Evaluation of Ankle Plantarflexion Endurance and Power Following Gastrocnemius Recession for Achilles Tendinopathy

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Introduction
Increased recognition of an isolated gastrocnemius contracture in patients with foot and ankle pathology has generated enthusiasm for selectively reducing tension on the Achilles tendon through a gastrocnemius recession (GR) procedure. Outcome studies to date are encouraging regarding patient satisfaction, pain reduction and return to daily activities. However, functional and recreational activities that require increased muscle endurance and ankle ‘push off’ power (eg. heel raise, climbing stairs, fast walking) present greater challenges. The purpose of this study was to determine the effects of an isolated GR on ankle muscle performance (plantarflexion endurance and power) during heel raise and stair ascent in patients who underwent a unilateral GR for the treatment of recalcitrant Achilles tendinopathy (AT).

Methods
13 patients (mean age: 53.8 ± 7 yrs; BMI 30±4.5; M:F=8:5) with a diagnosis of unilateral AT combined with an isolated gastrocnemius contracture received a GR (Strayer) procedure. Patients were evaluated an average of 20 months (range 13-36 months) post operatively. The control group consisted of six subjects (mean age: 53 ± 4 yrs) with overall similar demographics. Self-reported outcomes were assessed using the Foot Ankle Ability Measure (FAAM). Three-dimensional foot kinematics and force data were collected during heel raise and stair ascent. Calf endurance was assessed using the heel raise work test (plantarflexion force x heel height x number of repetitions of single limb heel raises) and a limb symmetry index (LSI) was used to determine the magnitude of side-to-side differences. Peak ankle push off power was assessed at two different step heights. Appropriate t-tests compared differences between involved and uninvolved limbs (patient group), as well as between the involved limb (patient group) and non-dominant limb of the control group.

Results
FAAM scores were 89.7% for activities of daily living subscale and 71% for sports and recreation. Calf endurance was significantly less between involved and uninvolved limbs (1240 ± 909 Joules vs. 1675 ± 585 Joules, respectively, p=.01), as well as between the patients’ involved limb and non-dominant limb of the control group (p=.009). The LSI indicated the involved limb was 67% of uninvolved limb in patients compared to 99% for controls. (Figure). These values are below normative side-to-side differences (>90%) reported for patients following recovery from Achilles tendon rupture. The ability to generate push off power during step up was significantly less between involved and uninvolved limbs when patients attempted to step up to a higher step (2.84 N/kg vs. 3.85 N/kg, respectively, p=.04).
Conclusion
Although patients may be functioning ‘near normal’ for their activities of daily living, they report difficulty during activities that may be more demanding for the ankle plantarflexors, as noted in FAAM scores for sports and recreation. This study demonstrated deficits in ankle calf endurance and power during heel raises and stair ascent. Assessment of endurance and power may provide a more comprehensive biomarker of overall muscle function that may be linked to patients’ self-reported outcomes following gastrocnemius recession.