

The Science of CERAMENT® & Bone Remodeling

EVIDENCE MATTERS



CERAMENT® BUILDS CONFIDENCE

CERAMENT® is an injectable, moldable and drillable ceramic bone substitute that fills voids and gaps in the skeletal system. Our unique formulation has a proven ability to remodel into bone in 6-12 months.

PROPRIETARY FORMULA	FEATURES & FUNCTIONALITY	EVIDENCE OF BONE REMODELING
40% Hydroxyapatite (HA) 60% Calcium Sulfate (CaS) Radiocontrast agent for enhanced visibility under fluoroscopy	Sterile, self-contained device helps reduce the risk of contamination Flexible delivery and handling: inject, mold or drill Not temperature sensitive Visible under fluoroscopy	Level Ib and IV clinical study Histology, radiology and multiple imaging techniques 150+ publications



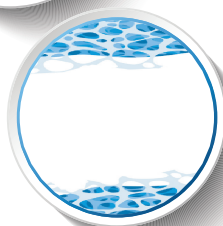
CERAMENT® PROVIDES CLINICAL VALUE^{1,2}

- Helps to reduce risk of infection and associated surgical costs
- Helps to improve union rates
- Improves patient outcomes

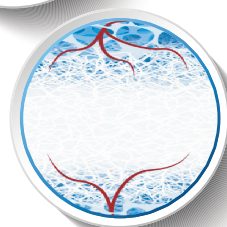
CERAMENT®: THE BONE HEALING JOURNEY



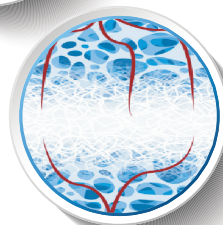
Bone injury/defect.



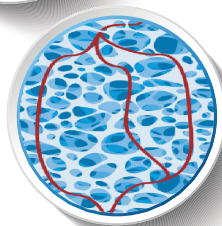
Injection: CERAMENT is highly flowable to completely fill void and cracks.



3 months: When in contact with vascularized bone, CaS in CERAMENT is resorbed, leaving a porous HA scaffold. Blood vessels grow into CERAMENT, attracting osteoblasts that begin to form bone.



6 months: Resorption of CERAMENT is at the same rate as bone formation which continues towards the center, becomes mineralized and remodels to trabecular bone.



12 months: CaS in CERAMENT is fully resorbed, HA is embedded in mature bone, natural bone building continues increasing mechanical strength.

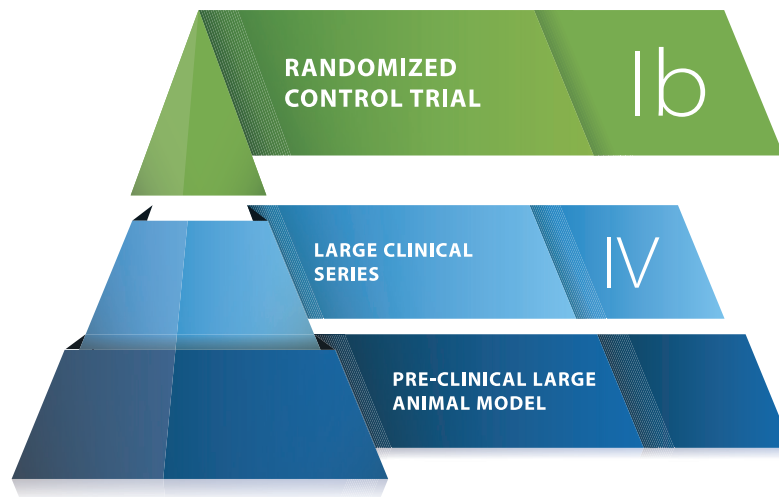


The bone is healed.

Disclaimer: This overview is a general illustration showing how CERAMENT™ remodels into bone. The content of the overview is based on the knowledge of bone biology and combined insight from internal research and published clinical studies. The liquid components of the CERAMENT portfolio products are different, but bone remodeling is deemed to be equivalent independent of these differences. Copyright © 2020 BIONE SUPPORT AB. All rights reserved.

PROVEN BONE REMODELING

CERAMENT has been extensively tested with more than 150 publications and abstracts in support of CERAMENT's safety and efficacy.



