T.15

Talonavicular Anchor & Tether System

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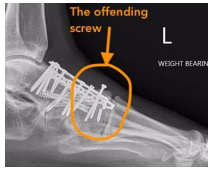
Need

Users: Orthopedic Surgeons - Dr. Sherman
Current Issues: 5-20% of talonavicular arthrodesis procedures fail- bones don't fuse due to device screws breaking and/or backing out
Objective: Engineer a device that promotes joint fusion by maintaining compression while reducing risk of displacement, and effectively reduces the risk of infection or patient discomfort.



Design Inputs

C1- Volume

C2- Biocompatibility

C3- Threading

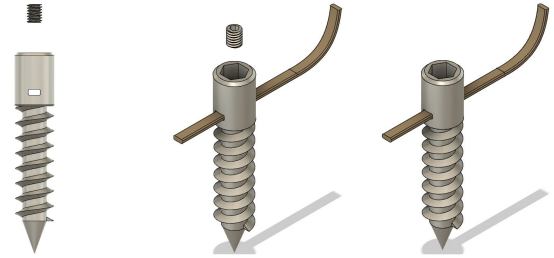
C4- Bit Type

Requirements:

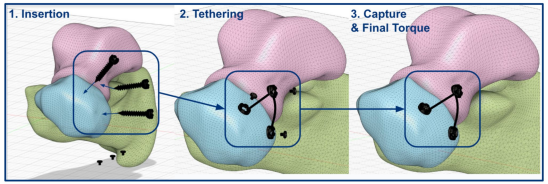
R1*- Surface Contact Area [>25%]*
R2*- Torsional Yield Strength [8 N*m]*
R3*- Insertion Torque [4 N*m]*
R4*- Pull out Force [10 N]*
R5*- Fatigue [>411k Cycles]*

Solution

1. Initial State **2. Prep** **3. Capture**



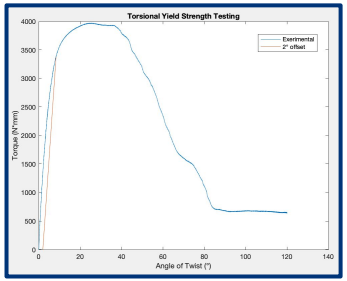
Intended Use and Implementation

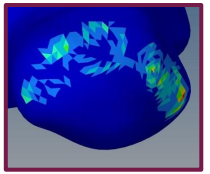


Machined aluminum versions of the Anchor Screw have been made and provide scale when compared to the Talonavicular Joint.
Current innovations over previous models include a revised screw head diameter to match thread diameter and more aggressive threads.

Verification

R#	Status
R1	Pass
R2	Fail
R3	Pass
R4	Pass
R5	N/A





Our solution only failed to meet the torsional yield strength requirement. Fatigue testing was not able to be completed due to time constraints.

Future

Revisions: Replace set screw → Implement an easier tether locking mechanism, Design tether that applies its own tension
Impact: Reduce # of incisions, time of surgery, repeat procedures (approx. 330), and cost of surgery (approx. $13.8 million)