A New Patent Pending Approach to Subtalar Joint Arthritis

Innovative Biological Implant Solutions LLC

Vytautas M. Ringus, MD
Matt L. Landsberger BS ME
Dr. Luis Neves PhD Bioengineering

Subtalar Arthritis

- Subtalar arthritis has multiple causes
  - Idiopathic
  - Inflammatory
  - Post traumatic
  - Compensatory
- Relatively common
- Altered kinematics of joint from adjacent arthritis

CONFIDENTIAL

Treatments

- "Live with it"
- Injections
- Arthroscopy
- Fusion

CONFIDENTIAL

Treatments

- NO JOINT PRESERVING OPTION EXISTS
  - Difficult multiplanar motion to reproduce
  - Difficulty of insertion
  - High weight to surface area ratio
- ALL PROBLEMS ENCOUNTERED WITH THE ANKLE JOINT

CONFIDENTIAL

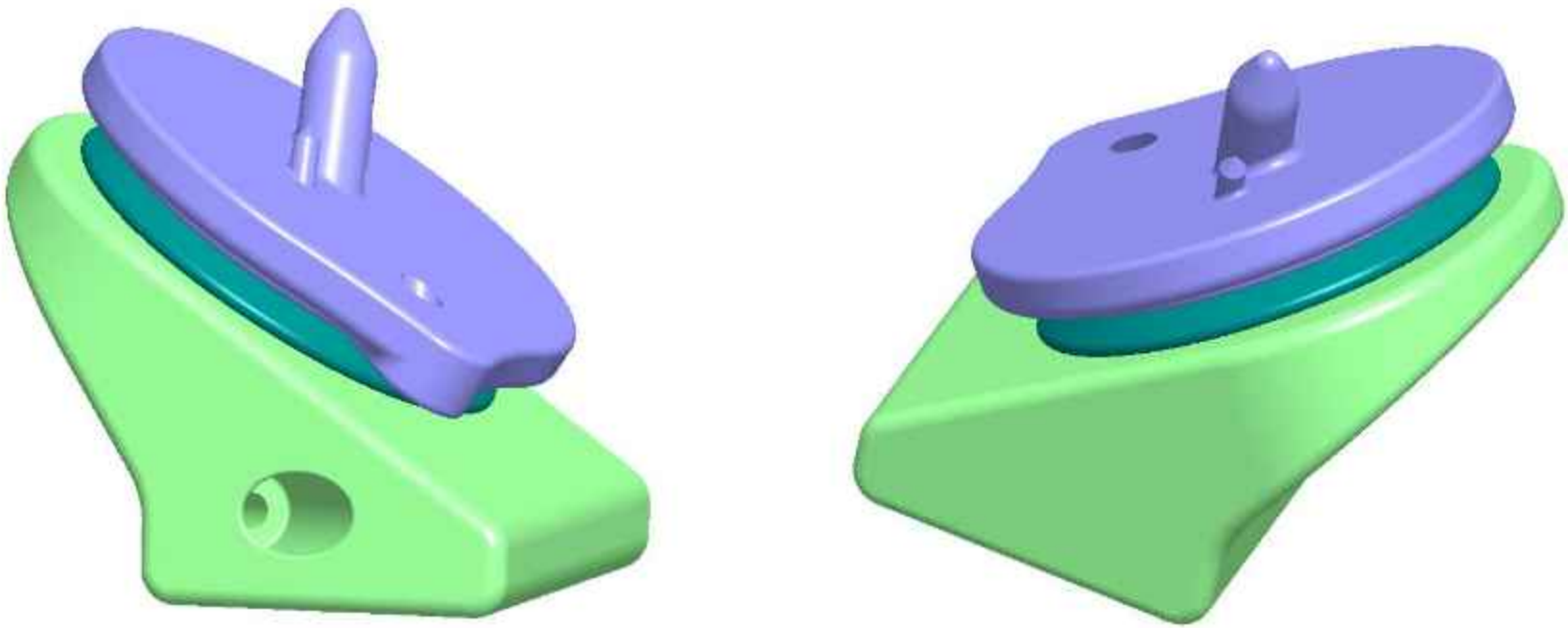
Alternative

- STAR results at 5 years 85-90% survivorship; 80-85% at 10
- Improved indications, technique, materials
- Unique application of a three piece design

CONFIDENTIAL

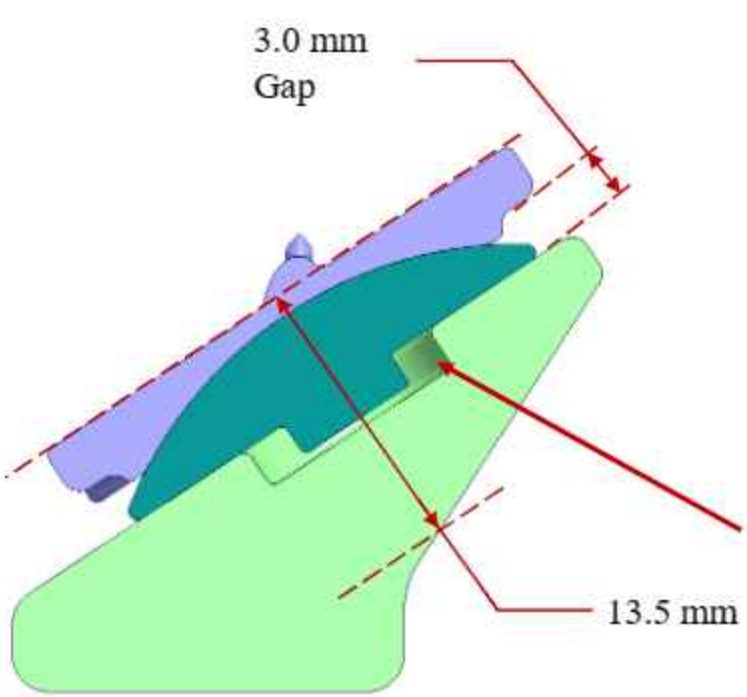
Design Details Introduction

- This is a device that is to be used as a joint replacement for the Subtalar joint of the foot.



Patent Pending Subtalar Joint Design By Innovative Biological Implant Solutions LLC

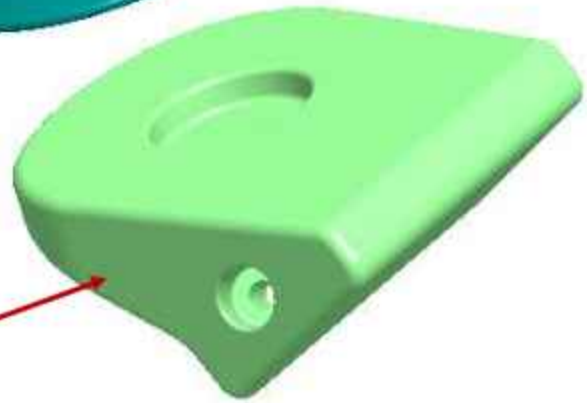
Assembly and Component Overview



Middle Cross Sections

Top Plate

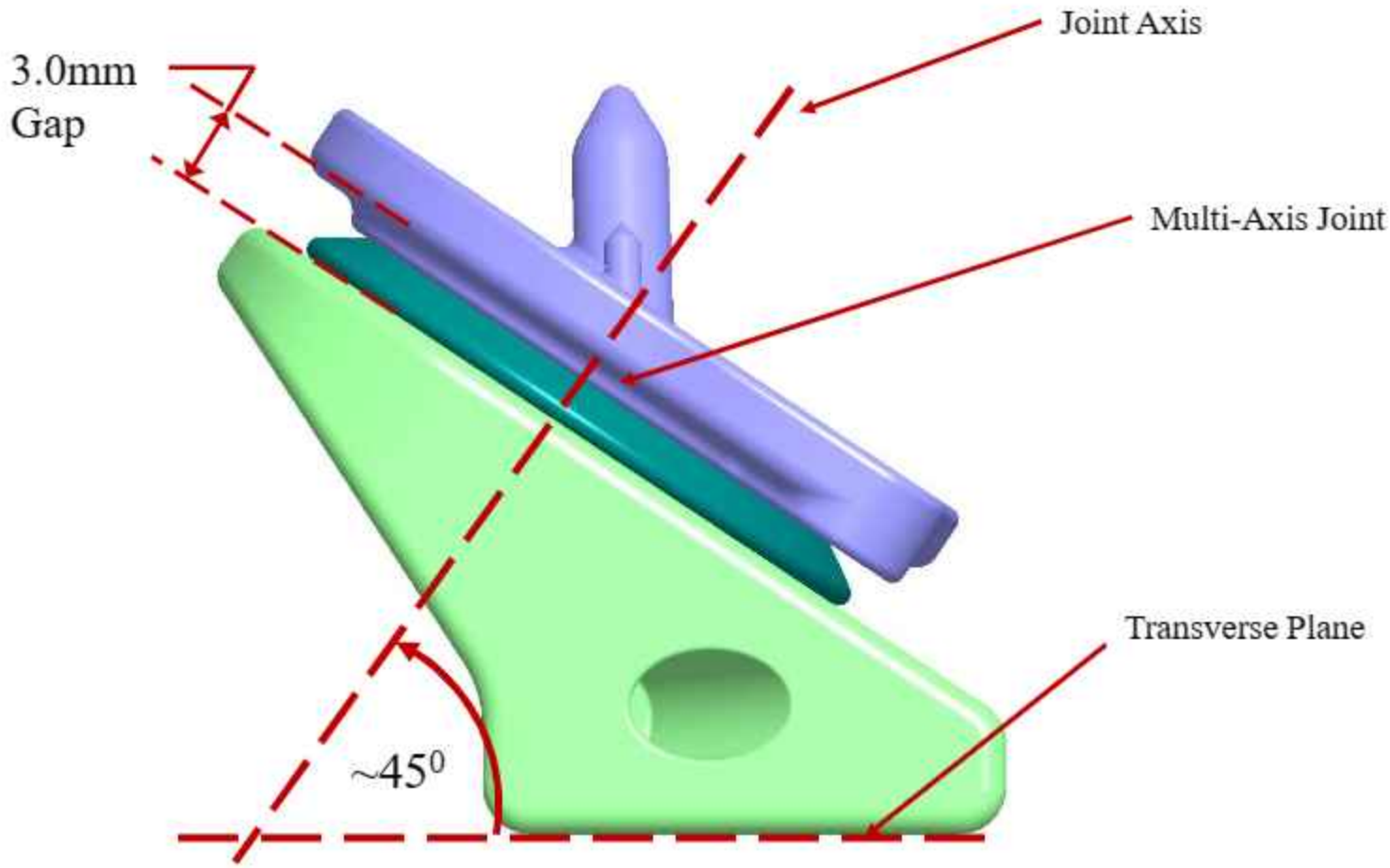
Polymer Sheet



Bottom Plate

Patent Pending Subtalar Joint Design By
Innovative Biological Implant Solutions LLC