LEVEL Ib: RANDOMIZED CONTROLLED TRIAL⁴

CERAMENT: Demonstrating efficacy and bone remodeling equivalent to autograft.

CERTiFy is a Level Ib, multi-center, prospective, randomized controlled trial of patient-reported outcome measures data in 135 patients.

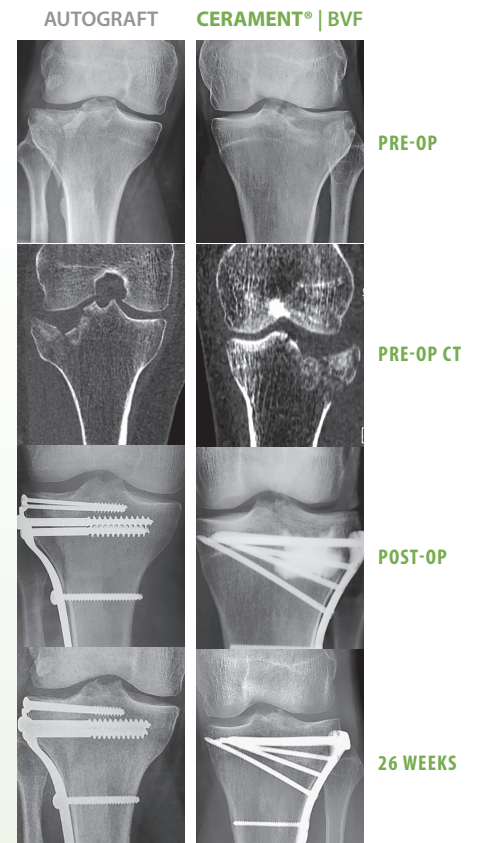
Published in Journal of Bone and Joint Surgery American (2020).

The non-inferiority study compared CERAMENT® BONE VOID FILLER to autograft in acute traumatic fractures of the proximal tibia. The study also compared bone remodeling and patient-reported outcome measures between the two treatment groups.

Results:

- CERAMENT is as good as autograft
- Proven bone remodeling
- Less post-op pain compared to autograft
- Less blood loss compared to autograft
- Trend towards shorter duration of surgery

PROVEN BONE REMODELING AS GOOD AS AUTOGRAFT



LEVEL IV: LARGE CLINICAL SERIES³

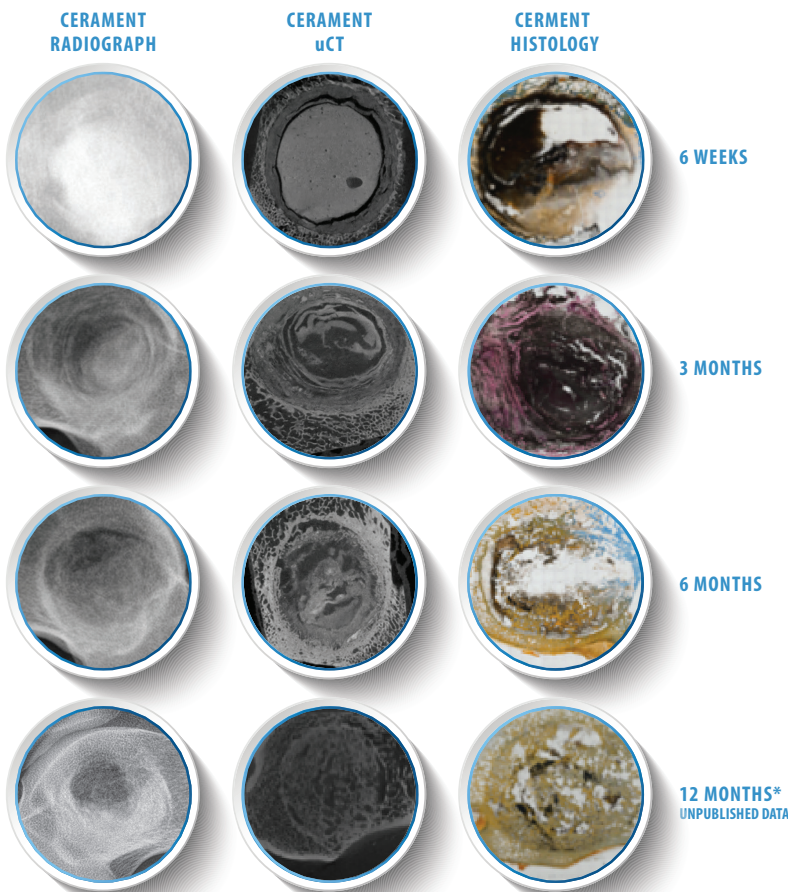
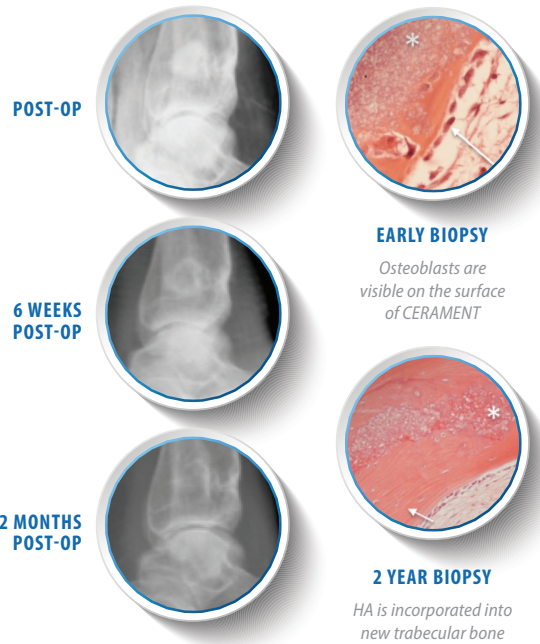
CERAMENT: Demonstrating bone remodeling with published radiographic and histologic imaging.

