Instrument assisted soft tissue mobilization alters material and mechanical properties in healthy, shortened Achilles tendons

Amy J Bayliss, DPT, PT; Trent Crandall, SPT; Danielle L Farmer, SPT; Stuart J Warden, PhD, PT

Purpose/Hypothesis: Clinical consequences of a shortened Achilles tendon include an increased risk for lower extremity injury, an increased likelihood of developing Achilles tendinopathy and reduced running economy. The purpose of this ongoing study is to explore the impact of instrument assisted soft tissue mobilization (IASTM) on Achilles tendon material and mechanical properties in healthy subjects with reduced tendon length.

Number of subjects: Six adults with bilaterally shortened Achilles tendons (age = 32.6±17.6; 66% female).

Material/Methods: Adults with bilaterally reduced Achilles tendon length as measured using a weight bearing lunge test are being recruited. Bilaterally reduced Achilles tendon length is being defined as a distance of <9cm from the tip of the great toe to the wall in the weight bearing lunge test, with <1.5cm side-to-side asymmetry. Subjects are excluded if they report any of the following: (1) pain in the foot, heel or ankle, (2) a history of Achilles tendon injury, rupture or surgery, or (3) previous foot or ankle surgery in the last 12 months. Treatment is being randomized within subject, with the treated tendon receiving 8 sessions of IASTM combined with stretching over a 4 week period and the control tendon being exposed to stretching alone. Real time ultrasound imaging and dynamometry at both baseline and follow-up are being used to acquire Achilles tendon resting length, elongation, cross-sectional area, force, stiffness, stress, strain and Young’s modulus.

Results: Statistical analyses of data from the 6 subjects tested thus far revealed a 28.1% gain in Young’s modulus in IASTM treated tendons compared to 4.0% gain in contralateral control tendons (p<0.05, IASTM vs. control [Wilcoxon signed-rank test]). There was also a trend towards an increase in tendon resting length with IASTM treatment (p=0.06). There was no statistical benefit of IASTM on tendon stiffness or strain, or performance on the weight bearing lunge test in the 6 subjects tested thus far (all p=0.12-0.17).

Conclusion: Tendons have an ability to remodel and adapt in response to stimuli. The initial results of this ongoing study suggest that IASTM introduces a stimulus that induces adaptation of the material properties in healthy, shortened Achilles tendons. In particular, IASTM increased the tendon’s Young’s or elastic modulus. Elastic modulus represents the stiffness of the material within a structure independent of its geometry, with a tendon exhibiting increased elastic modulus hypothesized to enable more effective transference of forces.

Clinical relevance: IASTM appears to be an effective intervention for altering Achilles tendon material properties in healthy, shortened tendons. Whether the induced changes alter injury risk or occur in injured tendons requires further exploration.

Keywords: Achilles tendon, soft tissue mobilization, ultrasound imaging.
References:


