Comparison of acute thrombogenicity for metallic and polymeric bioabsorbable scaffolds in a porcine arteriovenous shunt model

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THEME: Coronary Interventions

TOPIC(S): Stents and scaffolds

AIMS
The acute thrombogenicity of Magmaris magnesium BRS and the ABSORB BRS has not been compared. This study assessed acute thrombogenicity of Magmaris compared with ABSORB and the ORSIRO hybrid DES in a porcine arteriovenous shunt model.

METHODS AND RESULTS
An ex-vivo porcine carotid jugular arteriovenous shunt was established and connected to Sylgard tubing containing the Magmaris sirolimus-eluting magnesium bioabsorbable scaffold (140 μm strut thickness), ABSORB everolimus-eluting bioresorbable vascular scaffold (150 μm strut thickness), and Orsiro Hybrid cobalt chromium stent with a sirolimus-eluting bioresorbable PLLA polymer coating (60 μm strut thickness) were inflated to nominal pressure and allowed to run in the shunt for a maximum of one hour. Twelve shunts (2 shunt runs per pig) were run comparing the three scaffolds in alternating order. Nested generalized linear mixed models were employed to compare variables between scaffold groups while adjusting for variability between shunt runs. Confocal fluorescent microscopy costaining CD61/CD42b demonstrated both Magmaris (3.0 ± 0.8%) and Orsiro (5.3 ± 3.4%) had significantly less platelet coverage of the total scaffold compared with ABSORB (20.8 ± 12.6%). Scanning electron microscopy demonstrated significantly less thrombus deposition to Magmaris as a percentage of the total scaffold compared with ABSORB (5.2 ± 0.4% vs 18.5 ± 11.3%, p<0.05). Both Magmaris and Orsiro had significantly less PM-1 positive neutrophil and CD14 positive monocyte adherence compared with ABSORB. Magmaris had significantly less monocyte deposition compared with Orsiro. To further determine whether the polymer coating or metal scaffold significantly reduced the thrombogenicity of Magmaris BRS, a stainless steal stent with the same sirolimus-eluting bioabsorbable polymer as Magmaris was created (316-L) with 140 μm strut thickness. When compared in the porcine arteriovenous shunt model, the Magmaris BRS had significantly less platelet (2.6% vs 5.7%, p<0.0001) and inflammatory cell coverage (p<0.001) compared with the 316-L stent, demonstrating the magnesium bioabsorbable stent repels platelets and inflammatory cells.

CONCLUSIONS
Despite a similar scaffold strut thickness, the Magmaris sirolimus-eluting bioabsorbable magnesium scaffold was significantly less thrombogenic compared with the ABSORB BVS in an ex vivo porcine arteriovenous shunt model. We further demonstrated that the magnesium scaffold may help repel platelets and inflammatory cells. Further studies are needed to determine whether the reduced thrombogenicity of Magmaris will result in reductions in major cardiovascular events.