**JACC March 6, 2002 ABSTRACTS - ACCIS2002 (Angiography & Interventional Cardiology) 5A**

**1005-5**
**Endothelial Shear Stress Identified In Vivo Within the Stent Is Related to In-Stent Restenosis and Remodeling of Stented Coronary Arteries**

Background: Endothelial shear stress (ESS) is a potent stimulus for regulating endothelial cell activation and the signals for vascular smooth muscle cell proliferation. However, the relationship of ESS to the subsequent development of in-stent restenosis in-vivo has not been studied previously. The purpose of this study was to relate ESS measured at baseline to in-stent restenosis. Methods: We studied 3 patients after coronary artery stenting at baseline and 6 months. The 3-D anatomy of the stented segment was determined using intraocular ultrasound, biplane angiography, and coronary flow measurements. The lumen was reassembled in accurate 3-D space; local ESS was calculated using computational fluid dynamics. Outer vessel dimensions (external elastic lamina [EEL]) and the plaque (difference between EEL and the lumen) were similarly reconstructed. Changes in the artery at 6 mos were assessed by general linear regression accounting for repeated measurements. Results: Increasing ESS was associated with plaque progression and positive remodeling (all p<0.01). Lumen narrowing was least in the middle (physiological) ranges of ESS (9-26 dyne/cm²) and greatest with low and high shear stress. Conclusions: These results show that stented coronary arteries respond to interventions that are deployed to yield ESS in the physiological range.

**1005-6**
**A Novel Preparation of Systemic Paclitaxel Reduces In-Stent Restenosis in the Rabbit**

Background: Local delivery of paclitaxel (PXL) from drug-coated stents reduces in-stent restenosis. However, systemic side effects, namely reduced immune response and arterial remodeling. This technique could be used to determine whether restenosis could be prevented by interventions that are deployed to yield ESS in the physiologic range.

**1005-7**
**Pathological and Clinical Outcome of Long-Term Intracoronary Stenting: Is Its Efficacy Permanent?**
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Although coronary stenting effectively reduces clinical cardiac events for as long as 3 years, longer-term efficacy has not yet been established. We reported that angiographic regression of luminal narrowing occurred 6 months to 3 years after Palmaz-Schatz (PS) stenting. However after 4 or more years, lesions progressed gradually and late restenosis was observed in 28.7% of 122 lesions PS-stented within the past 10 years; in 11 lesions the stenosis was extremely severe or totally occluded. To have a deeper insight of these phenomena, 31 coronary artery specimens obtained from 27 necropsied patients expiring 1 to 7 years after PS stenting, were examined for histopathological and immunohistochemical studies. Chronic inflammatory cell infiltration, that included T lymphocytes (T cells), macrophages (MPs) and multineutotic giant cells were observed around the stent struts in the majority even in absence of restenosis. Lesions that had regressed within a year after PS stenting, featured spindle-shaped smooth muscle cells (SMCs) along the luminal surface, completely covered by regenerated endothelial cells; the intercellular spaces contained dense extracellular tissue, and inflammatory responses were still evident around the struts. In the non-stenotic neointima after more than 3 years post-PS stenting, the SKCs had become atrophic and abundant proliferation of SMCs there was evident instead. Immunohistochemically, the presence of a small number of helper/inducer T cells and slight MPs infiltration were evident adjacent to the stent struts. In arteries stented more than 5 years before, prominent infiltration by lipid-laden MPs was observed around the struts which had collagen-degrading matrix metalloproteinases immunoreactivity. In 2 of these arteries, the luminal surface of the sites where the PS-stent was located was focally eroded and non-occlusive thrombi consisting of platelets were observed at these portions. These findings suggest that the metal or PS stent evokes a remarkable foreign body inflammatory reaction. The residual chronic inflammatory cells around the struts may cause new and indolent atherothrombotic changes that induce plaque vulnerability.

**1005-8**
**Small Proximal Vessels Are Not Always Small: An Intravascular Ultrasound Study**

Background: Angiographically small vessels may be large when evaluated by intravascular ultrasound (IVUS). Methods: Pre-intervention IVUS was performed in 177 angiographically small vessels (<3.0 mm by QCA) in the proximal segment of the major coronary arteries. The lesions were divided into two groups according to the difference in reference vessel size between QCA and IVUS (distal reference minimal vessel diameter (VD)): 1) VD difference (<0.5 mm (n=119)) and 2) VD difference ≥0.5 mm (n=58). IVUS-guided balloon angioplasty or stenting was performed in the lesions.

Results: In multivariate analysis, LAD or RCA lesion (p=0.05) and reference vessel diameter by QCA (p=0.07) were predictors of large difference in reference vessel size.

Conclusion: In angiographically small major proximal vessels, reference vessel size is underestimated in 87% of the lesions. In these vessels, IVUS-guided intervention should be performed to select appropriate (larger) balloon or stent sizes in order to optimize final lumen dimensions.

| **PMN** = Polymorphonuclear Leukocytes. Values are means±SEM | **Diabetes mellitus (%)** | **LAD (%)** | **Balloon/vessel ratio** | **QCA** | **Lesion length (mm)** | **Reference diam (mm)** | **Pre MLD (mm)** | **Final MLD (mm)** | **IVUS** | **Prox. minimal VD (mm)** | **Dist. minimal VD (mm)** | **Pre-lumen CSA at lesion (mm²)** | **Final lumen CSA (mm²)** | **Peroxation (%)** | **1-month MACE (%)** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Neointimal Thickness (mm)** | 0.128±0.01 | 1.58±0.07 | 25.9±1.1 | 10.6±0.0 | 2.5 mg/kg | 0.104±0.01 | 1.30±0.08 | 23.0±1.5 | 21.3±1.2 | 1.9±0.6 | 2.4±0.6 | 3.9±0.5 | <0.01 | 1.7 | 0.2 |
| **Neointimal Area (mm²)** | 0.086±0.01 | 2.22±0.07 | 20.9±1.3 | 23.5±1.1 | 3.5 mg/kg | 0.087±0.01 | 2.10±0.06 | 20.1±0.89 | 38.6±16 | 2.9±0.4 | 2.7±0.6 | 3.7±0.6 | <0.01 | 0.0 | 0.0 |
| **% Stenosis** | <0.001 | <0.001 | <0.001 | <0.001 | 5.0 mg/kg | <0.001 | <0.001 | <0.001 | <0.001 | 2.2±1.1 | 2.4±1.2 | 0.4 | <0.01 | 0.0 | 0.0 |
| **Total Surface PMN** | 10.6±0.0 | 23.5±1.1 | 20.1±0.89 | 38.6±16 | * vs. control | 1.7 | 0.2 | 0.0 | 0.0 |