NEW DUPLEX-ALLOY BARE METAL STENT ENABLES MAGNETIC CAPTURE OF ENDOTHELIAL CELLS AND REDUCES NEOINTIMAL RESPONSE TO INJURY

i2 Poster Contributions
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Background: Facilitated endothelialization of stented arteries may reduce restenosis and requirements for prolonged antiplatelet therapy. Blood derived endothelial cells labeled with superparamagnetic particles have previously been magnetically attached to prototype magnetized stents. Clinical translation requires a high degree of biocompatibility, therefore a novel bare metal stent was developed from a duplex stainless steel alloy that has structural and biochemical properties similar to clinical grade 316L steel. These magnetically enabled bare metal stents were implanted in a porcine model and used to capture endothelial cells. Results of a 1-month pig study are presented.

Methods: Autologous endothelial cells were cultured from 200 ml blood and labeled with endocytosed 200 nm PLGA-magnetite particles. Laser-cut duplex stainless steel stents (austenitic-ferritic, 21% chromium) were magnetized using a 2T magnet for 30 min. Twenty magnetic and control stents were implanted in coronary arteries in 40 kg pigs. 2 million labeled cells were delivered locally during a 2 min flow occlusion with an over the wire balloon. The stented segments were subjected to histologic examination after 30 days.

Results: All 20 stents were widely patent. There was no corrosion or inflammation noted next to the duplex stainless steel stent struts. Iron staining documented traces of iron from superparamagnetic particles near the magnetized stent struts. These were not present adjacent the non-magnetic stent struts. Depth of vascular injury and neointima formation was quantitated at all struts using 6 cross sections per stent. For an equivalent injury score, the magnetic stent showed 8% less neointima formation. Subjective analysis indicated better tissue organization and more uniform endothelialization in the magnetized stents.

Conclusions: The novel duplex-alloy bare metal stent and biodegradable particles showed no local inflammation or adverse effects after magnetic cell capture. The reduction in neointima as well the improved healing supports the hypothesis that magnetically facilitated endothelialization has the potential to improve vascular healing in a pig coronary stent model.