

AETOS[◇] Stemless Shoulder System for anatomic total shoulder arthroplasty (TSA): bone engagement and density modeling study

AETOS Stemless is designed for stability with anterior and posterior cruciate fins, a proximal tapered inlay collar and press-fit plasma spray

Design rationale

AETOS Stemless aims for dense peripheral fixation and full circumferential support



Designed to **engage the peripheral metaphyseal bone** within 15–20mm of the resection plane



Designed to **circumferentially engage cancellous bone**

Proximal tapered inlay collar

Press-fit plasma spray

Cruciate fins (anterior/posterior)

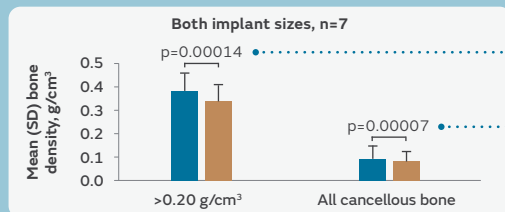
Study objective: to model and compare the volume and approximate density of humeral bone in contact with the AETOS Stemless and a comparator stemless implant across small (female) and large (male) anatomy¹

Study design:

- Preoperative humerus CT scans from patients scheduled for TSA had AETOS Stemless and comparator stemless ‘virtually implanted’ using recommended surgical techniques (Small: females aged 47–70 years, n=32; Large: males aged 55–74 years, n=42)¹
- Radiodensity categories selected to align with radial density in proximal humerus as reported in earlier literature²

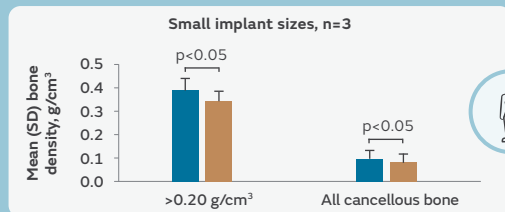
AETOS Stemless: higher bone density at implant interface than comparator stemless implant¹

■ AETOS Stemless ■ Comparator Stemless

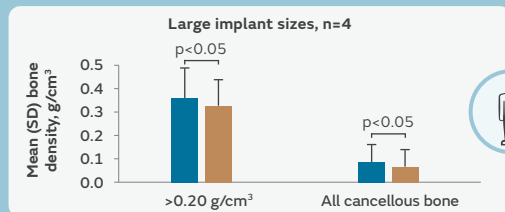


12% higher average cancellous bone density in the highest density regions (>0.20 g/cm³)¹

20% higher average cancellous bone density at the implant interface¹



Consistent results across full implant size range in small (female) and large (male) anatomy¹



Insights from the literature

Primary stability is better in higher density bone. Analysis of cadaveric humeral cancellous bone surrounding a press-fit stemless implant* (n=18) showed that micromotion of the implant under load was lower in higher density bone (p<0.0005)³

Secondary stability (osseointegration) is less likely to be compromised by micromotion† when implants are in higher density bone, based on finite element models of four press-fit stemless implants‡ in standardised CT scans of higher or lower density humeri⁴⁵

Modeling study outcomes¹

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*Sidus™ Stem-Free Shoulder (Zimmer GmbH).³ †Micromotion > 20µm. ‡Inhance™ Shoulder System (DePuy Synthes), Sidus™ Stem-Free Shoulder (Biomet), Simpliciti Shoulder System (Wright Medical), SMR Stemless (Lima Corporate).⁴ †Higher and lower density scans from people aged 20–40 and 60–80 years, respectively (each n=10); populations statistically different only in terms of bone density.⁴

Abbreviations: CT = computed tomography; MIMICS = Materialise Interactive Medical Image Control System (Materialise, Belgium); TSA = total shoulder arthroplasty.

References: 1. Smith+Nephew 2025. Volume and Density of Humeral Bone in Contact with Stemless Total Shoulder Arthroplasty Implants. CSD.REC.25.003v4 2. Alidousti H, et al. *J Shoulder Elbow Surg.* 2017;26(9):1653–1661. 3. Favre P, et al. *Clin Biomech (Bristol).* 2016;32:113–7. 4. Monteiro HL, et al. *J Shoulder Elbow Surg.* 2025;34(2):557–566.