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# EVALUATION OF MECHANICAL PROPERTIES OF RAT TIBIALIS ANTERIOR TENDON USING TWO DIFFERENT APPROACHES

Wu, J Z.[1]; Gregory, E W.[1]; Miller, G R.[1]; Metheny, R[1]; Brumfield, A[1]; Cutlip, R G.[1]

**Author Information**

[1]CDC/NIOSH, Morgantown, WV

(Sponsor: Stephen E. Alway, FACSM)

Tendon injuries may result in variations of its mechanical properties. Published data on the tendon stiffness of small animals, such as mouse and rat, are exclusively obtained by measuring grip-to-grip (g-t-g) displacement. Local strain concentration and relative sliding of the specimens in the clamps might affect the measured tendon deformation significantly.

**PURPOSE**

To measure the mechanical properties of rat tibialis anterior tendon based on the real tendon deformation and to evaluate the error introduced by using the g-t-g displacement.

**METHODS**

Five male Sprague Dawley rats (~418g) were used in the study. After being sacrificed, the tibialis anterior tendons of each animal were isolated. Two reference marks were made on the tendons using permanent ink. A microscope video system was customized to observe and record the tendon deformation. Pattern recognition software was developed to obtain the displacement-time histories of the reference marks. The distances between the grips and the reference marks were approximately 7 and 5 mm, respectively. Cross-sectional areas of the specimens were measured under a constant compressional stress (0.1 MPa) using a custom-made slot gauge. The tendons were clamped between two custom-made metal grips and stretched to failure at a constant speed (1 mm/s) on a testing machine. Throughout the tests, the tendon specimens were submerged in PBS bath at 22˚C. The deformation of the specimens was quantified using the g-t-g method and displacements between the reference marks.

**RESULTS**

The yield stress of the rat tibialis anterior tendon was approximately 140 MPa, which is consistent with the literature. The yield strain evaluated using the displacement between the reference marks was 5.5%, significantly smaller than that using the g-t-g method (10.5%).

**CONCLUSION**

Measurement of tendon stiffness using the g-t-g method may underestimate the true tendon stiffness by approximately 50%.