Serial imaging and histology illustrating the degradation of a bioabsorbable magnesium stent in a porcine coronary artery

Tina L. Pinto Slottow, Rajabu Pakala, and Ron Waksman*

Washington Hospital Center, Cardiovascular Research Institute, 110 Irving Street, NW, Suite 4B-1, Washington DC 20010, USA

* Corresponding author. Tel: +1 202 877 2812; Fax: +1 202 877 2715. Email: ron.waksman@medstar.net

Magnesium alloy stents have demonstrated swift degradation within 90 days of implantation in porcine and human coronary arteries. These stents are radiolucent and thus cannot be visualized by angiography. To assess the rate of degradation, bioabsorbable magnesium alloy stents were deployed in porcine coronaries, and serial imaging by intravascular ultrasound (IVUS) (Panels A and B) and optical coherence tomography (OCT) (Panels C and D) was performed at implant and at 3-month follow-up. The stent struts were clearly visible by both technologies at implant, but were degraded at follow-up. Low-voltage X-ray of these stents at implant and follow-up demonstrated degradation and loss of structural integrity at the later time point (Panels E and F). Histopathology at 3 months revealed that the struts had degraded (Panels G–I). These imaging modalities demonstrate the rapid degradation of the absorbable magnesium stent as intended in ≤90 days. This may result in early recoil of the vessel because of the lack of radial force exerted by the bioabsorbed stent at this early stage of healing. We propose that serial IVUS and OCT imaging can be employed to assess the rate of stent degradation and its impact on vessel recoil and restenosis.

Panel A. Intravascular ultrasound of the stented segment at implant.
Panel B. Intravascular ultrasound of the stented segment at 3-month follow-up.
Panel C. Optical coherence tomography of the stented segment at implant.
Panel D. Optical coherence tomography of the stented segment at 3-month follow-up.
Panel E. Low-voltage X-ray photograph of the stented vessel at implant.
Panel F. Low-voltage X-ray photograph of the stented vessel at 3-month follow-up.
Panel G. Histopathology of the stented vessel at 3-month follow-up: low power magnification, cross-section through stented segment.
Panel H. Histopathology of the stented vessel at 3-month follow-up: medium power magnification, stent strut has degraded.
Panel I. Histopathology of the stented vessel at 3-month follow-up: high power magnification, stent strut has degraded.