Use of ankle resting angle as a surrogate for tendon elongation in individuals following Achilles tendon rupture
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Introduction/Purpose: Tendon elongation is associated with poor functional outcome in individuals after Achilles tendon rupture. While imaging modalities are reliable to measure Achilles tendon length, alternative time- and cost-effective measures are of interest. The resting angle of the ankle in prone both with knee extended1 and knee flexed2 have been used in the literature as surrogates for measuring Achilles elongation, however, their relationship to tendon length is not well-established. The purpose of this study is to validate the ankle resting angle as a measure of tendon elongation and examine the relationship of ankle resting angle to tendon elongation and calf strength.

Methods: Individuals following unilateral Achilles tendon rupture, treated surgically, were included in this cross-sectional study. Individuals were excluded if they had deep wound infection or lumbar radiculopathy affecting the ankle plantar flexors. Ankle resting angle with knee extended and knee flexed to 90 degrees was measured using a digital inclinometer positioned on the lateral, plantar surface of the foot. Relative resting angle was calculated by subtracting the uninjured from the injured side. Tendon length to gastrocnemius was measured using B mode, extended field of view ultrasound imaging3 (tendon elongation = ruptured-uninjured). Calf strength was measured using the heel-rise test4. Limb symmetry indexes (LSI) were calculated (ruptured/uninjured side x 100) for total work performed on the heel-rise test.

Results: Twenty-five individuals, a mean(SD) age of 44.2(13.6) years and mean(SD) of 22.5(39.1) months post-rupture, were included in this study. Mean(SD) relative resting angle with knee flexed was -5.4(6.4)° and mean (SD) relative resting angle with knee extended was -6.7(8.8)°. Mean(SD) tendon elongation was 1.56(1.20)cm. Mean(SD) heel-rise test work LSI was 45.8(23.8)%.

Conclusion: The results of this study suggest that ankle resting angle with knee extended and flexed are related to tendon elongation, however, calf strength also has a relationship to resting angle with knee flexed. This suggests that the ability of the calf to put passive tension on the foot is also a component of resting angle. The relationship between tendon elongation and resting angle with knee flexed may have been limited by methodological concerns, as tendon length was measured with the participant positioned with knees extended.