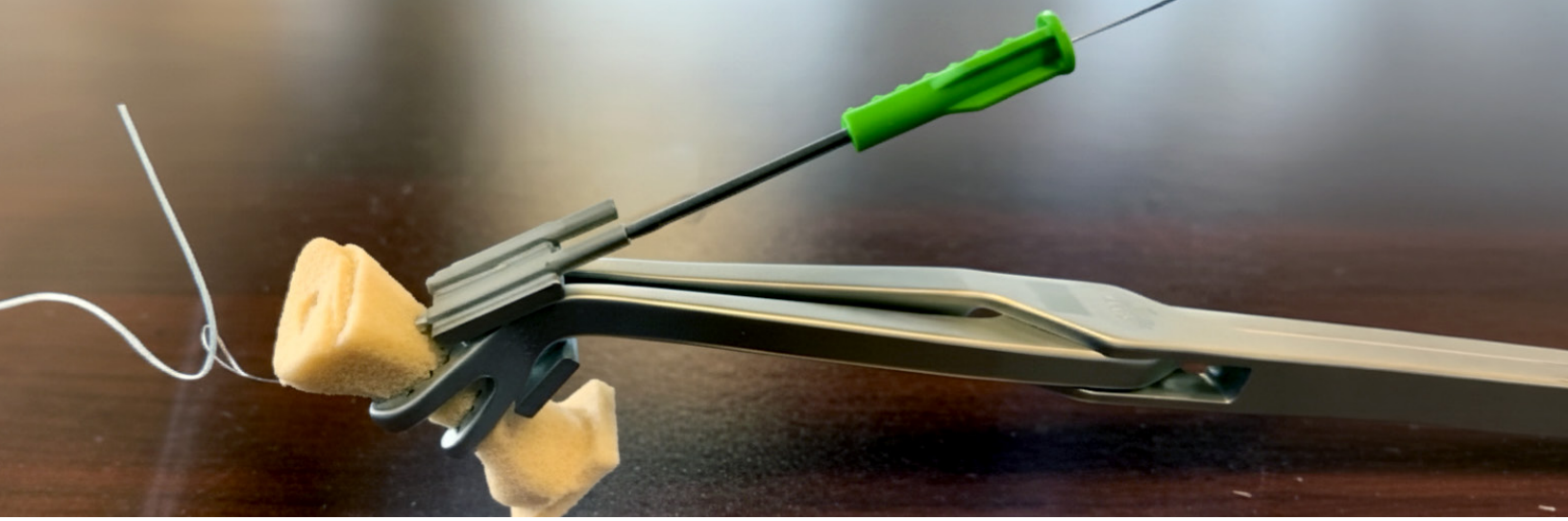
GODDARD
PRODUCT DEVELOPMENT

Aesclepius Corporation
Orthopaedic devices

CASE STUDY

Plantar Plate Repair Devices



OVERVIEW

Aesclepius Clamp+Cinch™ System

Plantar plate repair is a surgical procedure used to reattach the ligaments at the base of the toe, most often to correct hammer toe and toe deviation. The procedure depends on the precise placement of small bone tunnels through the proximal phalanx, and variability in that placement has long been a source of inconsistent outcomes.

The Aesclepius Clamp+Cinch System was designed to solve that problem with a two-part instrument that simplifies the procedure and requires minimal training to use.

Aesclepius Locking Clamp™

A reusable stainless-steel bone clamp that provides a stable grip and leverage on the proximal phalanx. Its integrated drill guide standardizes bone tunnel spacing and placement, removing a key source of surgeon-to-surgeon variability.

Aesclepius Suture Cinch™

A single-use device that integrates with the clamp and uses a curved nitinol snare to pass sutures through the bone tunnels. This allows the surgeon to reattach the plantar plate to its native attachment point and support proper healing.

Rethinking Plantar Plate Repair

Plantar plate tears are among the most common causes of forefoot pain, and the standard surgical fix has long depended on Kirschner wires (K-wires) to stabilize the joint and guide drilling through the proximal phalanx. The technique works, but it carries real trade-offs: bone fracture risk, inconsistent drill placement, and a workflow that pulls the surgeon's attention away from the surgical site.

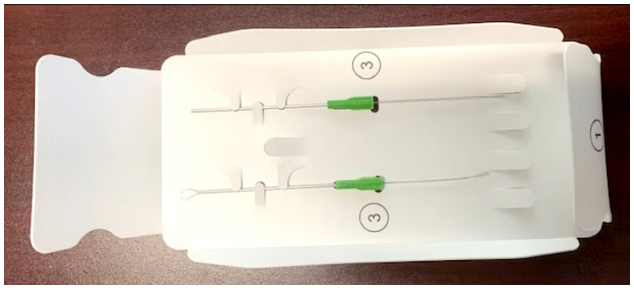
San Diego-based Aesclepius Corporation believed there was a better way. CEO Adam Hsieh, Ph.D., and COO Joe Lin had developed a proof-of-concept for a two-part system that would replace K-wires entirely with a locking clamp and a curved suture cinch. They had validated the concept in the lab. What they needed was a partner who could turn it into a manufacturable, surgeon-ready product.

Building on a prior successful collaboration, Aesclepius brought the project to Goddard Product Development's custom engineering team.

From Prototype to Production

Goddard engaged at the critical juncture between proof-of-concept and commercial product, the stage where most medical device programs stall. The mechanical engineering team took on functional refinement and manufacturing optimization in parallel, working through three design iterations on the clamp and matching iterations on the cinch.

Aesclepius Locking Clamp™ integrates a drill guide directly into the clamping mechanism, giving surgeons secure leverage on the joint and accurate, reproducible drilling through the proximal phalanx without K-wires. Goddard produced 3D-printed prototypes using Direct Metal Laser Sintering (DMLS) and ran cadaver studies with practicing surgeons to gather feedback at each stage. Key opinion leader testing surfaced a need for a second clamp size to accommodate anatomical variation, which was added before design freeze. Final refinements covered laser marking, finishing, passivation, and tolerance, the details that separate a working prototype from a part that performs consistently across thousands of units.



Aesclepius Suture Cinch™ had a harder engineering problem: a curved snare that needed to advance through the clamp's integrated cannula without buckling, then guide the suture through the bone tunnels to reattach the plantar plate at its native attachment point. Goddard's engineers evaluated several materials before selecting nitinol for its flexibility and shape memory. To compress the development timeline, the team built an in-house sand bath to shape-set and test nitinol prototypes, eliminating the cost and lag of outsourced vendors. The cinch's plastic hub was finished with Braille-style tactile dots, a small detail with outsized impact, letting surgeons feel the snare's curve direction without ever looking away from the surgical field.

Both devices went through multiple rounds of cadaver testing with practicing surgeons before design freeze. Once finalized, Goddard transferred full specifications to the production supplier for commercial manufacturing.

Outcome

The Clamp+Cinch System completed all verification and validation testing and is now commercially available. For Aesclepius, the partnership delivered more than a finished device. It delivered a product their surgeons can trust, one that simplifies a technically demanding procedure and reduces the complications that come with K-wire-based methods.

Let’s Build Something Great. Talk to Our Team.

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