

Suprapatellar Versus Infrapatellar Tendon Tone and Stiffness in Relaxed and Loaded Conditions

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BACKGROUND: The intra- and extramuscular connective tissue's mechanical properties play an important role in transmitting force from muscle to bone lever. Our recent study results in an assessment of the muscle tone, stiffness and elasticity [1]; indeed the visco-elastic property in muscle tissue exhibits a spring like behaviour of e.g. perimyseum and fascia. Force transmission culminates in the tendon. The goal of this study is to measure and compare suprapatellar tendon and infrapatellar tendon (patellar ligament) tone as a function of the oscillation frequency of tissue (Hz) and stiffness (N/m) with non-invasive myometric method and novel Myoton 3 device [2] in both young and elderly individuals.

METHODS: 8 healthy young and 8 healthy elderly women with age of 20.6 (SD 1.3) and 70.9 (3.3) yrs, body mass 60.0 (8.7) and 70.0 (8.0) kg, height 166 (3.7) and 157 (4.7) cm, respectively, participated. Subjects were in supine relaxed position with lower members on the special support base providing 25° hip and 20° knee joint flexion. Myometric measurements (Müomeetria Ltd CEO537, Estonia) were done from previously highlighted marks placed in palpable centre and on most lateral 3mm portion of tendon. First step, in relaxed state on both legs, and 2) again while holding calf detached 2 cm above the support base, not changing the knee angle as compared to the recording in the first step.

RESULTS: Shown in Figure 1.

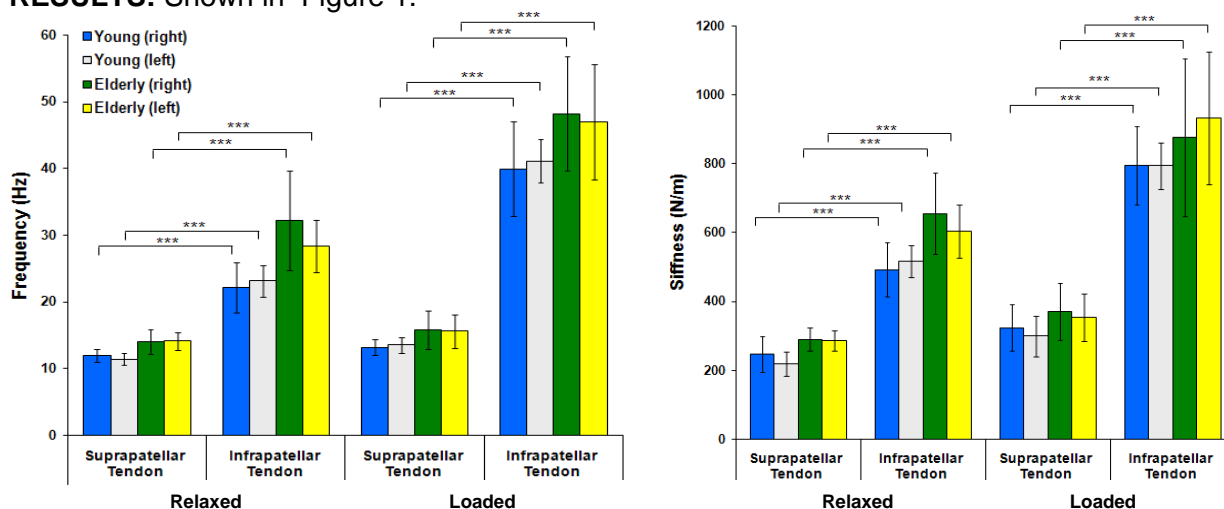


Figure 1. The frequency and stiffness of supra- and infrapatellar tendon (means \pm SD), *** P<0.001.

CONCLUSION: Both young and elderly women demonstrated significantly higher tone and stiffness in infrapatellar tendons than in suprapatellar tendons both in relaxed and loaded states. Summation of force transmission requires more stiffness in infra- versus suprapatellar tendon, and this is in line with results of our study. We cannot confirm any existing trend of increase in tone and stiffness parameters from young to elderly individuals, possibly due to our small study sample. With myometry, one can register tone and stiffness from specific and different areas of tendinous tissue, not from the tendon as a whole. On one hand, this gives a possibility to detect local changes in tendon, yet this is a limitation of our study and further studies are needed to expand registered data to the whole tendon.

REFERENCE: 1) Viir R et al. Repeatability of trapezius muscle tone assessment by a myometric method. *J Mech Med Biol.* (6):215-28, 2006; 2) Vain, A. A method and device for recording mechanical oscillations in soft biological tissues, US Patent 6,132,385 Oct.2000.