- Retrospective review of prospectively collected series of 163 patients with chronic osteomyelitis treated with CERAMENT G^{**}
- 138 radiographs assessed (min. 12 months f/u)
- 9 biopsies (between 19 days and 24 mos.)

Results:

- ~74% mean bone void-filling at 12 months
- Histology showed active biomaterial remodeling
- Osteoconductive with osteoblast recruitment
- Woven and lamellar bone on substrates surface

HISTOLOGY MATCHES RADIOGRAPHIC CHANGES, CONNECTING CLINICAL OUTCOMES TO THE BONE REMODELING OF CERAMENT



Visible signs of trabecular bone growth into periphery

PRE-CLINICAL LARGE ANIMAL MODEL^{5*}

CERAMENT: Demonstrating bone remodeling with multiple imaging techniques.

- Evaluating bone remodeling in medial femoral condyles of sheep
- 10ml voids filled with cancellous allograft, CERAMENT G^{**} or left empty
- Using radiographs, MRI, μ CT, DEXA and histology to prove bone remodeling
- Published in APMIS (2019)

Results:

- CERAMENT G showed centripetal biodegradation and new trabecular bone formation in the periphery at 6 months

NEW TRABECULAR BONE FORMATION VISIBLE

* Pre-clinical data is not an indication of clinical performance
 ** CERAMENT G is not approved for sale in the U.S.

References:

1. Bark S. et al. Arthroscopic-assisted treatment of a reversed hill-sachs lesion: description of a new technique using CERAMENT. Case Rep Orthop. 2015.
2. Abramo et al. (2010), Osteotomy of distal radius fracture malunion using a fast remodeling bone substitute consisting of calcium sulphate and calcium phosphate. J. Biomed. Mater. Res., 92B: 281-286. doi:10.1002/jbm.b.31524
3. Ferguson et al. Radiographic and Hstological Analysis of a Synthetic Bone Graft Substitute Eluting Gentamicin in the Treatment of Chronic Osteomyelitis. J Bone Jt Infect. 2019 Mar 16;4(2):76-84.
4. Hofmann et al. Autologous Iliac Bone Graft Compared with Biphasic Hydroxyapatite and Calcium Sulfate Cement for the Treatment of Bone Defects in Tibial Plateau Fractures. J Bone Joint Surg Am. 2020 Feb 5;102(3):179-193.
5. Hettwer et al. Establishment and Effects of Allograft and Synthetic Bone Graft Substitute Treatment of a Critical Size metaphyseal Bone Defect Mode in the Sheep Femur. APMIS. 2019; 127: 53-63.



Restoring health to improve the quality of life
for patients with bone disorders.

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