Histologic Evaluation of a Novel Fully Biodegradable Salicylate-Based Sirolimus-Eluting Stent

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Background: The concept of fully biodegradable stents has emerged as an attractive alternative to current permanent metalplic stents. We sought to evaluate a novel, fully biodegradable sirolimus-eluting stent (SES) synthesized entirely from salicylate-based polymer, in a clinically relevant animal model.

Methods: Fully biodegradable balloon-expandable stents (n=32) were implanted in pig coronary arteries using quantitative coronary angiography (QCA) and intravascular ultrasound (IVUS) to optimize stent apposition. Dose density of sirolimus was 8.3 μg/mm of stent length with *in-vitro* studies demonstrating elution over 30 days and complete stent degradation in 9-12 months. Animals were terminated at 7, 14, 30, 90, and 180 days for complete histopathologic and histomorphometric analyses.

Results: All stents were deployed successfully without notable mechanical difficulties. At 7 days, stents had thin mural thrombus coverage with scattered leukocyte infiltration. At 14 days, early thrombus organization including invasion with round, spindle-shaped, and stellate cells was seen along with collagen deposition; endothelialization was nearly complete and there was a mild inflammatory reaction. At 30 days, the neointima was increased in size (0.26±0.14mm) and showed a well-healed fibrocellular composition with only minimal residual thrombus components; inflammation was mild to moderate and mostly in the form of multinucleated foreign-body giant cells. At 90 days, healing had progressed so that only rare intramural thrombus was seen, and endothelialization was complete; intimal thickness was 0.4±0.17mm**.** The stent appeared at this time to have undergone considerable absorption mostly in the form of surface erosion, with some cellular infiltration into the stent space. At 180 days, arterial wall incorporation of the absorbable stent involved a highly organized and stable fibrocellular neointima with thickness of 0.31±0.10mm. There was no evidence of any residual thrombus, fibrinoid deposits, or hemorrhage. Inflammatory reaction was minimal and stable, being almost entirely of giant cells. The appearance of the stent profiles suggested further erosion and cellular infiltration compared to 90 days.

Conclusions: This study shows favorable vascular compatibility for a novel fully biodegradable salicylate-based SES. Serial temporal histologic analysis revealed a consistent, gradual process of absorbable vascular prosthesis incorporation into arterial wall tissue, with stable healing and endothelialization.