Smith+Nephew

REDAPT◊

Revision Acetabular System
Acetabular Augments

CONCELOC◊

Advanced Porous Titanium

Design Rationale

Design surgeon list

Smith+Nephew thanks the following surgeons for their participation as part of the REDAPT◊ Revision Acetabular System design team

Dr. Robert Bourne
London, Ontario
London Health Sciences, University of Western Ontario

Dr. Richard McCalden
London, Ontario
London Health Sciences, University of Western Ontario

Dr. Andrew Shinar
Nashville, TN
Vanderbilt Orthopaedics

Dr. Scott Marwin
New York, NY
NYU-Hospital Joint Diseases

Dr. Steven Weeden
Fort Worth, TX
The Texas Hip & Knee Center

Dr. Mathias Bostrom
New York, NY
Hospital for Special Surgery

Dr. John Masonis
Charlotte, NC
OrthoCarolina

Dr. James Waddell
Toronto, Ontario
University of Toronto,
St. Michael's Hospital

Dr. Craig Della Valle
Chicago, IL
Midwest Orthopaedics at RUSH

Mr. Stephen Jones
Cardiff, UK
Univ. Hosp. of Wales and
Univ. Hosp. Llandough

Dr. David Campbell
Adelaide, South Australia
Wakefield Orthopaedic Clinic

Prof. Christian Götze
Bad Oeynhausen, Germany
Auguste-Viktoria-Klinik

REDAPT◊ Acetabular Augments

The REDAPT Acetabular Augments are developed for use in revision total hip arthroplasty cases where bone voids exist that may not be able to be addressed solely through placement of an acetabular shell. Augments aid in the restoration of the native hip center, where using a cup alone might produce a high hip center.[1-3] To allow ingrowth, an additive, or 3D-printed manufacturing process is used to produce an entirely porous implant that is intended to mimic the structure of cancellous bone. Augments are designed with bone-conserving shapes, to support the construct while removing minimal bone. Additionally, variable-angle locking screws can be used. Compared to conventional screws, REDAPT Variable Angle Locking Screws have demonstrated enhanced rigidity*, which can increase the initial stability of the construct.[4-7]

Please utilize the QR Code here to view the Additive Manufacturing Video.

CONCELOC◊ Advanced Porous Titanium

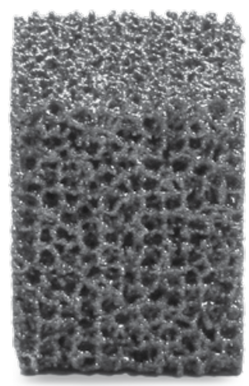


Figure 1: CONCELOC

Material

CONCELOC is made from Ti-6Al-4V and meets the ASTM and ISO standards for that alloy, with a good clinical history and over 40 years of use in medical devices.[8-11]

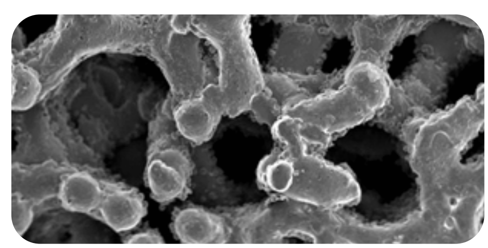


Figure 2: CONCELOC at 25x magnification

Porosity

CONCELOC Advanced Porous Titanium has an interconnected network of pores with an average porosity of 80% in the near-surface regions where the initial fixation will occur, and an average overall porosity of 63%.[12] These porosities are within the range of 60-80% porosity reported for other advanced porous structures.[13-16]

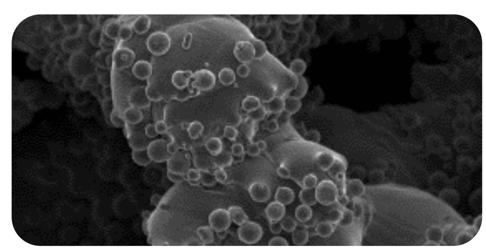


Figure 3: CONCELOC at 80x magnification

Pore size

CONCELOC has pore sizes greater than 100 μm, which the literature suggests is beneficial to biological fixation.[17-19] CONCELOC Advanced Porous Titanium has an average pore size that ranges from 202 to 342μm overall and from 484 to 934μm at the surfaces of the porous structure.[12, 20]

