Percutaneous Coronary Intervention for Chronic Total Occlusion: Intraoperative Brachytherapy

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Background: Chronic total occlusions (CTO) are a significant problem identifying patients at increased risk of death and myocardial infarction. Currently, There are no reproducible animal models for evaluation of new percutaneous devices in the treatment of CTO. We propose a novel model of CTO mimicking human fiberoatheroma. This model could be used to understand the unique properties of fibrous CTO as well as a new develop new devices.

Methods: Ten common swine (Sus Scrofae) were intubated and underwent selective coronary artery catheterization. After selective engagement of either the right or circumflex coronary artery, an introducer sheath was advanced into the mid-segment of the artery. A proprietary L-FFPA 3rd microrobop balloonexpandable polymer cylinder (PC) was placed using a solid introducer. This polymer allows limited antegrade flow to occur resulting in gradual occlusion of the artery over hours or days. The balloonexpandable polymer is designed to be completely absorbed by 28 days with replacement of the polymer by a dense fibrootic plaque.

Results: PC were successfully delivered to all ten animals. One animal, who received a proximal PC delivery died from an acute anterior wall myocardial infarction. The remaining 9 animals underwent repeat angiography with intravenous ultrasound at 70 days. One of the 9 animals had spontaneous recanalization at the PC implant site from bridging collaterals. The remaining 8 animals had complete occlusion of the vessel distal to the PC without collateral formation. The total occlusion was crossed, intravascular ultrasound imaging was performed using a mechanical imaging system (CVIS). After imaging the animal was euthenized and the segment dissected. The histopathology demonstrated a fibrootic occlusion with minimal residual polymer and no calcification.

Conclusion: We present a new porcine model for fibrous CTO in the coronary arteries that allows for complete occlusion at an early time point. This model mimics human non-calcified occlusive atheroma. This model may allow the development of new techniques and devices for treatment of CTO.

Temporal Trends in the Treatment of Total Coronary Occlusions

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Background: Success rates for treatment of totally occluded (TO) coronary arteries have been lower than for arteries with less severe lesions. Whether refinements in techniques and equipment now available have improved the outcomes of TO intervention is unknown.

Methods: From the 1985-86 NHLBI PTCA Registry and the current NHLBI Dynamic Registry (1995-2002), we assessed relative prevalence and success rates in treating TO lesions (<90% stenosis, TIMI 0 flow) in consecutive TO patients (pts) with (n=563) and without (n=453) acute myocardial infarction (AMI).

Results: The prevalence of TO lesions attempted in AMI pts decreased over time from 14% in the 1985-86 Registry to 8%, 6%, 4% in Waves 1-3 of the Dynamic Registry, respectively (P<0.001). Similarly findings were observed among non-AMI pts, from 14% in the 1985-86 Registry to 8%, 6%, 4% in Waves 1-3 of the Dynamic Registry, respectively (P<0.001). Rates of successful intervention improved in AMI TO pts from 65% in the 1985-86 Registry to 90%, 92%, and 88% in Waves 1-3 of the Dynamic Regis-