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Titel des Beitrags: Tibiofemoral and patellofemoral joint 3D-kinematics in patients with posterior cruciate ligament deficiency compared to healthy volunteers.

Abstract: The posterior cruciate ligament (PCL) plays an important role in maintaining physiological kinematics and function of the knee joint. To date mainly in-vitro models or combined magnetic resonance and fluoroscopic systems have been used for quantifying the importance of the PCL. We hypothesized, that both tibiofemoral and patellofemoral kinematic patterns are changed in PCL-deficient knees, which is increased by isometric muscle flexion. Therefore the aim of this study was to simultaneously investigate tibiofemoral and patellofemoral 3D kinematics in patients suffering from PCL deficiency during different knee flexion angles and under neuromuscular activation. We enrolled 12 patients with isolated PCL-insufficiency as well as 20 healthy volunteers. Sagittal MR-images of the knee joint were acquired in different positions of the knee joint (0°, 30°, 90° flexion, with and without flexing isometric muscle activity) on a 0.2 Tesla open MR-scanner. After segmentation of the patella, femur and tibia local coordinate systems were established to define the spatial position of these structures in relation to each other. At full extension and 30° flexion no significant difference was observed in PCL-deficient knee joints neither for tibiofemoral nor for patellofemoral kinematics. At 90° flexion the femur of PCL-deficient patients was positioned significantly more anteriorly in relation
to the tibia and both, the patellar tilt and the patellar shift to the lateral side, significantly increased compared to healthy knee joints. While no significant effect of isometric flexing muscle activity was observed in healthy individuals, in PCL-deficient knee joints an increased paradoxical anterior translation of the femur was observed at 90° flexion compared to the status of muscle relaxation. Significant changes in tibiofemoral and patellofemoral joint kinematics occur in patients with isolated PCL-insufficiency above 30 degrees of flexion compared to healthy volunteers. Since this could be one reasonable mechanism in the development of osteoarthritis (OA) our results might help to understand the long-term development of tibiofemoral and/or patellofemoral OA in PCL-insufficient knee joints.