Reference: Bassett CC, Gilbert KK, Hooper TL, James R. Shear wave elastography measured differences between unembalmed and embalmed knee tissue stiffness. 2019; (In preparation)

Context: Cadavers are valuable resources for education, research, and clinical simulation; however, no quantitative data exists to compare fresh? cadaver tissue stiffness relative to embalmed cadavers.

Objective: To determine whether knee tendon, muscle, and ligament tissues stiffnesses are different between unembalmed and embalmed cadavers or between 5 and 20 degrees of knee flexion. To provide recommendations for unembalmed and embalmed cadaver use based on quantitative *in situ* tissue stiffness. It was hypothesized that embalmed cadavers would have greater stiffness values than unembalmed cadaver tissues based on the empirically noted rigidness of embalmed cadavers.

Design: A 2x2 factorial design.

Setting: A Clinical Anatomy Research Laboratory.

Specimens, Patients or Other Participants: Five unembalmed and five embalmed cadavers of varying age (60-94 years), sex (5 male), and BMI (16-39 kg/m^2) were used to collect data based on randomized consecutive sampling.

Intervention(s): Ultrasound shear wave elastography (SWE) was used to calculate patellar tendon (PT), vastus medialis oblique (VMO), and superficial medial collateral ligament (sMCL) stiffness. Unembalmed and embalmed cadaver tissues were measured at five and 20° of knee flexion.

Main Outcome Measure(s): Embalmed and unembalmed cadaver tendons, muscles, and ligament stiffness values were measured in kilopascals (kPa) with the SWE. Measurements were recorded at 5 and 20 degrees of knee flexion.

Results: Tissue stiffness measurements were significantly different between embalming conditions for the PT and VMO (PT $p < .001$; VMO $p = .008$), but sMCL data is inconclusive ($p = .342$). There were no significant tissue stiffness differences between 5 and 20 degrees of knee flexion (PT $p=0.473$; VMO $p=0.598$; sMCL $p=0.348$).

Conclusions: Embalmed PT and VMO tissues are stiffer than unembalmed tissue but knee flexion between 5 and 20 degrees does not change stiffness in either condition. Unembalmed cadavers are recommended for biomechanical research and clinical simulation. Embalmed cadavers are recommended for anatomical education. Future research should compare tissue stiffness measures of cadavers pre- and post-embalming.