*As demonstrated in benchtop testing

Stability

Variable angle locking screws

For bone ingrowth to occur, it is critical that implants remain stable. It has been reported that as little as 150 microns of motion can interrupt the process of bone ingrowth.[21]

Screws have historically been used as a means to provide adjunctive fixation. Spherical head screws or REDAPT◊ Variable Angle Locking Screws can be used in any of the available screw holes on the REDAPT Acetabular Augments. Compared to conventional screws, the use of REDAPT Variable Angle Locking Screws has demonstrated increased construct rigidity*, which may reduce micromotion and in turn promote bone ingrowth.[4-7]

- Variable angle lock up to 12˚ (included angle) (Figure 6)
- Testing has shown increased stiffness in static bending compared to non-locking screws[5]
- Variable Angle Locking Screws create a construct with greater than 7x the rigidity of a construct using non-locking screws[5]
- 6.5mm cancellous thread
- Lengths 15mm – 50mm

Figure 4: Slice Augment

Figure 5: Slice Augment

Figure 6: Variable angle locking screw

High friction surface

The high friction surface of the CONCELOC◊ Advanced Porous Titanium is designed to aid in achieving the initial stability needed to hold the implant in place upon insertion.[22,23]

- Topographically mapped “bumps” on all bone-interfacing surfaces (Figure 7)
- Patented design feature
- Benefit of additive manufacturing

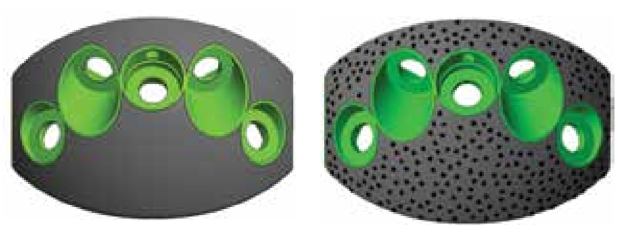


Figure 7: Three dimensional model before and after application of friction bumps.

*As demonstrated in benchtop testing

Adaptability

Three styles to address varying defects

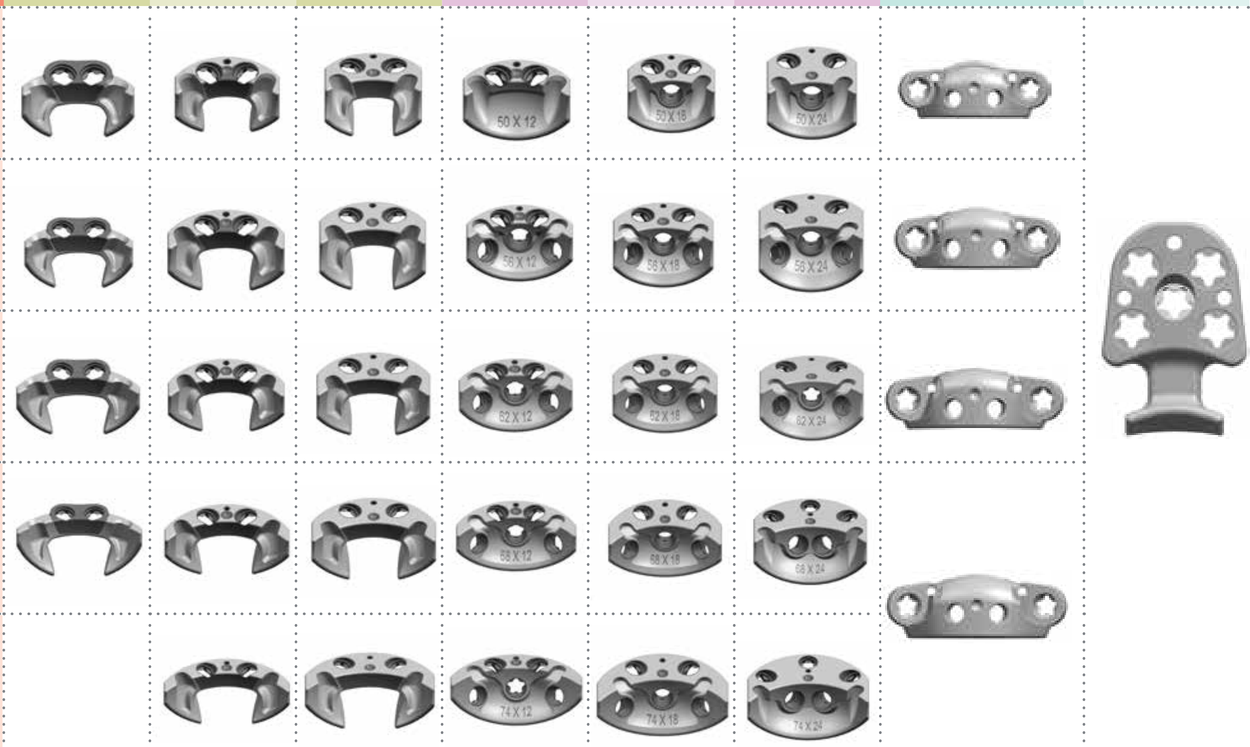
Staple
Designed to allow the augment to span around a screw that is placed through the cup into the acetabulum