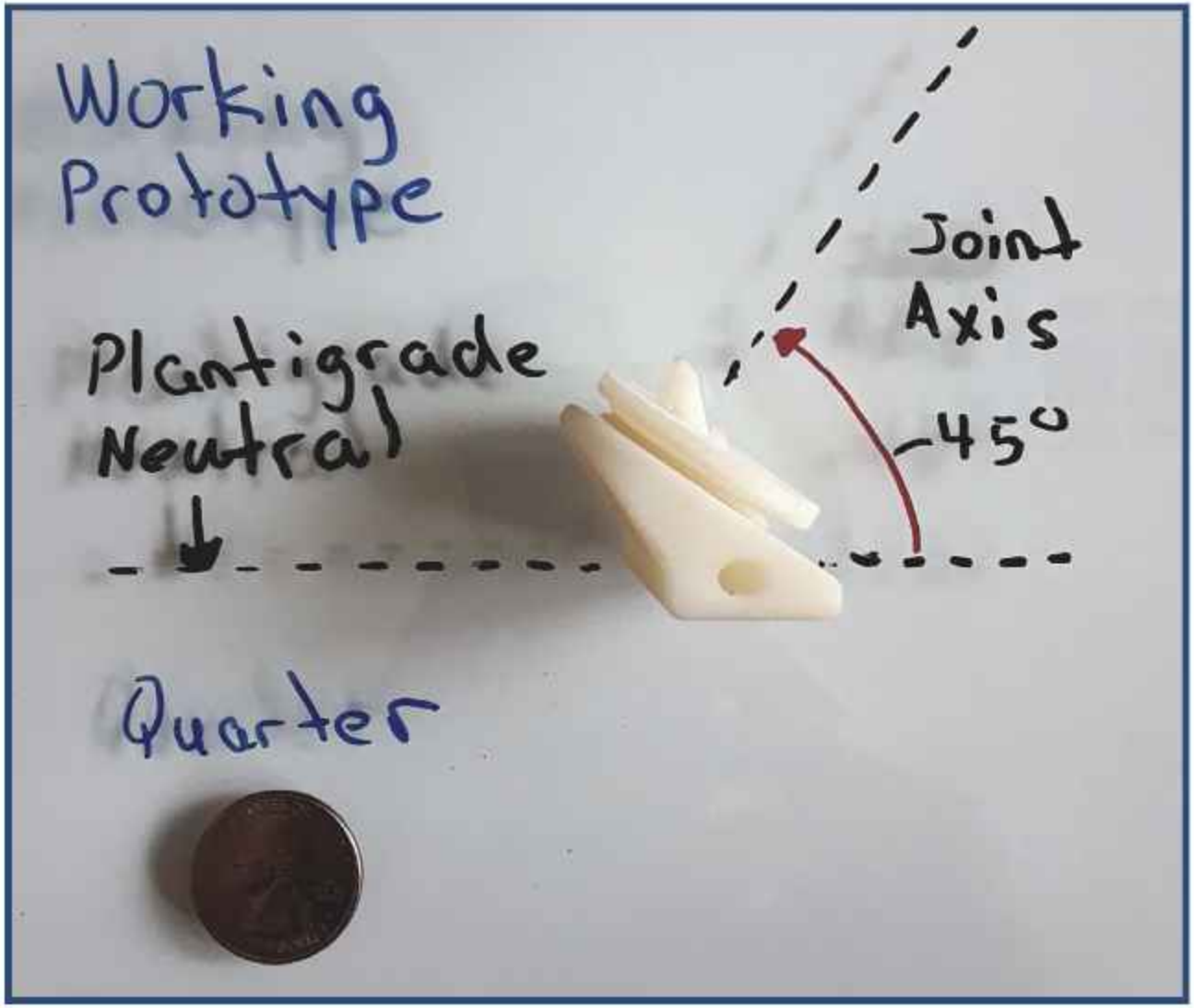
Assembly and Component Overview



CONFIDENTIAL

Patent Pending Subtalar Joint Design By
Innovative Biological Implant Solutions LLC

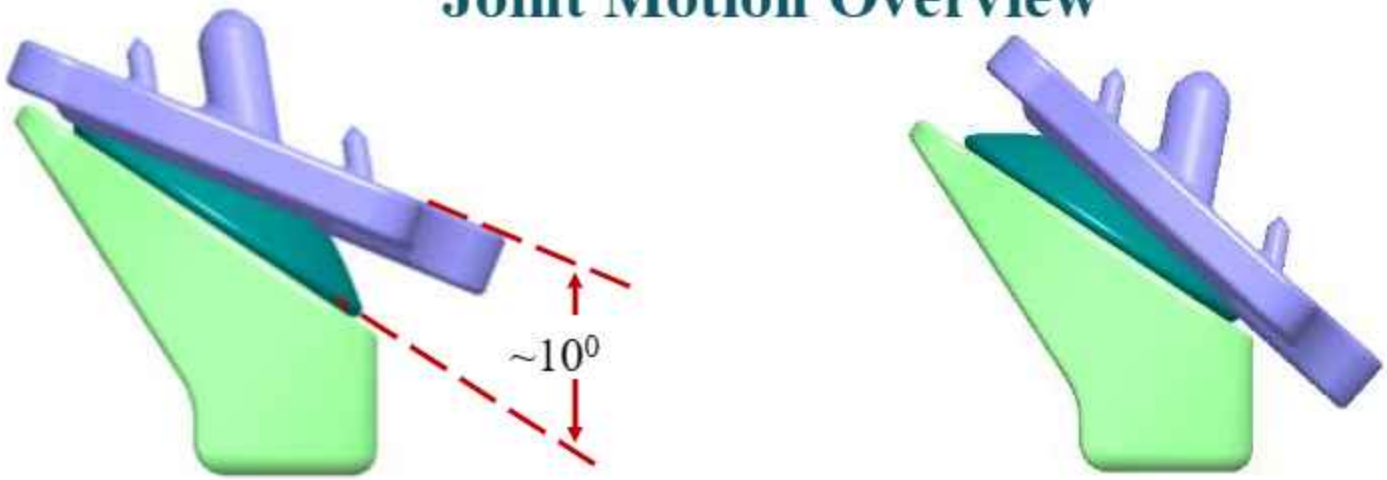
Assembly and Component Overview (Working Prototype)



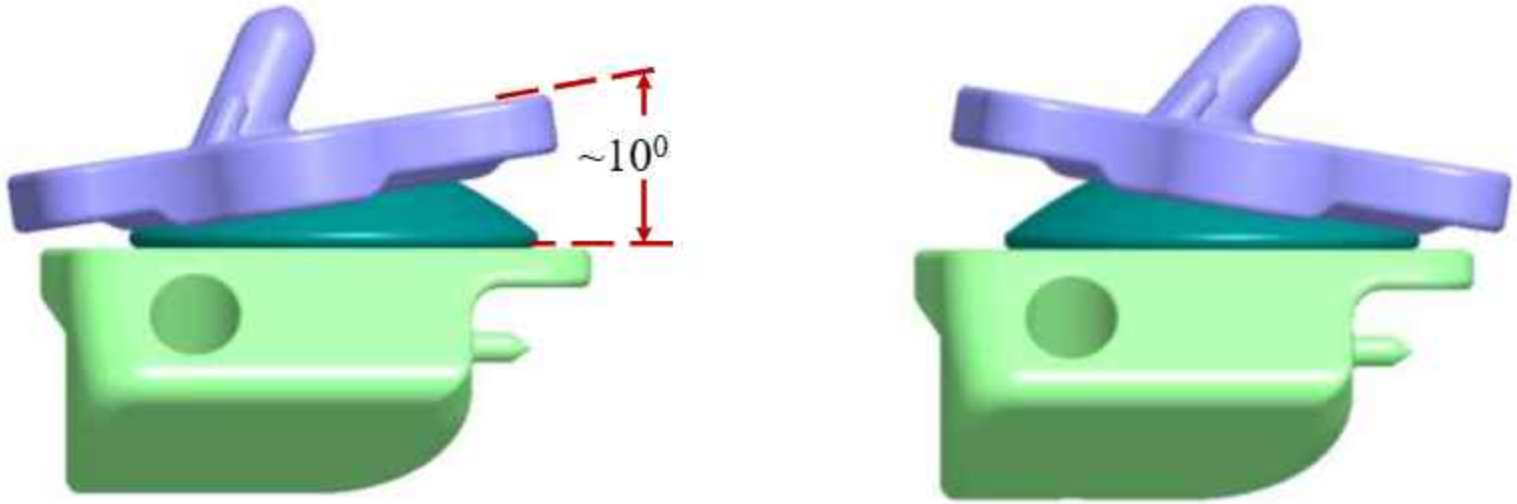
CONFIDENTIAL

Patent Pending Subtalar Joint Design By
Innovative Biological Implant Solutions LLC

