Initial Assessment of a Novel Radioactive Tin-117m Stent in Porcine Coronary Arteries

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Background: Tin-117m (117mSn) is a novel conversion electron emitting radioisotope that deposits intense energy in a very short range. It can deliver high doses of radiotherapy to a target while minimizing collateral damage to adjacent normal tissue, and has been used clinically in the management of bone pain associated with osteosarcoma. There are several potential cardiovascular applications of 117mSn, one being an electroplating on stents, since the coronary media is 0.2-0.3mm thick, no adjacent tissue exposure would result.

Objective: To assess the feasibility and coronary artery effects of an 117mSn-electroplated stent in a clinically relevant animal model.

Methods: 72 stents of 3 types were implanted in pig coronaries: Bare metal stents (BMS, n=14), Tin-only sham electroplated stents (Tin-only, n=15), and three incremental doses of radioactive 117mSn electrolyticated stents (Low 30μCi, n=14; Medium 60μCi, n=14; and High 150μCi, n=15). Pigs were terminated at one month for complete histological analysis.

Results: Intimal thickness varied according to stent type with highest level for the Low, Medium and High radioactive stents compared to BMS and Tin-only (0.43±0.06mm, 0.41±0.06mm, and 0.47±0.07mm, vs. 0.17±0.02mm, and 0.26±0.03mm, respectively, P<0.001). % area stenosis was higher for radioactive stents compared to BMS and Tin-only. (51±6%, 51±4%, and 55±5%, vs. 27±2% and 35±3%, respectively, P<0.001). There was consistently a distinct, discrete, dense collagenous ring of tissue which included a densely cellular outer rim, in the perivascular space at the outer adventitial border ~0.2-0.3mm radially outward from 117mSn stents. This appears to reflect a unique biological effect or ‘signature’ of this radioisotope in this application.

Conclusions: This study showed that novel radioactive 117mSn stents were compatible with porcine coronary artery implant. Although these devices exacerbated rather than inhibited in-stent neointima formation, unique histological effects were observed that support further investigation of 117mSn effects in the circulatory system to understand the interaction of this unique conversion electron energy with the vascular tissue.