





Biodegradable magnesium bone staples show comparable primary stability

in comparison to bone staples made of steel: A biomechanical comparison.

Adrian Deichsel¹, MD, Johannes Glasbrenner¹, MD, Michael J. Raschke¹, MD, Prof., Jens Wermers¹, Dr, Matthias Klimek¹, Msc, Christian Peez¹, MD, Thorben Briese¹, MD, Elmar Herbst¹, MD, PhD, Christoph Kittl¹, MD,

¹Department of Trauma, Hand and Reconstructive Surgery, University Hospital Muenster, Germany







The authors declare that magnesium bone staple prototypes were provided by Medical Magnesium GmbH (Aachen, Germany) free of charge.







Bone Staples Provide Favorable Primary Stability in Cortical Fixation of Knee Medial Collateral Ligament Tendon Grafts¹

The Biomechanical Stability of Bone Staples in Cortical Fixation of Tendon Grafts for Medial Collateral Ligament Reconstruction Depends on the Implant Design²

Bone staples present a viable alternative for cortical fixation of tendon grafts in knee surgery. However, implant removal is often necessary

- 1) Glasbrenner et al. OJSM (2021)
- 2) Deichsel et al. AJSM (2022)





Purpose \rightarrow To evaluate a novel magnesium biodegradable bone staple prototype and to compare it with conventional metal bone staples



Left: Richards fixation width 8 mm (Me1 – Smith and Nephew, London, UK) Middle: Spiked ligament staple, width 8 mm (Me1 - Arthrex, Naples, Florida). Right: Magnesium bone staple prototype (Mg – Medical Magnesium GmbH, Aachen, Germany)





- Testing performed with uniaxial testing machine (Instron model 8874, Norwood, MA)
- Test protocol
 - Cyclic loading
 - 500 cycles from 0 to 50 N¹
 - 500 cycles from 0 to 100 N¹
 - Load to failure (25 mm/min)
- Determination of stiffness from the load to failure curve
- Statistical comparison by Kruskall-Wallis test with posthoc Dunn's correction



1) Shelburne et al. Medicine & Science in Sports & Exercise (2005)







No significant differences between staple constructs regarding elongation and load to failure, and sttiffness

Me1: Richards fixation width 8 mm (Smith and Nephew, London, UK) Me2: Spiked ligament staple, width 8 mm (Arthrex, Naples, Florida). Mg: Magnesium bone staple prototype (Medical Magnesium GmbH, Aachen, Germany)





Bone staples made from magnesium display favourable biomechanical primary stability and may therefore be a possible alternative to conventional metal implants.



Thank you!







Adrian Deichsel, MD

Department of Trauma, Hand and Reconstructive Surgery, University Hospital Muenster Albert- Schweitzer-Campus 1, Building W1 48149 Münster, Germany