Joint Motion Overview



Sagittal Plane Tilt – Total Range of ~20⁰



Coronal Plane Tilt – Total Range of ~20⁰

Patent Pending Subtalar Joint Design By
Innovative Biological Implant Solutions LLC

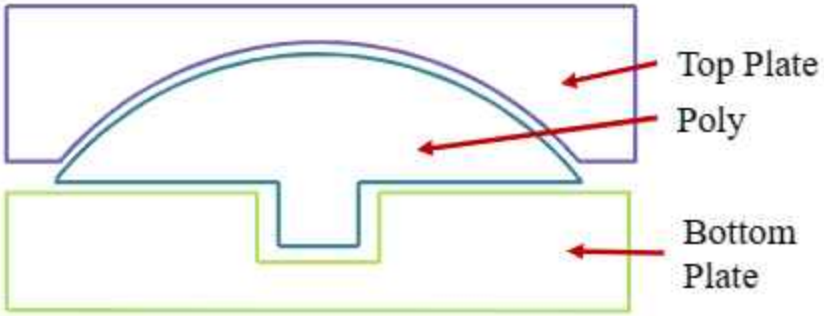
CONFIDENTIAL

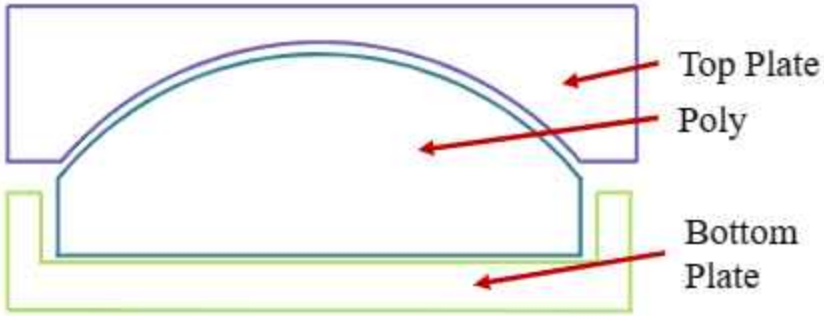
Joint Motion Video

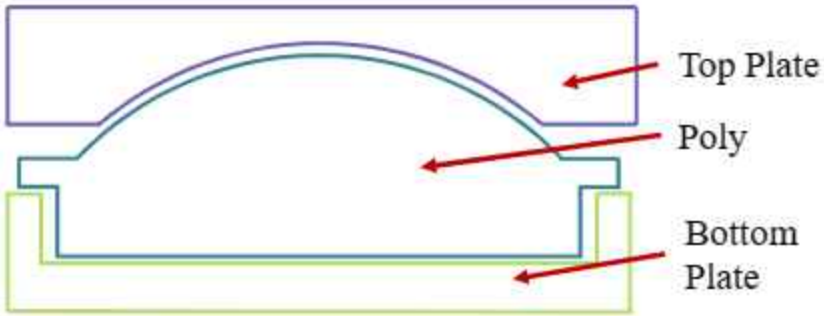
Joint Motion.wmv

Refer to File Sent in Email

Alternate Designs





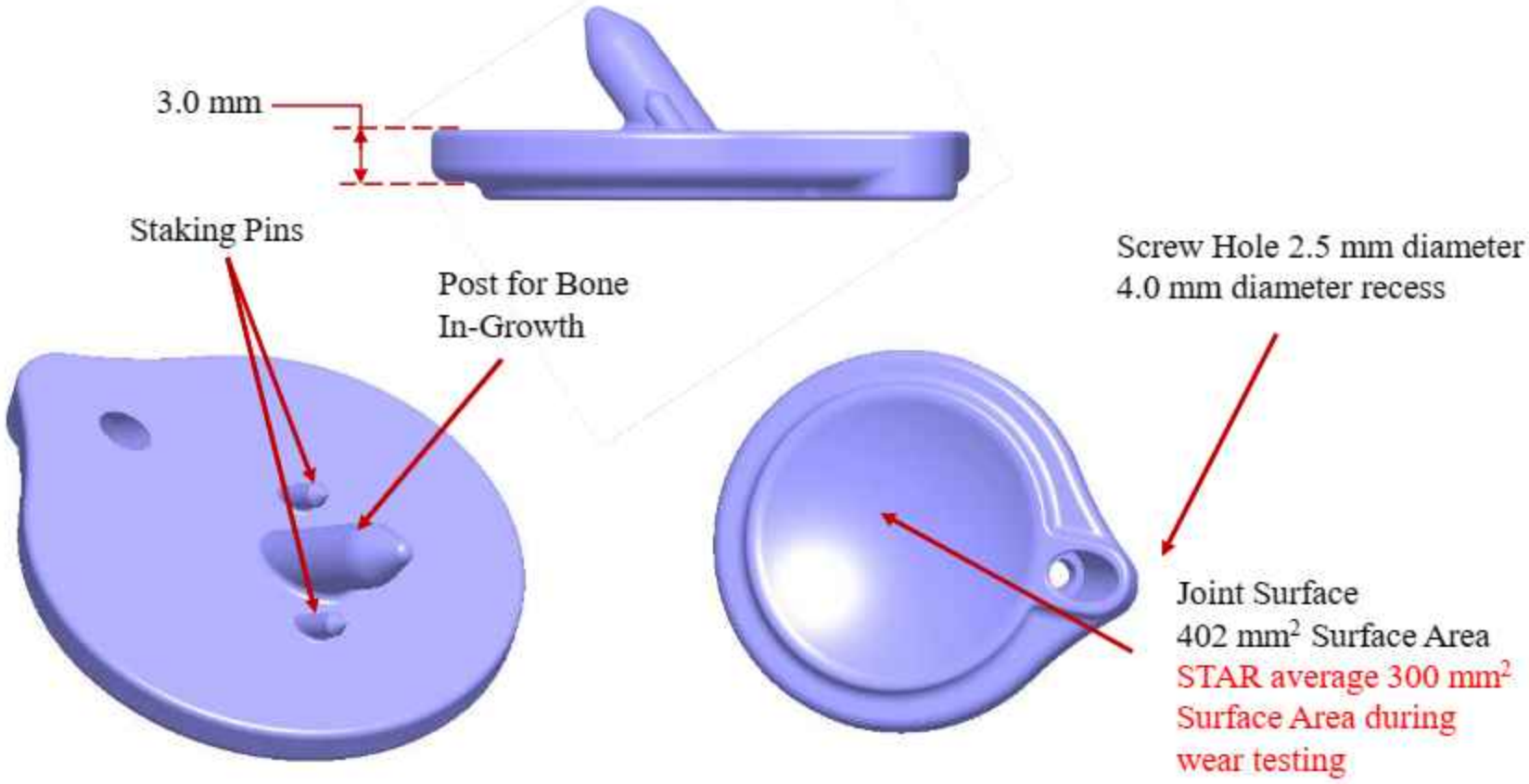


CONFIDENTIAL

Patent Pending Subtalar Joint Design By Innovative Biological Implant Solutions LLC

Component Overview (Top Plate)

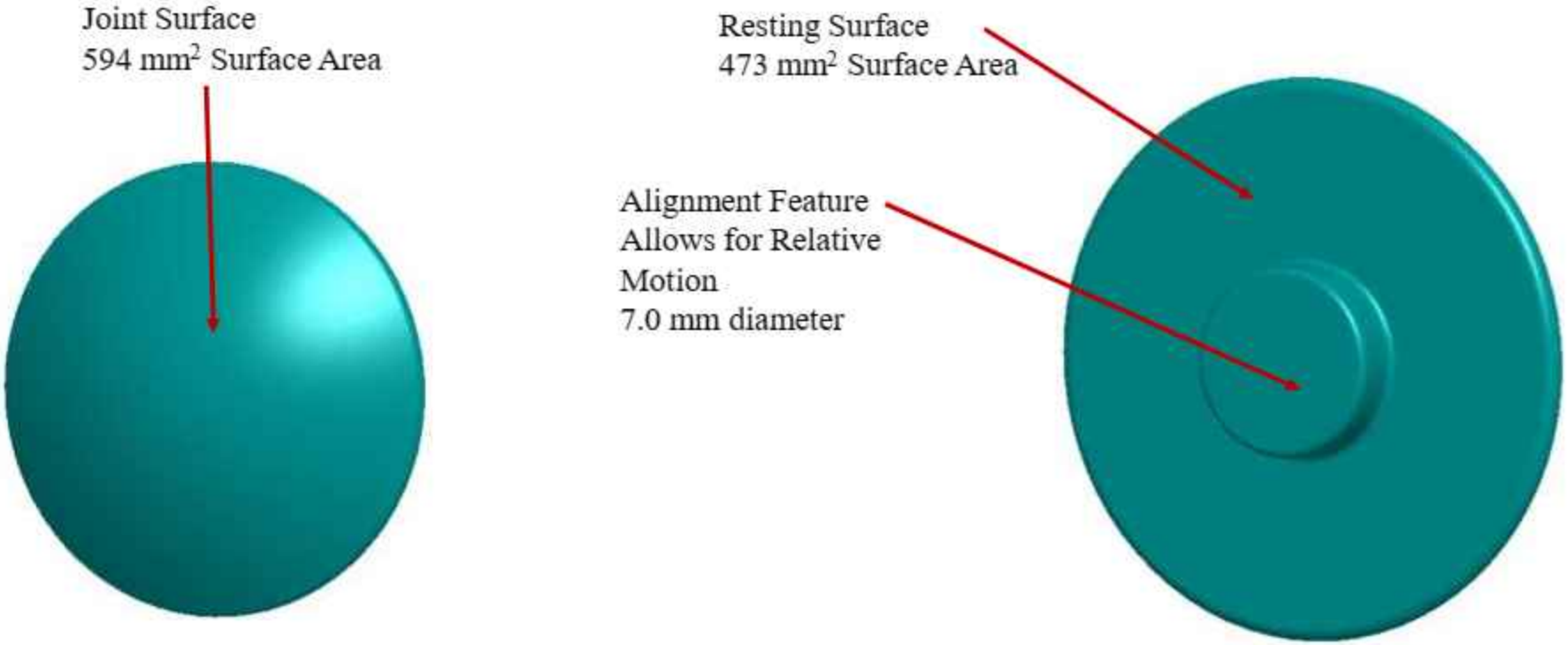
- Plate is approximately 1.0 mm thick at the thinnest location and 4.0 mm at the thickest location.
- The Post, Staking Pins, and Screw Hole are angled at 45^0 from the sagittal and transverse planes.