Slice
Designed to provide additional support where defects may be present in the more medial aspects of the acetabulum

Blade
Eliminates the need to use different augment geometries. Features a two-piece design with a modular junction so the components can be positioned to conform to a variety of pelvic anatomies

Augment sizes

Shell OD	Augment Sizes	Staple			Slice			Blade	
		8mm	12mm	18mm	12mm	18mm	24mm	Base	Wing
48-52	50mm								
54-58	56mm								
60-64	62mm								
66-70	68mm								
72-80	74mm*								



- Screw holes "optimized" per implant size to allow access to available host bone (Slice Augment)
- One Augment fits multiple shell diameters

*Staple and Slice Augment only

Augment Holding Forceps

Designed to allow independent placement of the augments to achieve desired orientation

Figure 8: Augment Holding Forceps

Four thickness options* – 8, 12, 18 and 24mm

- Addresses wide range of defect sizes
- Aid in the restoration of the native hip center, where using a cup alone might produce a high hip center.[1-3]

Figure 9: Slice Augment

Reproducibility

Trials

- Exact replica of each implant size

Driver Platform

- Designated surface for light impaction if necessary

Steinmann Pin Holes (except 8mm Staple Augment)

- Allow for implants to be positioned exactly where trialing is completed

Cement Ports

- Simplifies unitization of Augments to the acetabular shell
- Allow for positioning of the implants prior to unitizing the construct with cement

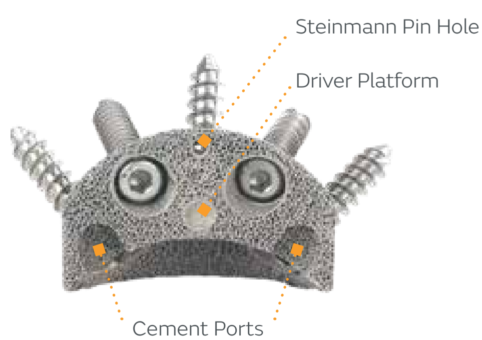


Figure 10: Slice Augment

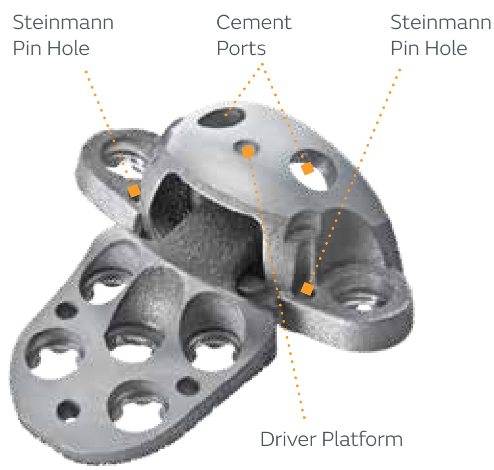


Figure 11: Blade Augment

*Staple and Slice Augment only

Implant overview

REDAPT◊ Acetabular Augments

Staple Augment
8mm – 18mm thickness

Slice Augment
12mm – 24mm thickness

Augment Base

Augment Wing

Spherical Head Screws
15mm – 50mm

REDAPT Locking Screws
15mm – 50mm

Smith & Nephew, Inc.
1450 Brooks Road
Memphis, Tennessee 38116
USA

www.smith-nephew.com
Telephone: 1-901-396-2121
Information: 1-800-821-5700
Orders/Inquiries: 1-800-238-7538

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