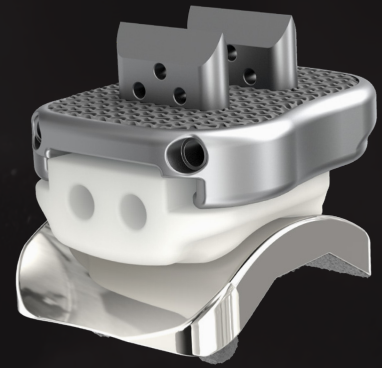
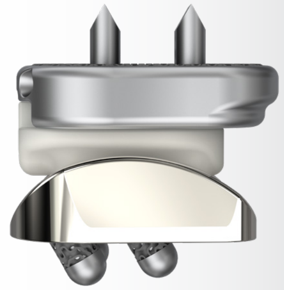
Kinos Axiom® Total Ankle System

featuring TIDAL Technology

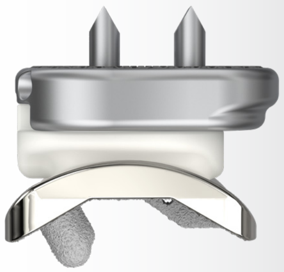
First Biomechanically Accurate Ankle Replacement



Interchangeable with both Flat-Cut and Chamfer-Cut Talar Implants



Flat-Cut Talar Dome

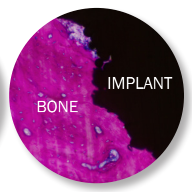


Chamfer-Cut Talar Dome

TIDAL Technology

restor3d's TIDAL Technology is an optimized porous architecture designed for osseointegration. Derived from sinusoidal functions, TIDAL Technology guides bone growth through the fully interconnected structure with maximized surface area.

- 100% Interconnectivity and up to 80% porosity[1]
- Mesoscale pores support graft retention and bony ingrowth[2]
- Direct bony apposition to implant surface guided by surface topography and curvature demonstrated in preclinical model[2,3]



Biomimetic Design Restores Natural Range of Motion

The Kinos Axiom® Total Ankle System increases patient satisfaction by improving implant function and life expectancy via biomimetic articulating surfaces, which mimic the biomechanics of the native ankle joint. The range of motion of the ankle joint occurs in the three anatomic planes.[4] The Kinos Axiom® implant construct recreates this natural motion. The talar implant internally rotates relative to the tibia with plantarflexion, and externally rotates with dorsiflexion. This "coupled motion" recreates that of a healthy ankle joint during normal gait.

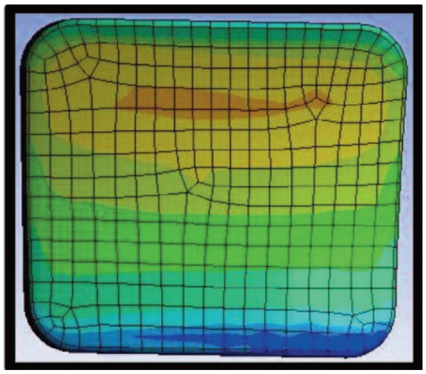
The biomimetic surface allows for independent inversion and eversion motion throughout the flexion profile. In mimicking the range of motion provided in a healthy joint, the Kinos Axiom® implant more evenly distributes the forces during gait. The polyethylene articular surface, as compared to the more constrained bi-condylar designs, provides the range of motion (ROM) and stability necessary to withstand the rigors of a patient's daily activities - including walking on uneven terrain.[5] Other devices do not provide for this anatomically accurate motion profile.[6]

KINOS AXIOM®	RANGE OF MOTION (ROM)	LEADING COMPETITOR[6]
±25°	Flexion/Extension	±25°
8°	Internal/External Rotation	0°
7°	Inversion/Eversion	0°

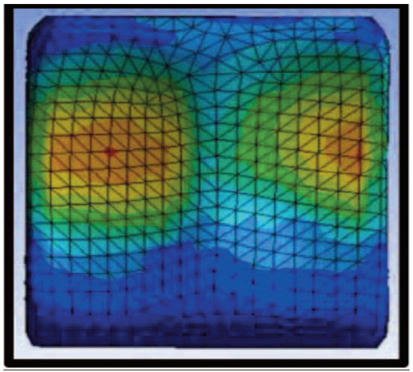
Kinos Axiom®'s semi-congruent design is better able to distribute loading across the ankle joint and greatly reduces the likelihood of point stress concentrations during a range of simulated use conditions, as shown in the images below.[7] Point loading creates areas of high stress along the surface of the polyethylene implant, leading to wear and asymmetric load transfer. Due to its articulating surfaces, Kinos Axiom® is less constrained within the prescribed ROM than competitors and provides uniform load transfer.