Patent Pending Subtalar Joint Design By
Innovative Biological Implant Solutions LLC

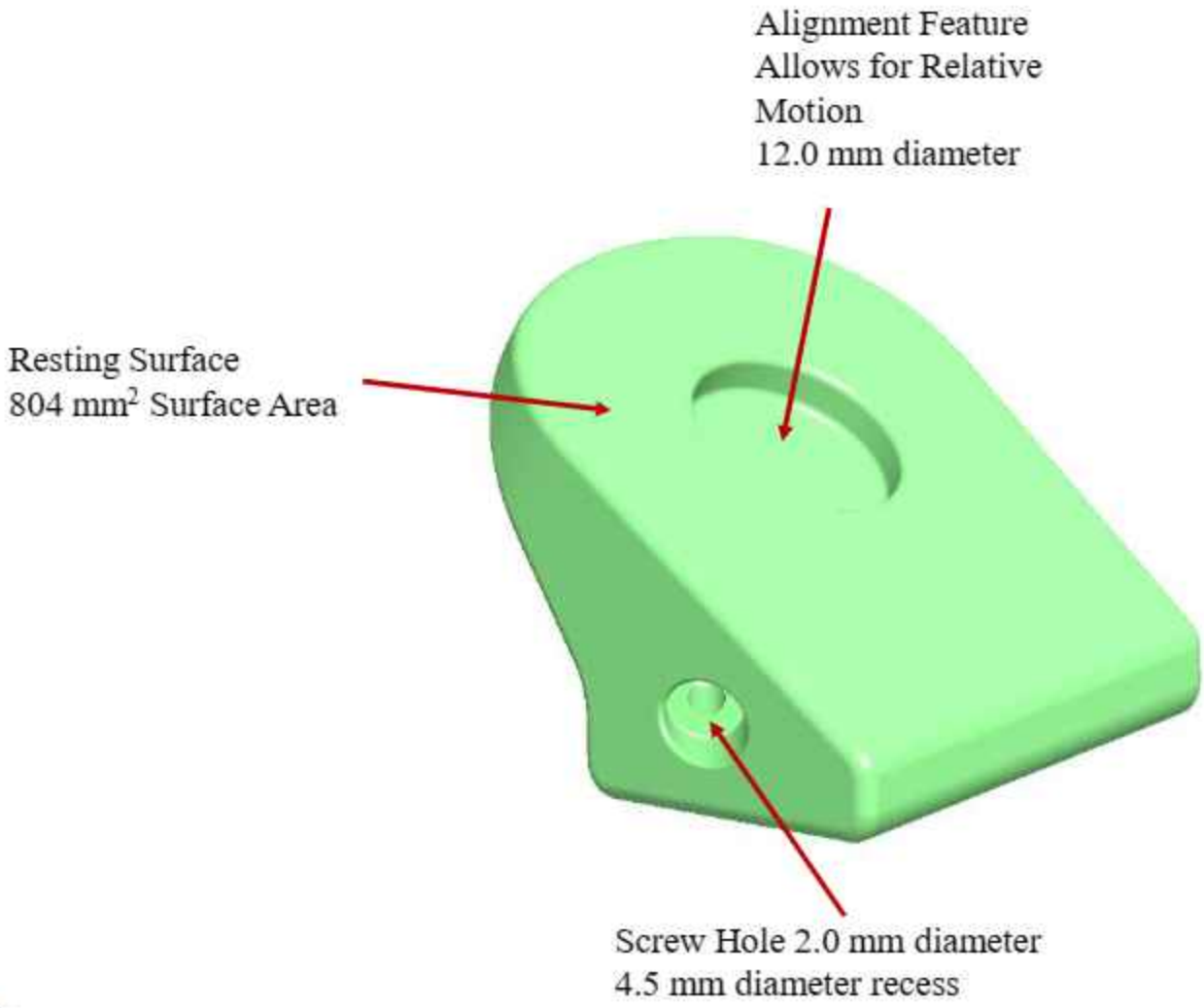
Component Overview (Polymer Sheet)

- Poly is approximately 1.0 mm thick at the thinnest location and 7.0 mm at the thickest location.



Patent Pending Subtalar Joint Design By
Innovative Biological Implant Solutions LLC

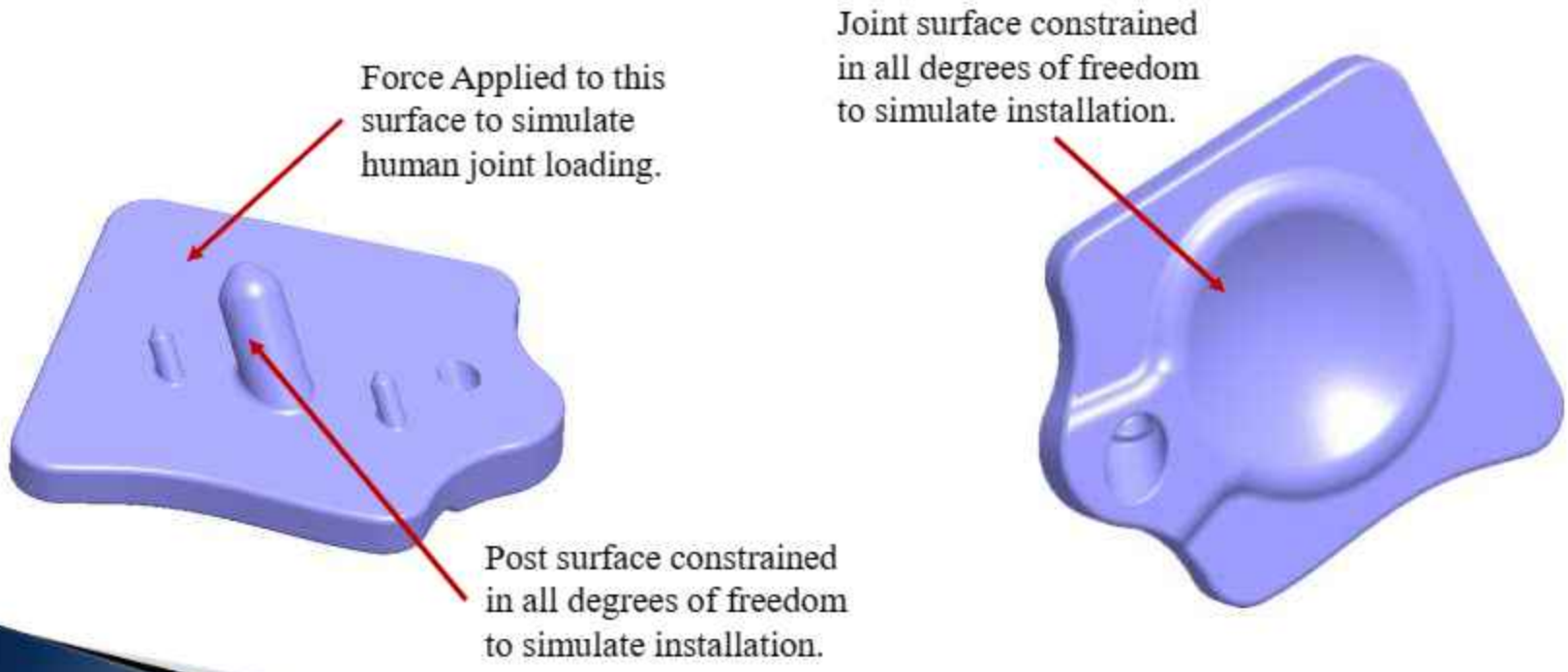
Component Overview (Bottom Plate)



Patent Pending Subtalar Joint Design By
Innovative Biological Implant Solutions LLC

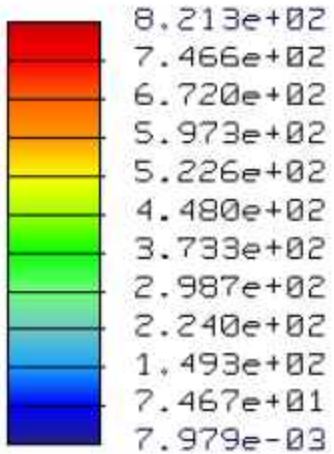
Loads and Constraints

- Load = 556 N (2000 lbf) to simulate dynamic shock
- Load = 390 N (1400 lbf) to simulate high cycle fatigue
- Material = **Titanium Ti-6Al-4V (Grade 5), Annealed**
  - Yeild Strength = 880 Mpa
  - Fatigue Strength = 510 Mpa (Unnotched)

