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Summary:
In this in vitro biomechanical study, the sMCL was the primary restraint of valgus laxity, with the dMCL being the primary restraint of external rotation in extension. Both the dMCL and sMCL were co-primary restraints of anteromedial rotation. The addition of a partial sMCL injury resulted in increased valgus laxity, AMR and increases in ACL forces.

Data:
Introduction: Recent studies have highlighted the importance of the deep and superficial MCL (dMCL and sMCL respectively) in controlling anteromedial rotation (AMR). Conflicting data exists as to which of these structures is most important, and no data exists that determines the impact of a combined dMCL and partial sMCL (parsMCL) injury. The purpose of this study was therefore to evaluate knee kinematics and in situ ligament forces during simulated clinical laxity tests following sMCL and dMCL sectioning in ACL intact and deficient knees. We hypothesized that the dMCL has a role in controlling AMR, with the sMCL having a greater role in controlling valgus rotation (VR). Furthermore, a combined dMCL and parsMCL injury would result in increased AMR and increased ACL graft forces. Methods: Testing was performed on 16 cadaveric knee specimens. Three distinct cutting protocols were used. 1 (n=8) - ACL/ dMCL/parsMCL/sMCL; 2 (n=4) - ACL/sMCL/dMCL; 3 (n=4) - dMCL/parsMCL/ sMCL/ACL. The responses of each specimen to VR (8 Nm), external rotation (ER), (4 Nm) and AMR (combined anterior-directed force (89 N) and external torque (4 Nm)) tests at 0°, 30°, 60°, and 90° of flexion were recorded while intact and after each cutting stage. Joint kinematics were re-applied, allowing for in situ ligament forces to be measured. Sample sizes were determined to detect differences of 1° or 5% between states with 80% power and 95% confidence. Results: In ACL deficient knees, an isolated dMCL resulted in a small increase in VR (<1.5°). The addition of parsMCL caused a significant increase in VR (2.1°+/-0.4°, p = 0.006). When the ACL was intact, parsMCL injury caused a small (1.4°) increase in VR. A small increase in ER was observed with isolated dMCL injury in ACL deficient knees at all flexion angles, showing statistical significance at 0° (1.7°+/-1.7°, p = 0.047) and 90° (1.5°+/-1.3°, p = 0.016). ParsMCL injury created a larger statistically significant increase in ER at 30°, 60°, and 90° of flexion. With the ACL intact, dMCL transaction caused a small increase in ER at 60° (0.3°+/-0.2°, p = 0.012), with no significant effect from parsMCL. In ACL...