TEAM 1

CalcMOD

Problem Statement

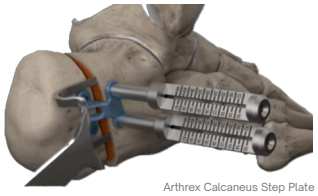
Current procedures lack a reliable way to achieve precise and repeatable medial calcaneal displacement. Surgeons must rely on visual approximation and copious X-Ray imaging. Current tools do not ensure accurate displacement needed for flat-foot correction. Variability increases risk of misalignment and inconsistent outcomes. Current techniques offer poor mechanical control when applying medializing force to the calcaneus.

State of The Art

One of the current procedures relies on jamming an off the shelf elevator rod and using leverage to initiate translation. This does not ensure constrained motion with many degrees of freedom.

Arthrex Calcaneus Osteotomy

The calcaneus step plate is an alternative which fixes the fragments onto a metal piece. This means that the meadialization is not variable and needs to be bough on a per case basis.



Arthrex Calcaneus Step Plate

Stakeholders

Orthopedic Surgeons:
Less cumbersome procedure

Patients:
Better long-term outcomes

Hospitals:
Efficient operating schedules & CapEx reduction

Knurled Torque Knob

Provides ergonomic grip and tactile feedback, allowing the surgeon to apply controlled input with minimal hand force. The geometry improves handling under gloved conditions and enables repeatable torque application.

Internal Threaded Mechanism

Converts rotational input from the knob into precise, linear medial translation. The threaded interface enables fine displacement control and repeatability while mechanically constraining unintended rotational motion of the posterior fragment.

Dovetail Aligner

The moving leg and the static leg interface with a dove tail style mechanisms which ensures that the translation stays stricly 1 dimensional. It also ensures that they stay stuck to each other while the knob is in place and comes apart when removed.

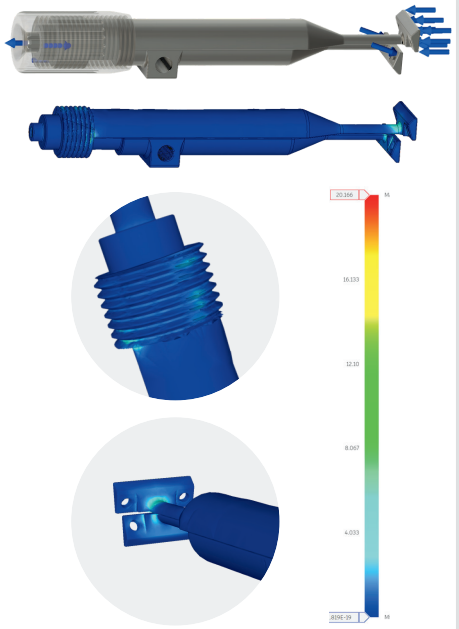
Laser Marked Engraving

Allows for instant depth readings with milimeter precision. Completely mechanial and acurate, removing the need for calibration.

Fixation Plate

Interfaces directly with the posterior calcaneal fragment to transmit medialization force. The compact geometry minimizes soft tissue disruption. Includes holes for 2.0mm speed screws aligned at an angle to maintain maximum grip on the calcaneal fragments.

FEA Analysis



The simulation shows the device easily withstands the applied load, with a minimum safety factor of 10.2. Stresses are concentrated near the fixation plate and internal threaded mechanism, whereas the rest of the structure remains lightly loaded. While the material and design are sturdy, peak stresses occur in thinner sections of the design, where load-bearing area is reduced. Overall, the simulation indicates a robust design that is unlikely to yield or degrade under repeated surgical use.

Financing

We have partnered with Globus Medical, a rapidly growing musculoskeletal technology company to assist us in 3D printing and metal prototyping.

GLOBUS MEDICAL

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