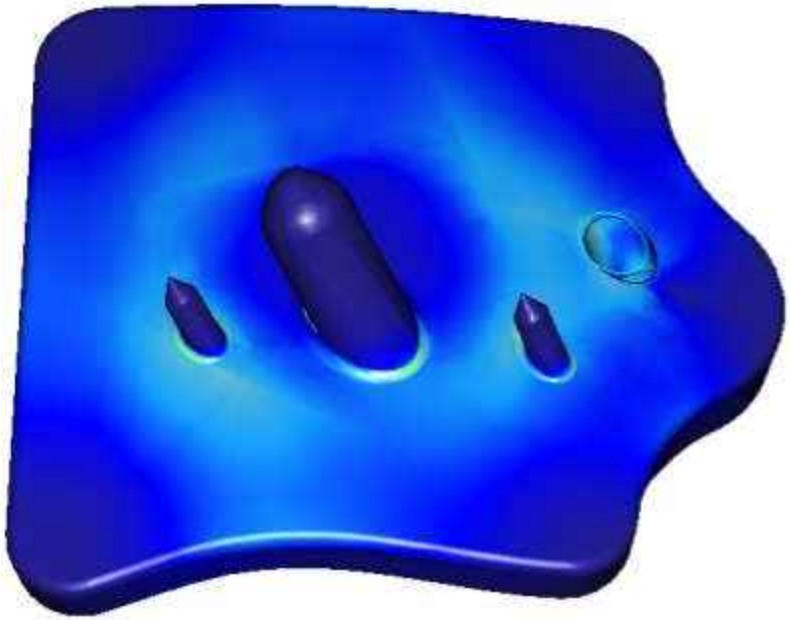


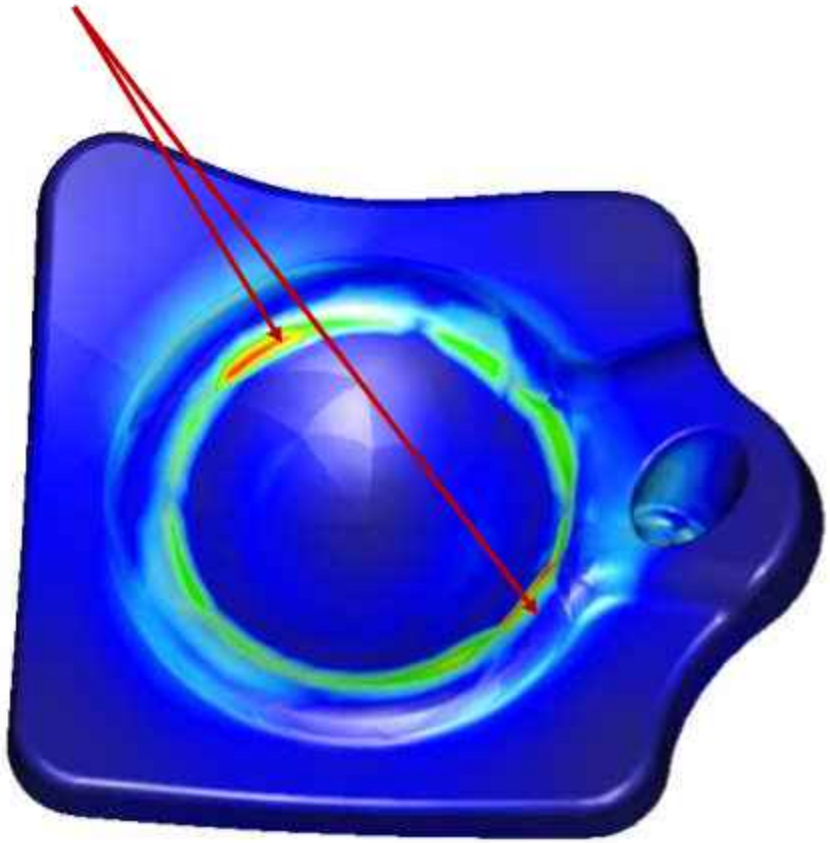
Patent Pending Subtalar Joint Design By Innovative Biological Implant Solutions LLC

Results (Stress)



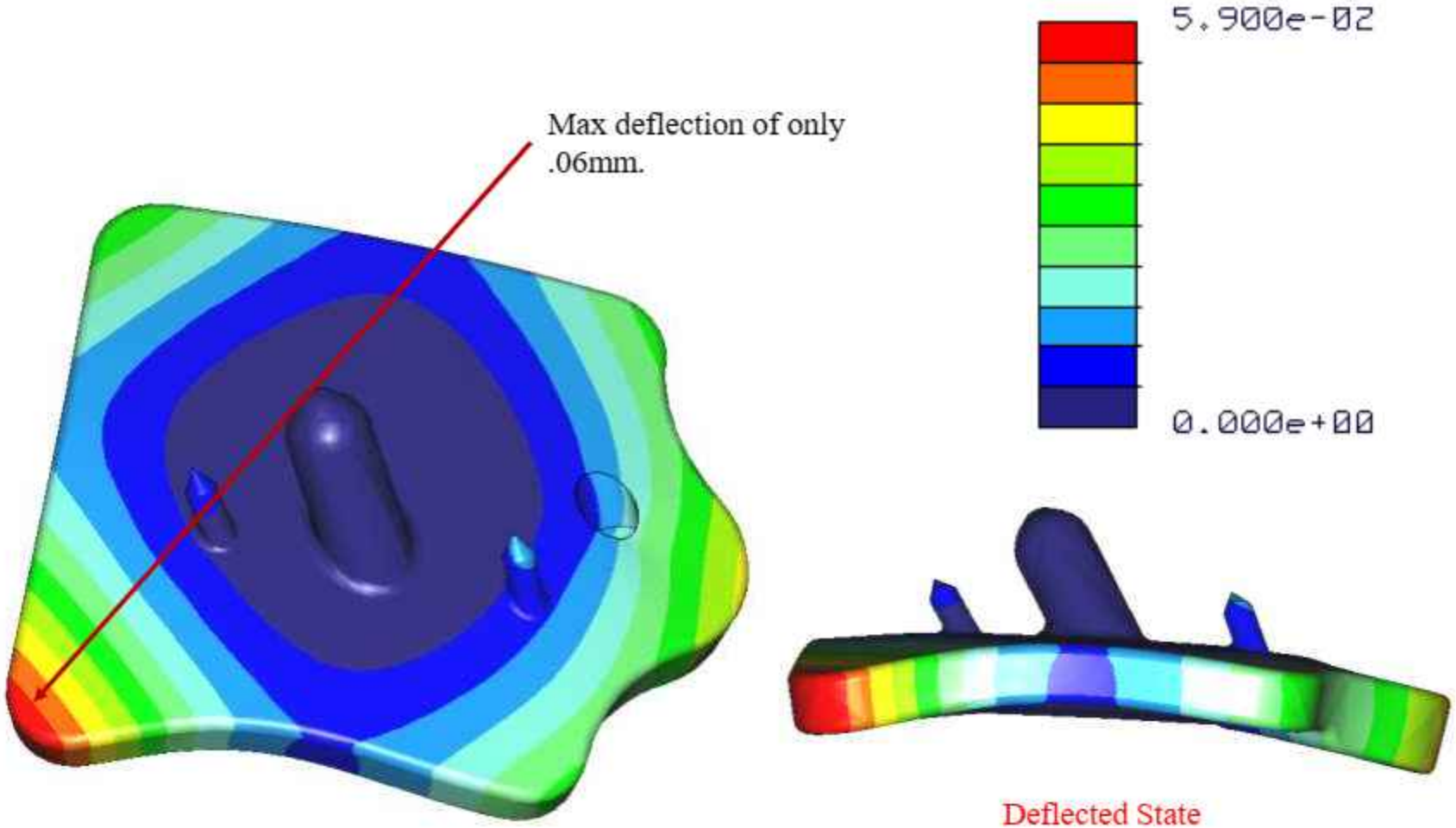
Max stresses are seen in these areas but are within limits.





