

Arthrex Tightrope Tension Device: a quantitative research tool for determining optimal tension for ankle syndesmosis reduction

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Motivation

- Approximately 1%-18% of ankle sprains involve injury to the ankle syndesmosis.
- 20% to 45% of ankle fractures require operative fixation.¹
- Syndesmotic over-compression was found in 52% of patients and was associated with excess clamp force.¹
- Syndesmosis injuries fixed by suture button fixation rely on a surgeon's intuition.
- A tension measuring device would quantify tension of suture fixation and would standardize the force used.
- This device would improve accuracy and suture button fixation outcomes.

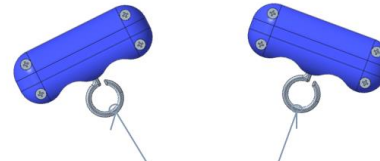
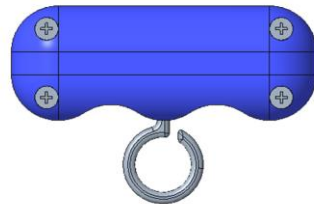
Further Research Directions

- Measure correlation between internal and extremal tension measurement in cadaver specimens.

Market

- No device exists to quantify suture system compression.
- "When the syndesmosis screws were removed 100% of the time, suture button fixation was more economical by \$85,000–\$194,656 per 100 ankles."³
- "Fixation with a single suture button device proved more cost-effective than fixation with either 1 or 2 syndesmotic screws."³

Solution



Features: 1) Tension Sensor
2) Bluetooth Connection (stores data)

Cost to Date: \$250

Design: 11 Weeks

Build and Test: 13 weeks

References

1. Dattani R, Patnaik S, Kantak A, Srikanth B, Selvan TP. Injuries to the tibiofibular syndesmosis. J Bone Joint Surg Br. 2008;90(4):405–10
2. Pettrone FA, Gail M, Pee D, Fitzpatrick T, Van Herpe LB. Quantitative criteria for prediction of the results after displaced fracture of the ankle. J Bone Joint Surg Am. 1983;65(5):667-677
3. Neary KC, Mormino MA, Wang H. Suture Button Fixation Versus Syndesmotic Screws in Supination–External Rotation Type 4 Injuries: A Cost-Effectiveness Analysis. The American Journal of Sports Medicine. 2017;45(1):210-217. doi:10.1177/0363546516664713

Constraints

- Similar size to Arthrex Tightrope system handle
- Minimum of 20 N and maximum of 125 N must be able to be registered on device
- Measurement will be displayed as close to instantaneously as possible with a temporal resolution smaller than 135 ms
- Contrast ratio between text and background must be at least 300:1

Impact

- Provide quantitative measurement for joint reduction
- Reduce the variability in tension, which will lead to lower costs.
- Improve surgical outcomes for Suture button fixation