**Angioplasty and Restenosis: Clinical**

Wednesday, March 27, 1996, 4:00 p.m.-5:00 p.m.
Orange County Convention Center, Room 209

4:00

**804-1**  Yttrium-90, a New Beta Emitter for Prevention of Post Angioplasty Restenosis: Tissue Dosimetry and Importance of Intraarterial Centering

Vitali Verin, Youzi Popowski, Philip Urban, Phillip Ncuet, Michel Rouzaud, Michael Schwager, John M. Kurtz, Wilhem Rutishauser. University Hospital, Geneva, Switzerland

Intraarterial irradiation reduces restenosis following experimental balloon angioplasty. Beta irradiation has the advantage of a markedly steeper dose decrease in tissue and less radioprotection problems, allowing its use in an ordinary catheterization laboratory. We developed a dedicated 90-Yttrium (90Y) pure beta-emitting source, in the form of a flexible coil (diameter 0.014", length 22 mm) attached to the distal end of a 0.014" thrust wire. A segmented balloon consisting of four interconnected compartments (Schneider-Europe, AG) was developed to allow for intrarterial centering of the 90Y source. The tissue depth curve and dose-variability on the surface of 1) conventional angioplasty balloons and 2) the centering balloon were studied using small thermoluminescent dosimeters. The tissue-depth dose curve for standard 2.5, 3, 3.5 and 4 mm balloons filled with contrast medium (Omnipaque 240) normalized to a surface dose of 10 Gy is presented in the figure. The standard deviations (percent of the mean) for the surface doses of 2.5, 3, 3.5, and 4 mm conventional PTFCA balloons were 1.9 (13%), 5.5 (59%), 5.8 (73%), and 6.5 (110%) Gy, respectively. The mean, minimum and maximum doses on the surface of the 3.5 mm centering balloon were 8.4, 7.3, and 9.5 Gy (standard deviation 0.66 Gy, or 8% of the mean).

Conclusions: 1) The tissue dose distribution of 90Y is well suited to the purpose of selective irradiation of the coronary arterial wall (thickness 0.3–0.8 mm) for prevention of restenosis; 2) Homogeneous intramuraie dose delivery can be achieved with the help of a specially designed centering balloon.

4:15

**804-2** Imaging of Human Atherosclerotic Lesions With In-111 ZD3 Antibody Specific for Proliferating Smooth Muscle Cells in Human Atheroma


Radio labeled mouse/human chimeric antibody ZD3 specific for an antigen on proliferating/smooth muscle cells in human atheroma has been used to noninvasively visualize experimental atherosclerotic lesions in rabbits. Furthermore, negative-charge polymer-modification of ZD3 allowed enhanced target visualization with very high specific radioactivity and reduced background activity. To evaluate its usefulness, negative-charge-modified ZD3 F(ab')2 was administered to 11 patients undergoing carotid endarterectomy. Each patient received 250 μg of ZD3 labeled with 5 mCi of In-111 i.v. Serial gamma images, blood and urine samples were obtained for 72 h following injection. Carotid endarterectomy was performed within 48 h after the last imaging session. The sites of stenosis seen arteriographically were compared to the sites of tracer uptake. Intraarterial imaging appeared to cover moderate proximal or distal stenoses. The concentration of the antibody was seen in all patients in the region of the carotid plaques. Uptake was focal and was best seen at 4 h. Intensity of uptake decreased over time. Whole body scans demonstrated localization in the kidneys, liver, and bone marrow which remained essentially unchanged. No adverse reactions to the antibody were observed. Immunohistochemistry of endarterectomy specimens demonstrated specific localization of ZD3 in the region of proliferating smooth muscle cells in the intima of the lesion.

The present study demonstrated the feasibility of noninvasive visualization of human atherosclerotic lesions. Further studies will be needed to optimize the imaging technique for potential clinical applications.

