

## OBJECTIVE

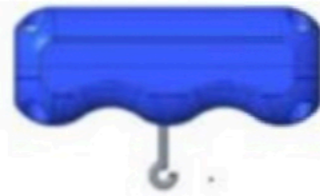
Develop a research instrument that measures tension in TightRope® implants in situ. The resultant data can be used to improve understanding of forces in TightRope® implants to further develop syndesmotic fixation devices.

## NEED

Current surgical solution (Arthrex TightRope) lacks a mechanism for quantifying compression during ankle syndesmosis repair. Therefore, there is the potential for over-compression and under-compression which can lead to inadequate stabilization of bones, limitations in range of motion, and risk of TightRope failure.

## CURRENT SOLUTION

SD Team 16 (2021) created a device capable of measuring tension during installment, but not after device placement.



## PROTOTYPE

Prototype components include:

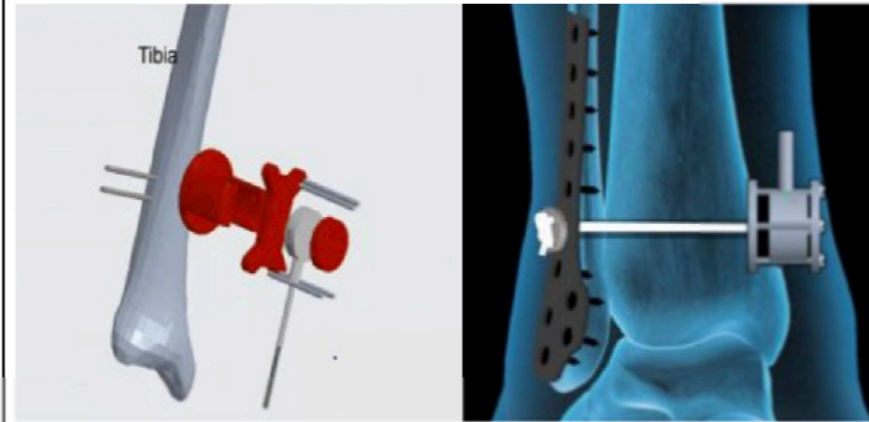
FUTEK LLB300 Miniature Load Button delivers continuous force readout via USB

Tension from suture applies compression onto sensor via housing

PEEK 3D printed housing

Stronger than most 3D printing filaments with more rapid prototyping than machining

Integrates with FUTEK sensor and TightRope® anchor without obstructing native anatomy



## REQUIREMENTS AND CONSTRAINTS

- R1 The device must be able to measure a compressive force of between 80N and 140N to avoid under and over compression of syndesmoses
- R2 The device must be able to measure tension in the TightRope® during normal ankle range of motion, meaning 65° to 75° in the sagittal plane
- C1-C4 Universal constraints (time, budget (\$800), limited resources, university policy)
- C5 Solution must interface with tightrope fixation device
- C6 Solution must not obstruct/interfere with ankle articulation

## IMPACT & CONCLUSION

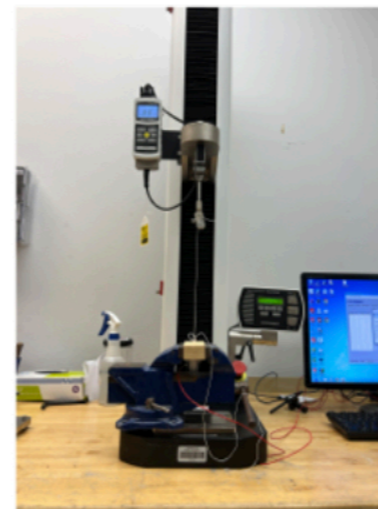
Expanded testing in the future may help us understand the impact of various forces during syndesmotic injury repair  
 Further cadaveric research may help quantify forces needed for repair  
 Device design could be adapted to clinical setting with appropriate development  
 Device expands on key limitations of prior SD group by quantifying expected force during and after surgery

## ACKNOWLEDGEMENTS

Dr. Sorin Siegler, (Mark-10 MTS, load sensor, 3D printers)  
 Dr. Thomas Sherman (Tightrope units, FiberWire suture)

## VALIDATION

Test	Method	Conclusion
1	Test strength of device components by implementing device with Sawbone foam blocks and applying force by hand.	Expected upper limit of 210 N. Test results not acquired 116N.
2	Assemble device on Sawbone ankle model, and record forces at angles within ROM.	Testing is still in progress with results forthcoming.



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