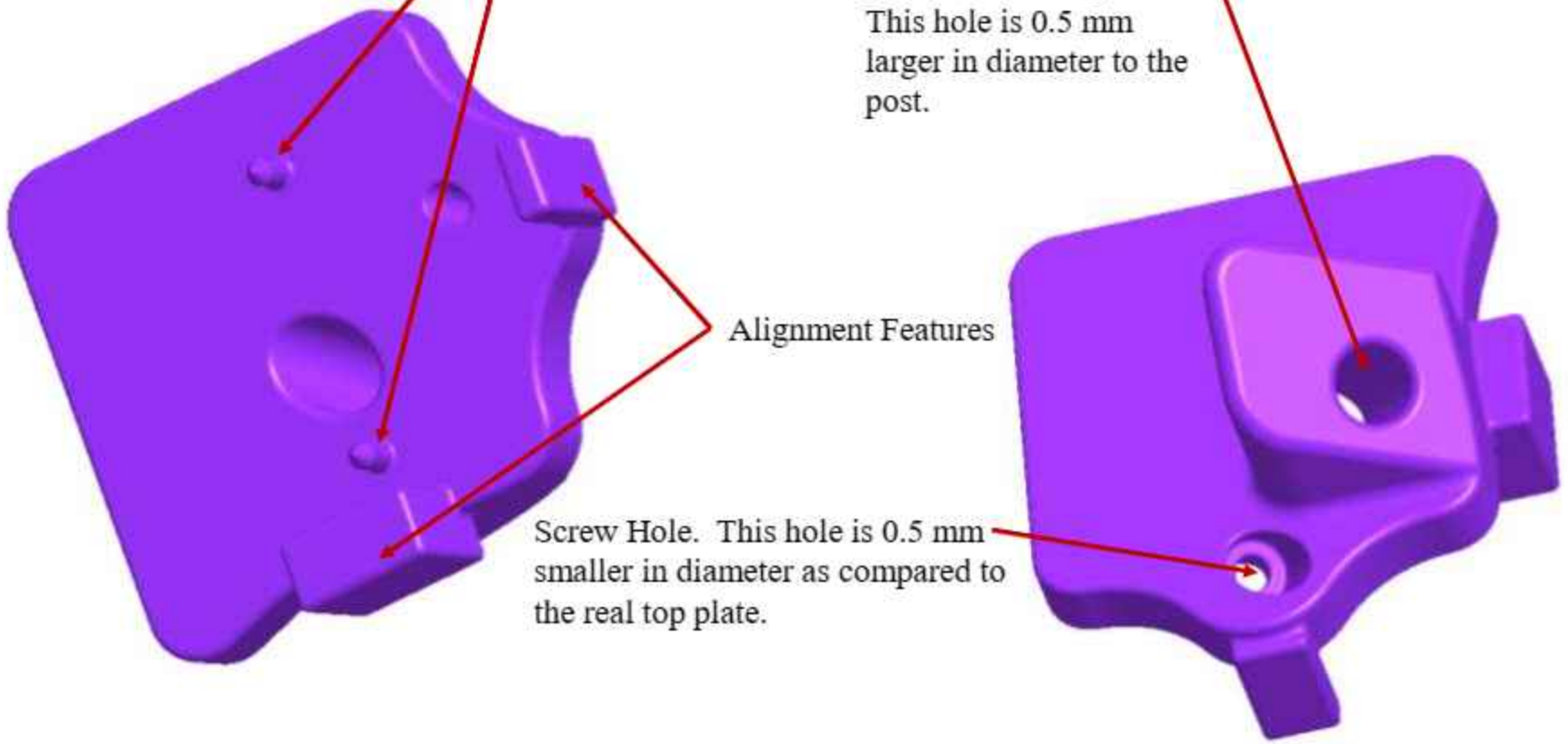
Patent Pending Subtalar Joint Design By Innovative Biological Implant Solutions LLC

Results (Deflection)



Deflected State

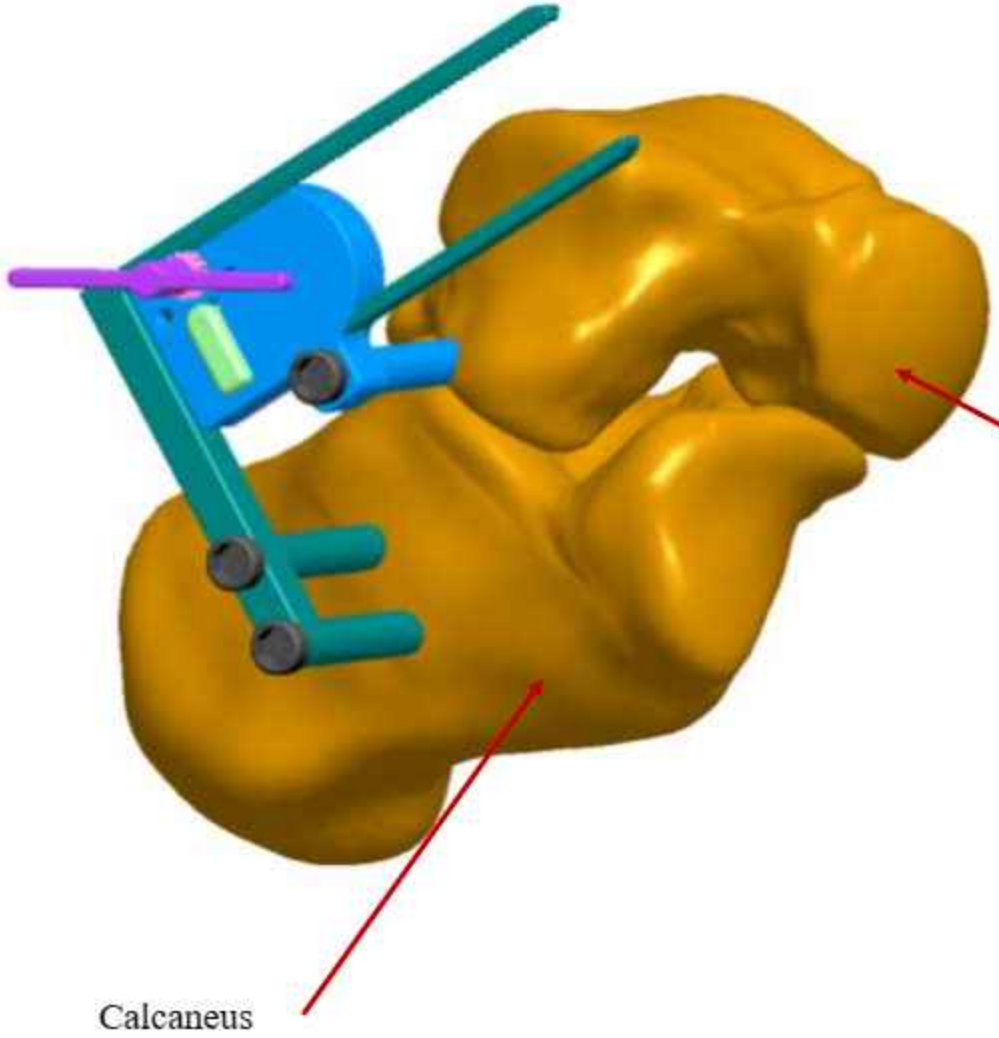
Component Overview (Drill Guide Plate)



CONFIDENTIAL

Patent Pending Subtalar Joint Design By Innovative Biological Implant Solutions LLC

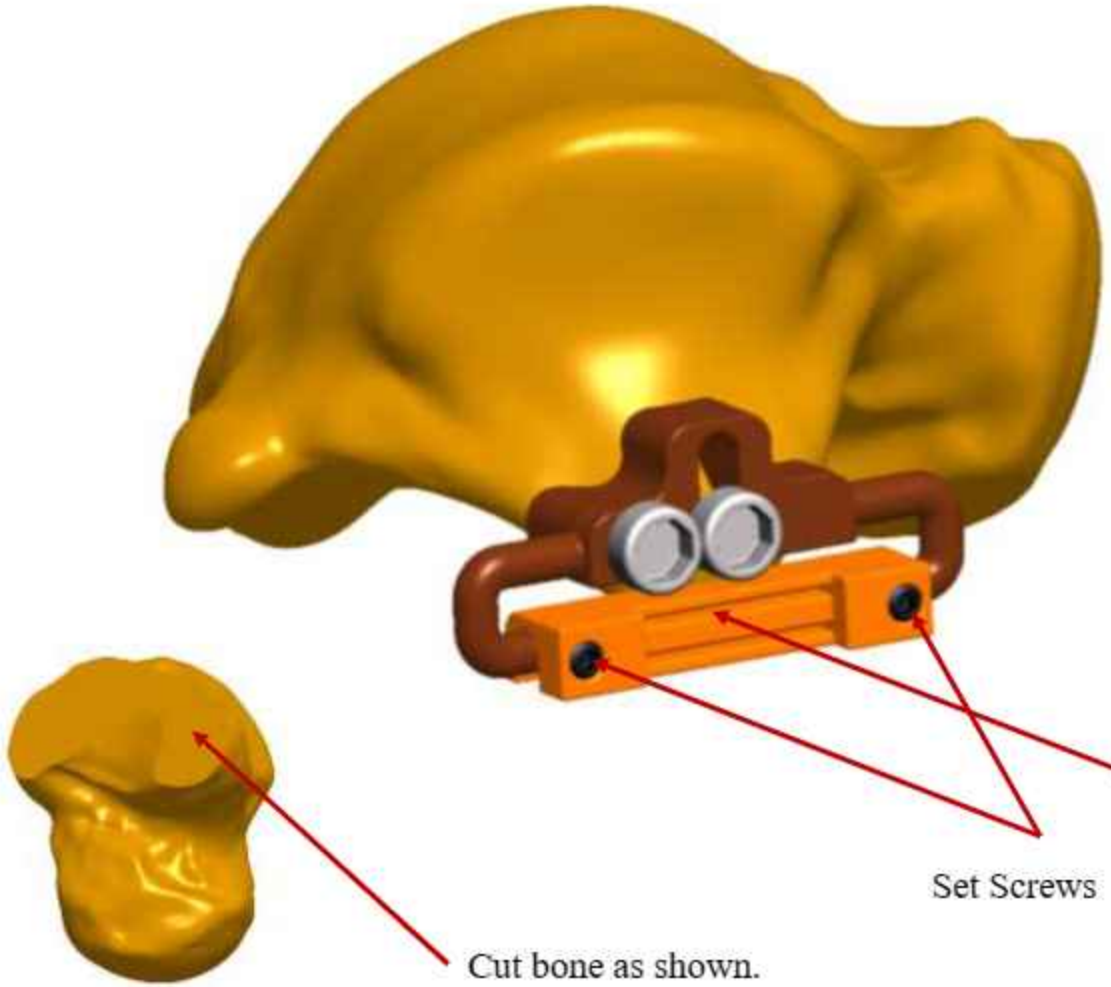
Installation



Step 1: Make incision.
Step 2: Attach distracter to bones as shown and distract joint ~2 inches.