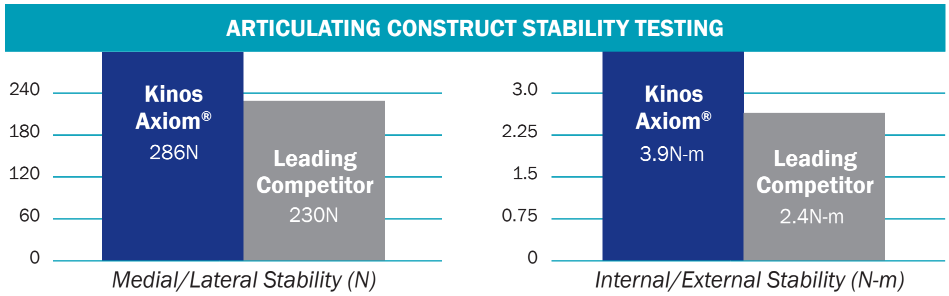
However, the medial and lateral aspects of the Kinos Axiom® design provide sufficient constraint to resist excessive loading directed during medial/lateral translations or internal/external rotations.[7]

Kinos Axiom®



Leading Competitor

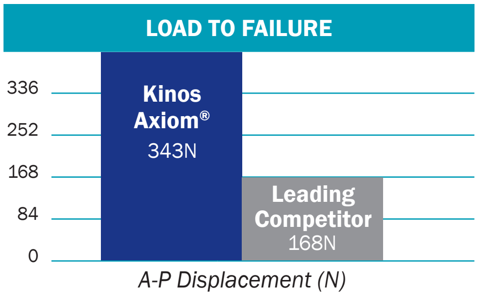




Maximizing Implant Stability

Tibial implant loosening is a major concern of total ankle systems. This concern was addressed through a novel design of the bone-implant interface. The Kinos Axiom® tibial implant employs vertically inserted fixation features that increase the implant-to-bone contact area without increasing the overall construct footprint. The vertical buttresses are oriented to maximally resist clinical loading.[7] Additionally, bone ingrowth holes are provided with an optimal size to promote stability.

In vitro testing was conducted to evaluate the ability of various implant designs to resist clinically relevant loading. Testing confirms significantly improved implant-to-bone stability for the Kinos Axiom® implant compared to other systems on the market.[7]



The robust bone fixation features of the Kinos Axiom® Total Ankle System improve stability in the following ways:

- Fixation perpendicular to the predominant loading vector
- Asymmetry to resist torsional loading
- Increased surface area for maximum bony integration

1. Kelly, et al. Acta Biomaterialia (2019) 94, 601-626.
2. Kelly, et al. Journal of the Mechanical Behavior of Biomedical Materials (2021) 116, 104380.
3. Kelly, et al. Biomaterials (2021) 279, 121206.
4. Koo, S., Lee, K. M., & Cha, Y. J. (2015). Plantar-flexion of the ankle joint complex in terminal stance is initiated by subtalar plantar-flexion: A bi-planar fluoroscopy study. Gait and Posture, 42(4), 424–429.
5. Arndt, A., Wolf, P., Liu, A., Nester, C., Stacoff, A., Jones, R., Lundgren, P., & Lundberg, A. (2007). Intrinsic foot kinematics measured in vivo during the stance phase of slow running. Journal of Biomechanics, 40(12), 2672–2678
6. Per manufacturer's documentation.
7. Data on File.

Foundational Research

Award winning research, contributing to the design of the Kinos Axiom® Total Ankle System, was conducted by Sorin Siegler, PhD, Director of the Biomechanics Lab at Drexel University. Dr. Siegler has been a leader in orthopedic biomechanics research for over 30 years. The new understanding of the natural articulating joint surfaces this research provided received the Clinical Biomechanics award in 2013 from *Clinical Biomechanics*.

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The Clinical Biomechanics Award 2013 -- presented by the International Society of Biomechanics: New observations on the morphology of the talar dome and its relationship to ankle kinematics

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