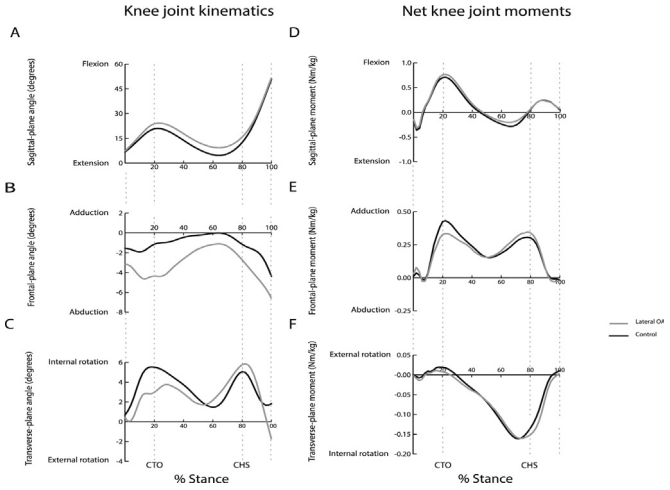
**Purpose:** Lateral knee osteoarthritis (OA) is evident in more than 50% of individuals with post-traumatic knee OA after anterior cruciate ligament reconstruction (ACLR). Currently, little is known about the gait characteristics associated with this condition. Knowledge of biomechanics associated with the knee joint and secondary joints will improve our understanding of this condition, and assist in developing targeted interventions for this patient population. This study aimed to compare: i) knee kinematics and net joint moments; and (ii) trunk, pelvis, hip and ankle kinematics and net joint moments, in individuals with predominant lateral knee OA after ACLR and healthy controls.

**Methods:** Volunteers who had undergone a primary ACLR 5-20 years previously, with symptomatic (Knee Injury and Osteoarthritis Outcome Score (KOOS) criteria) and radiographic (Kellgren & Lawrence $\geq$2) lateral knee OA, and healthy control volunteers were recruited from the community in Melbourne, Australia. Quantitative gait analyses were conducted during walking trials at self-selected speeds. Post-processing of gait data involved calculation of trunk, pelvis, hip, knee and ankle kinematics, and external hip, knee and ankle net joint moments. Peak values were identified in the first half of stance phase. Data were statistically analysed using independent Student's t-tests ($p<0.05$).

**Results:** The lateral knee OA group consisted of 19 individuals (15 males) (mean±SD age 37±7yrs, body mass 80±10kg; KOOS subscales: pain 80±15, symptoms 74±13, activities of daily living 88±15, sport/recreation 69±26, quality of life 58±23) who were 12±4 years post-ACLR. The control group consisted of 25 healthy individuals (14 males, age 31±6yrs, body mass 69±11kg). Participants in the lateral knee OA group were approximately 6 years older ($p=0.004$) and weighed 11kg more ($p=0.001$) than controls. There were no significant differences in gait speed between the two groups ($p=0.143$). Compared to controls, the lateral knee OA group had greater peak knee flexion (mean difference: 3.51°, 95% confidence interval: 0.89 to 6.14) and lower peak knee internal rotation (-3.30°, -6.16 to -0.50) angles. Trends of lower external knee adduction moment (-0.12 Nm/kg, -0.24 to 0.00) and external rotation moment (-0.01, -0.02 to 0.00) were noted in the lateral knee OA group. Those in the lateral knee OA group had greater anterior pelvic tilt (3.21°, 0.15 to 6.26) and hip flexion (5.09°, 1.85 to 8.32) angles relative to controls. At the ankle joint, with the lateral knee OA group had a significantly greater dorsiflexion moment (0.11Nm/kg, 0.02 to 0.21) than controls.

**Conclusions:** Younger people with lateral knee OA after ACLR had lower knee internal rotation angles, greater knee flexion, anterior pelvic tilt, and hip flexion angles, and greater dorsiflexion moment than controls. The findings highlight that in people with lateral knee OA after ACLR, biomechanical deficits are present at the knee joint, as well as secondary joints. Currently, there is no evidence to guide management of post-traumatic lateral knee OA after ACLR, and practitioners can only draw on evidence for interventions designed for non-traumatic OA. However, gait characteristics of patients with post-traumatic knee OA do not necessarily match those seen in non-traumatic knee OA patients. Thus, targeted interventions should be investigated for this patient population that could potentially address biomechanical deficits at the knee joint, as well as secondary joints.

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## METABOLOMIC CHARACTERIZATION OF EXPERIMENTAL OSTEOARTHRITIS IN A NON-INVASIVE BIOLUMINESCENT REPORTER MOUSE

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**Purpose:** Mouse models are valuable tools for understanding osteoarthritis (OA). Current methods are unable to monitor longitudinal cartilage changes in vivo. The aim of this study was to develop novel methods for quantifying changes in cartilage during an experimental model of OA. Utilizing novel transgenic mice that display cartilage-specific bioluminescence, cartilage was quantified in vivo in a model of surgical destabilization and forced running. After the final timepoint, whole joint metabolomics were identified via HPLC-MS to compare with in vivo cartilage degradation results.

**Methods:** Animal studies were approved by IACUC. This study used mice (n=10, all female) containing a conditional luciferase reporter driven by tamoxifen-inducible CREtargeted to the aggrecan promoter. In this model, cells expressing aggrecan (i.e. chondrocytes) are time-stamped with bioluminescence by tamoxifen treatment prior to injury. . Bioluminescence was induced via sub-q scruff injections of tamoxifen (10mg/mL) for 3 days (2 mg/day). After a 5 day rest period, mice were imaged (Kodak ImageStation) using 15 min exposures following sub-q scruff injection of luciferin (1.5mL/mouse at 15 mg/mL). 16-bit images were contrasted, inverted, and thresholded prior to region of interest analysis for each knee. Baseline values were determined by 3 consecutive days of imaging. Unexercised (UE) control mice and exercised (E) mice were used. E mice were trained on a treadmill for 10 consecutive days building to 30 cm/s for 20 minutes at 15° incline. After training, left knees of E mice were surgically destabilized using the MMT model. After 96 hours of recovery, E mice were run for 15 days. UE mice were handled daily without running as a control. Both groups were imaged every 2 days for 15 days.

Mice were euthanized by cervical dislocation, joints dissected (both condyles and the distal ~80% of the trochlear grove), pulverized, and metabolites extracted. Untargeted and targeted metabolite detection was performed via LCMS.

For analysis, four analytical groups were established; UE left knee (UEL), UE right knee (UER), E left knee (EL), and E right knee (ER). To determine