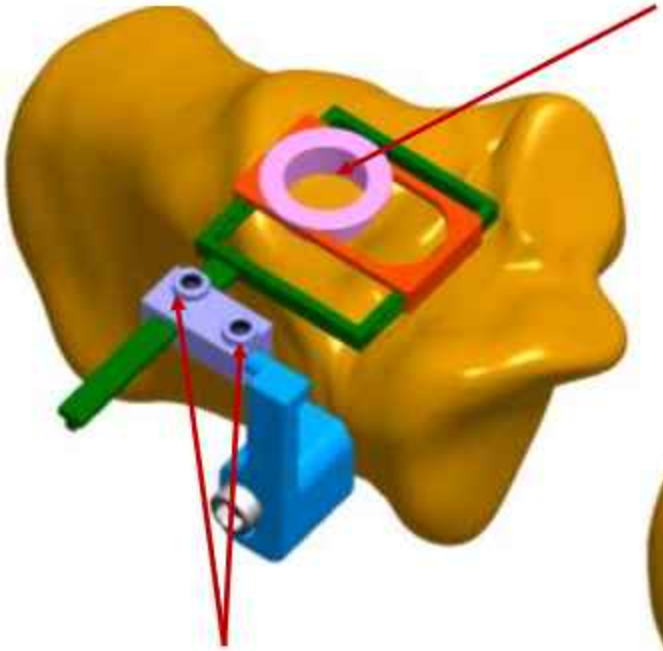
Patent Pending Subtalar Joint Design By Innovative Biological Implant Solutions LLC

Installation



CONFIDENTIAL

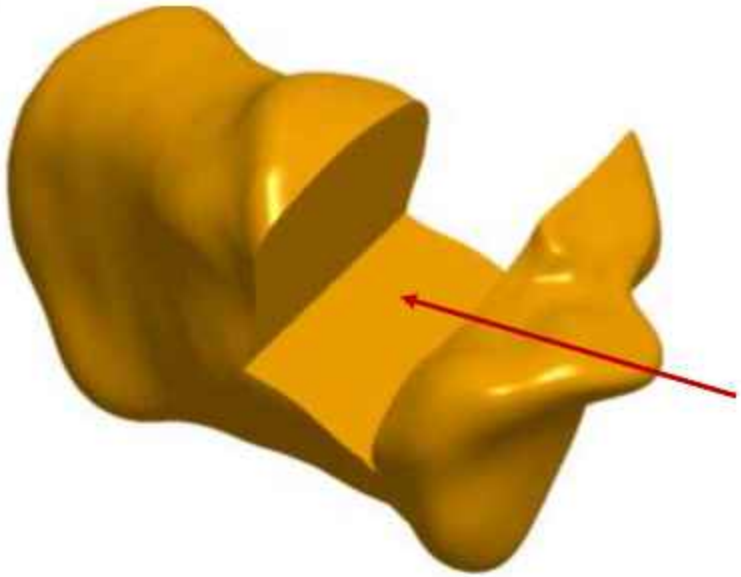
Installation



90 degree angled bit is used to rout out bone by translating on the track.

Set screws.

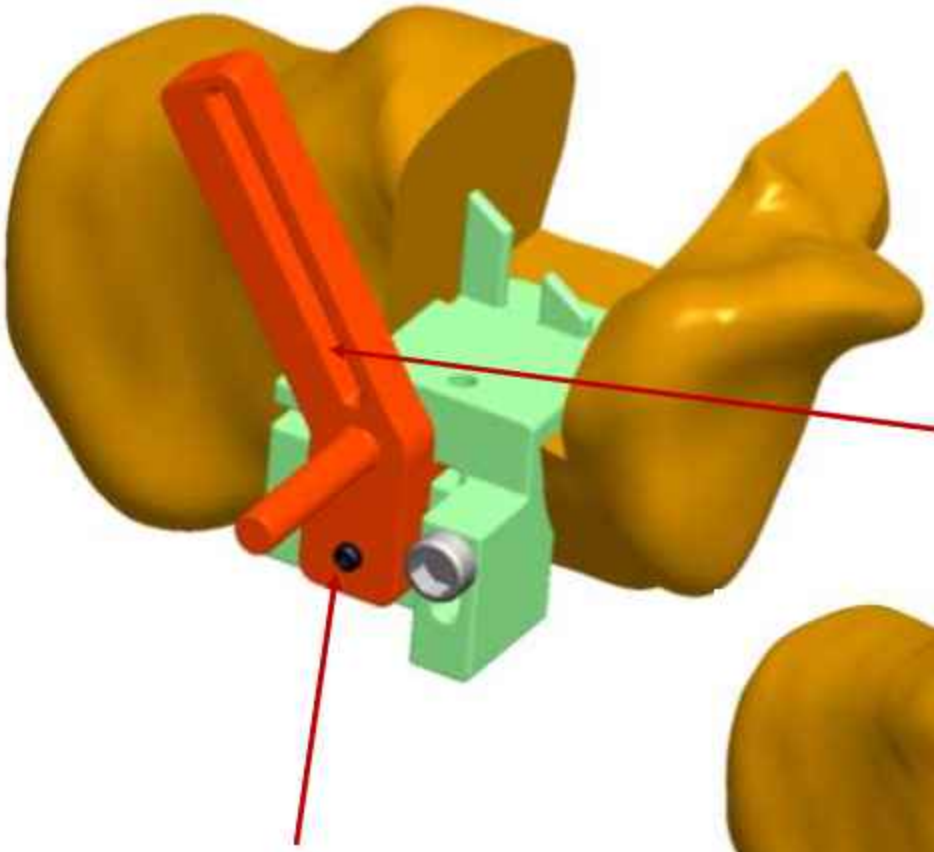
Step 4: Attach calcaneus cutter guide as shown, align, set set-screws, and cut bone to make first cut.



Cut bone as shown.

CONFIDENTIAL

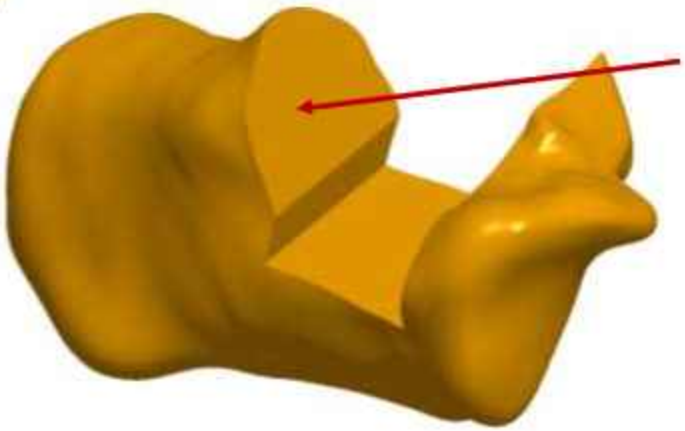
Installation



Step 5: Attach calcaneus cutter guide as shown, align, set set-screws, and cut bone to make second cut.

Insert flat cutter blade and cut to specified depth.

Set screw

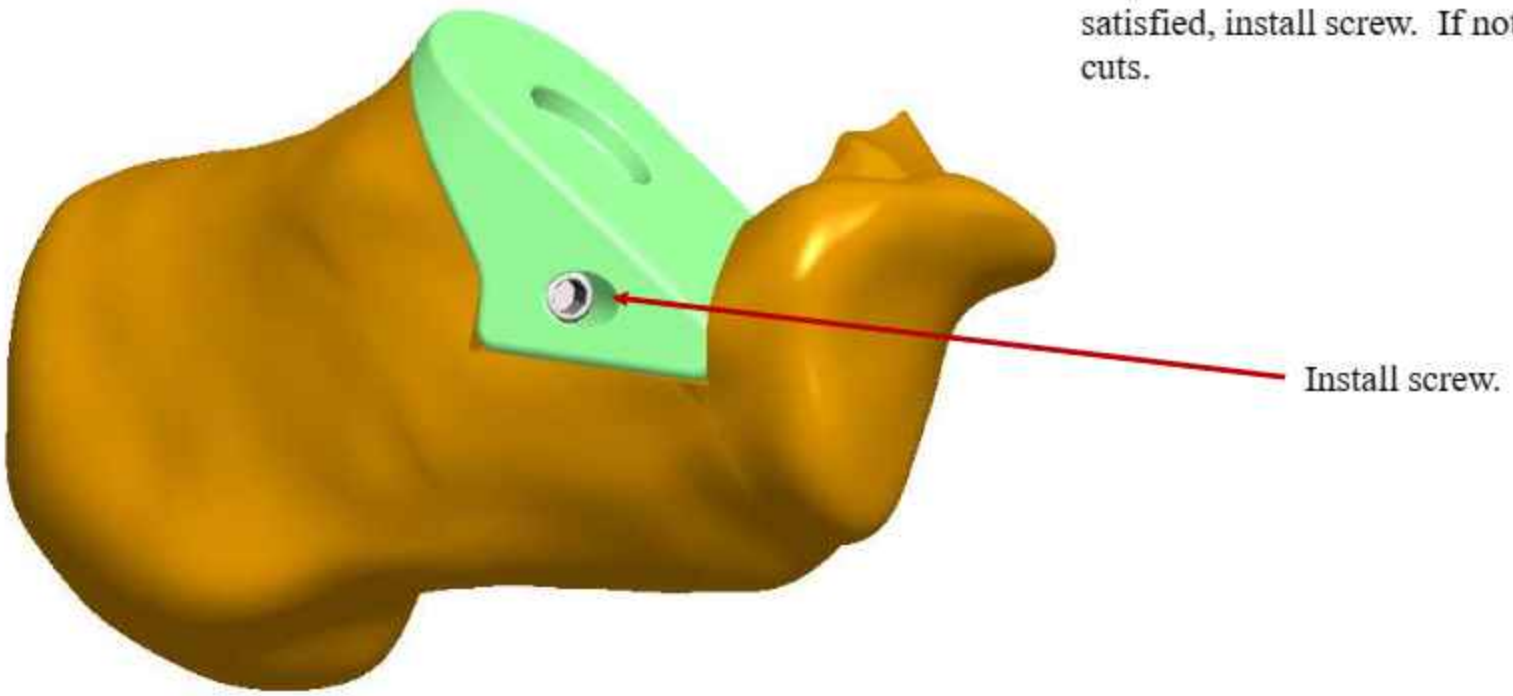


Cut bone as shown.

