2016 IFFAS Award for Excellence - Peroneal Tendon Repairs: Can Tenodesis or Allograft Reconstruction Restore Physiologic Loading of the Peroneus Brevis and Peroneus Longus Tendons?

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Introduction/Purpose: Irreparable peroneal tendon tears are rare and there is scant evidence to guide surgeons on the appropriate treatment. In general, if more than 50% of the tendon is affected, segmental resection of the tendon and tenodesis to the remaining healthy tendon is recommended. We hypothesized that normal tension at the insertions of the peroneal tendons after an irreparable tear cannot be reestablished by tenodesis to the remaining tendon and can only be restored by allograft reconstruction.

Methods: To assess tendon loading at their insertions, custom-made strain gage-based tension transducers were implanted into the peroneus longus (PL) and brevis (PB) tendons adjacent to their insertions on the 1st and 5th metatarsal bases in 12 fresh-frozen cadaver feet. Axial load was applied to the foot, and the peroneal tendons, tibialis anterior and posterior tendons were tensioned to 50% and 100% of physiologic load. Transducer outputs were recorded in this normal tendon condition and after sequential PB to PL tenodesis and peroneus brevis allograft reconstruction. The tendon force transmission was quantified in five different foot inversion/eversion and plantarflexion/dorsiflexion positions. The distal peroneal tendons and 1st and 5th metatarsals were then excised along with the implanted transducers, and calibration was performed by applying incremental tendon loads in a materials testing machine. Insertion site tensile loading in each surgical condition was then expressed as a percentage of normal. Results of the allograft and tenodesis procedures were compared using paired t tests.

Results: Under 50% of physiologic load, tendon tension at the PB insertion ranged from 3% to 28% of normal after tenodesis. After allograft reconstruction, PB insertion tension increased to 73% to 101%
of normal. Tension at the PL insertion site was 102% to 117% of normal after tenodesis, and 84% to 93% of normal after allograft reconstruction. The treatment outcomes differed significantly, with p-values < 0.02.

Under the 100% loading condition, tension at the PB site ranged from 6% to 43% of normal after tenodesis and 88% to 99% of normal after repair with allograft. Tension at the PL insertion site was 101% to 120% and 94% to 101% after tenodesis and PB allograft reconstruction, respectively. The treatments differed significantly, with p-values < 0.02, in all comparisons except for PL tension in inverted and neutral foot positions.

**Conclusion:** Allograft reconstruction of a peroneus brevis tendon tear substantially restored tension at both the PB and PL insertion sites when the tendons and their antagonists were loaded to 50% and 100% of physiologic load. In comparison, peroneus brevis tenodesis to PL did not effectively restore tendon tension under most of the tested conditions, suggesting that this procedure may result in an imbalanced foot when applied clinically. Clinical comparative studies are necessary to determine if the results of this cadaveric, biomechanical study have similar in-vivo consequences.