

Sources of Variation in Flexor Tendon Repair Stiffness Measurements

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Introduction

- There is a large variation in reported flexor tendon repair stiffness values
- Purpose: Evaluate flexor tendon repair stiffness dependence on:
 1. Tendon length included in the measurement
 2. Presence of gapping

Methods

- 7 cadaveric FDP tendons
 - Transected in Zone II
 - Repaired with 4-strand cross-stitch cruciate, no epitendinous stitch
- Tensile testing machine displaced tendon ends at 0.5 mm/s
- Camera markers (Figure 1)
 - 10 regions interpolated from markers, 4mm to 40mm in length
 - Regions centered on transection
- Stiffness calculated as linear region of force-displacement curve
- 2-way ANOVA on stiffness with factors of included tendon length and presence of gap
- Tukey's test for post-hoc comparisons

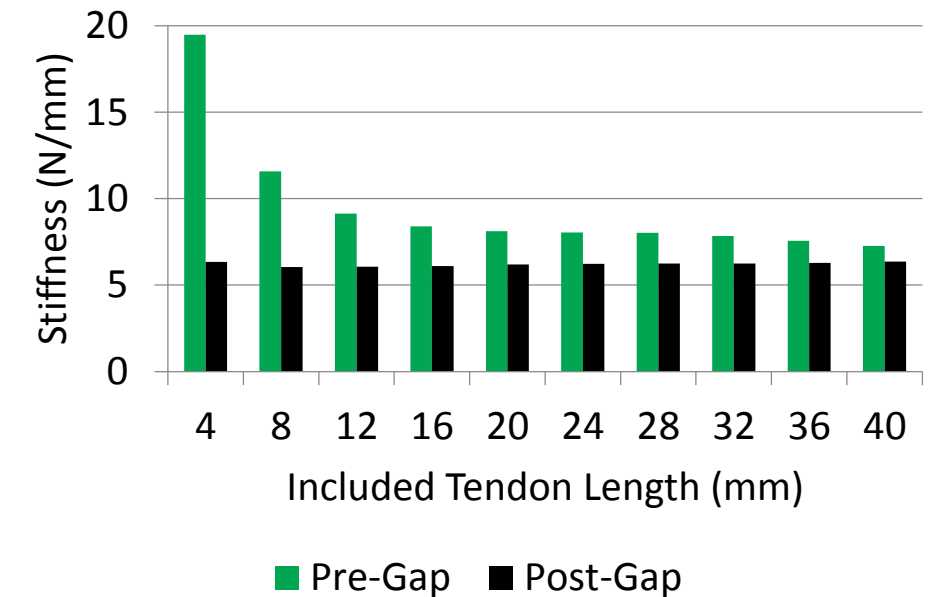
Figure 1



Results

- Pre-gap repair stiffness > post-gap stiffness ($p < 0.01$)
- At 4mm the stiffness > 32mm or more ($p = 0.04$)
- At 4mm of pre-gap, the repair stiffness > 12mm or more pre-gap repair stiffness and all values of post-gap repair stiffness ($p = 0.04$)

Figure 2



Discussion and Conclusion

- Bunching creates an infinite stiffness effect at the transection site prior to gapping because increased load does not change the displacement until gapping occurs (Figure 2)
- Pre-gap stiffness measurements drop as distance from the transection increases (Figure 2)
- From the edge of the repair region outwards, stiffness measurements are nearly constant because undamaged tendon is much stiffer than the repair (Figure 2)
- Post-gap stiffness measurements are nearly constant because each tendon half is translating as a unit with no motion between the markers on each half; the underlying suture is bearing load and stretching (Figure 2)

Conclusion: A flexor tendon repair stiffness measurement should report the tendon length over which the stiffness measurement was calculated and whether or not gapping was present.