4:45

**804-4** An Open Multicenter Registry to Evaluate Local Heparin Delivery Following Balloon Angioplasty for the Prevention of Restenosis: Preliminary Results

Eduardo Camenzind, Victor Legrand, Mathias Voilx, Claude Hanet, William Wijns, Christophe Bauters, Wim Aengevaeren, Peter den Heijer, Tony Gershlick, Eline Montauban van Swijndregt, Peter van der Meer, Rein Melkert, Patrick Serruys, on behalf of the DISPATCH Investigators.

Although heparin has been shown effective to prevent restenosis in animal studies, previous clinical studies have failed to show any efficacy after systemic administration.

Local, intracoronary heparin delivery (Dispatch™ Salmed; 1783 ± 185 IU during 30 ± 3 min) was successfully performed in 117 patients (79 men, 52 ± 10 years) following balloon angioplasty. No acute cardiac event were observed during hospital stay. Meanwhile 43 patients (52 men, 58 ± 9 years) have been reviewed clinically and angiographically for 6 month follow-up. 10 patients were symptomatic (3 unstable and 7 stable angina). Angiography showed in 10/43 (23%) restenosis (diameter stenosis > 50%). No aneurysmal dilation at the site of heparin delivery was observed, MLD measured by quantitative analysis system (CAAS II) in matched projections changed from 1.15 ± 0.36 mm (pre) to 2.03 ± 0.44 mm (post) to 1.75 ± 0.62 mm (at 6 month follow-up).

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8:00

**804-3** What Causes Focal Restenosis at the Margins of Palmaz-Schatz Stents? A Serial Intravascular Ultrasound Study


To understand the mechanism of restenosis at the margins of Palmaz-Schatz stents, we compared serial intravascular ultrasound (IVUS) studies post stent implantation and follow-up (5.4 ± 3.8 months) in 88 lesions and analyzed reference (Ref: arterial, lumen, and plaque areas (in mm²); plaque burden (plaque/arterial area)), remodeling (Δ arterial area); tissue growth (Δ plaque area); and dissections and stent margin (Δ stent and intimal hyperplasia (ΔH) areas). 29 lesions had focal restenosis involving one or both margins.

### Table

<table>
<thead>
<tr>
<th>Component</th>
<th>Stent</th>
<th>No Stent</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-stent Ref arterial area</td>
<td>15.8 ± 3.8</td>
<td>18.6 ± 7.5</td>
<td>0.1097</td>
</tr>
<tr>
<td>lumen area</td>
<td>8.5 ± 3.4</td>
<td>10.8 ± 5.3</td>
<td>0.0387</td>
</tr>
<tr>
<td>plaque burden</td>
<td>46 ± 13</td>
<td>43 ± 12</td>
<td>0.0101</td>
</tr>
<tr>
<td>Ref remodeling</td>
<td>2.2 ± 1.8</td>
<td>1.2 ± 2.4</td>
<td>0.0892</td>
</tr>
<tr>
<td>Stent area</td>
<td>8.7 ± 3.6</td>
<td>10.4 ± 4.4</td>
<td>0.0607</td>
</tr>
<tr>
<td>δH area within stent</td>
<td>5.0 ± 2.7</td>
<td>2.1 ± 1.8</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Stent margin dissections were uncommon (4/88). There was no significant tissue growth (Δ plaque area) at the Ref sites or recoil (Δ stent area) of the stent margins. We conclude: Restenosis at the stent margin is common (33%) and is associated with implanting the edge of the stent within smaller, more diseased Ref vessels (smaller arterial, lumen, and plaque areas; greater plaque burden). Superimposed Ref segment remodeling and neo-intimal tissue accumulation within smaller stent margins results in restenosis. These findings underscore the importance of anchoring edges of Palmaz-Schatz stents into healthy vessels with large lumens; this may require more extensive stenting to cover moderate proximal or distal stenoses.

4:45

**804-5** Importance of Intraarterial Centering

Post Angioplasty Restenosis: Tissue Dosimetry and...