Talonav Tether Screw

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Background

➔1 in 6 adults over 50 years old have foot osteoarthritis

➔7 million experience talonavicular joint arthritis (> 50 years of age)

➔11,000 talonavicular arthrodesis annually

➔20% failure in talonavicular joint fusions

Existing Solutions & Limitations

Existing Solution	*Limitation*
Staple 	Does not achieve as much compression as some of the other solutions
Post & Screw 	Tapered screws can become removed from bone.
Variable angle compression screw 	Inconsistencies in bone purchase between anchors
Clip and plate 	Device is bulkier and requires a more invasive surgery

Constraints

1. Time: 34 weeks
2. Resources: Bone Blocks and Biomechanics Lab
3. Budget: $800
4. Policies: IRB and IACUC approval, Drexel environmental health and safety plan, Drexel clinical safety plan
5. Size: Limited by anatomy around region
6. Biocompatible Material: To not be rejected by body
7. Thread Size: Outlined by ASME B1.1
8. Bit Type: Outlined by ASTM F116-12

Requirements

1. Displacement: 0-30° variation, uniform compression
2. Insertion Torque: 50% or less of the torsional strength
3. Torsional Yield Strength: > 8 Nm
4. Tensile Strength: Experimentally determined using Bose ElectroForce 3200
5. Resistance to Fatigue: > 411K cycles/steps

Objective

Design a device to successfully secure the talonavicular joint and improve patient outcomes

Solution

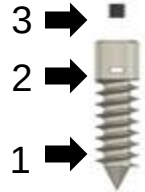
Our innovative solution uses device designs from successful rotator cuff repairs and will allow stability for patients

A 

B 

(A) Three screws are inserted into one bone and compression is applied using a suture → no backing out **(B)** Sutures are screwed into place using screw caps → reduced surface prominence, patient comfort, less/smaller incision sites

Design & Build



1. Anchor Screw
   - Optimized threads for bone purchase
2. Capture Channel
   - Passage for thread
3. Set Screw
   - Secure tether to screw

Societal Impact

Reoperations Prevented 330

Patient Costs Saved $13,800,000

Future Plans

2023-2024	2025	2026	2027
• Prototype • Surgical Technique	• Verification and Validation • 510k Submission • First Production Lot		• Market Release • Acquisition

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