Patent Pending Subtalar Joint Design By Innovative Biological Implant Solutions LLC

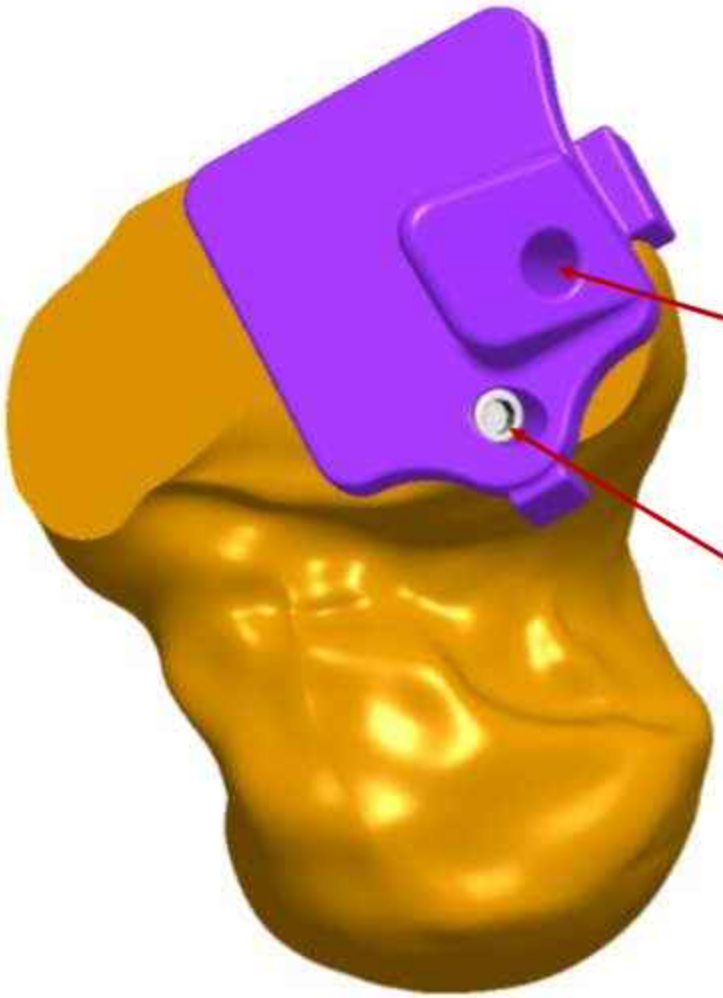
Installation

Step 6: Test the fit of bottom plate. If satisfied, install screw. If not, modify cuts.



CONFIDENTIAL

Installation

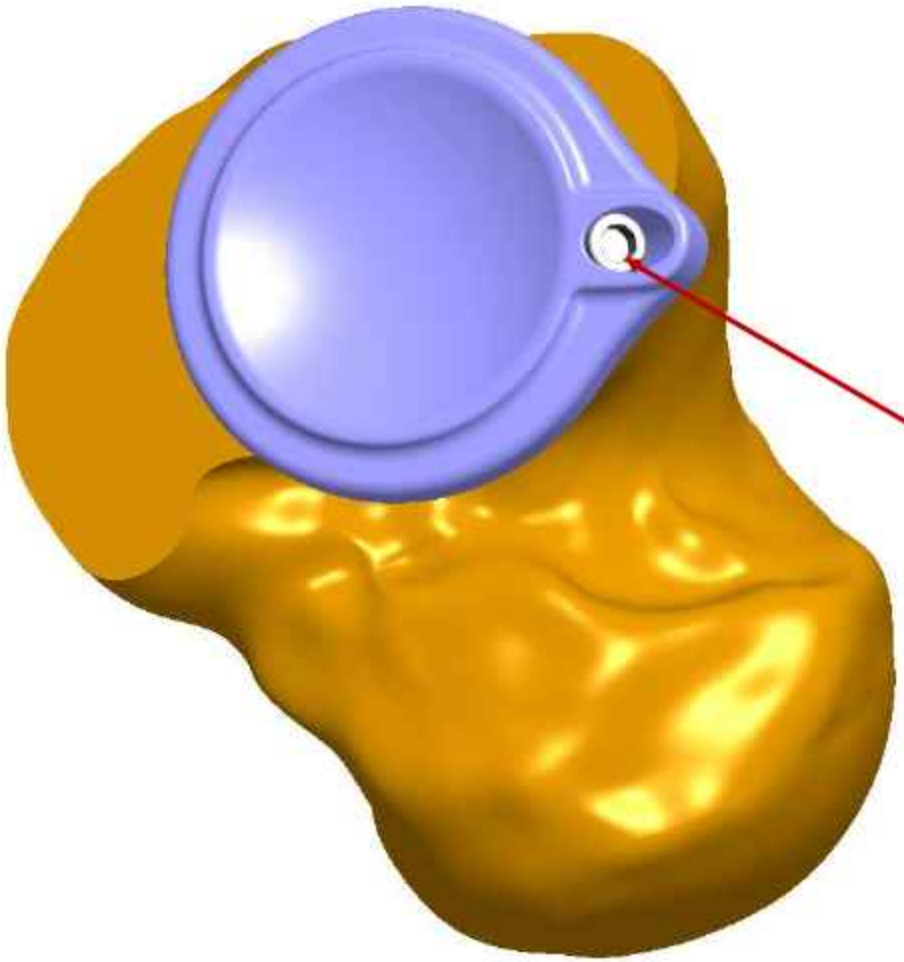


Step 7: Drill hole in talus using dummy plate as a guide.

CONFIDENTIAL

Patent Pending Subtalar Joint Design By Innovative Biological Implant Solutions LLC

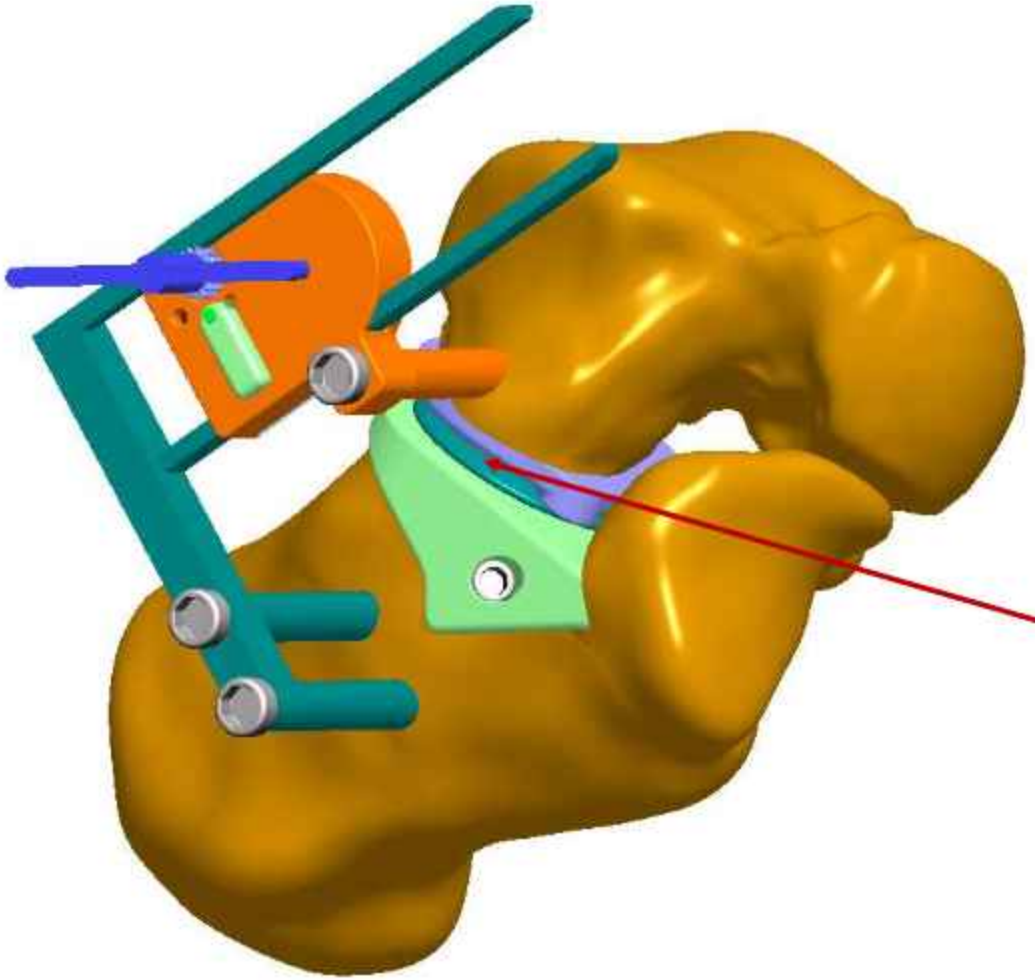
Installation



Step 8: Install top plate.

Install screw.

Installation



Step 9: Install the polymer sheet, un-distract the bones, check joint gap, adjust joint gap as necessary with variable height polymer sheets, remove distracter, and close incision.

Install variable height polymer sheets to set joint gap.

Patent Pending Subtalar Joint Design By Innovative Biological Implant Solutions LLC

Market Analysis
See Excel Spreadsheet

Innovative Biological Implant Solutions LLC
Copy Right

Vytautas M. Ringus, MD
Matt L. Landsberger BS ME
Dr. Luis Neves PhD Bioengineering