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

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Intraarterial irradiation reduces restenosis following experimental balloon angioplasty. Beta irradiation has the advantages 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" thoracic BRISE (Schneider-Europe, AG) was developed to allow for intraarterial 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 PTC A 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 intramural dose delivery can be achieved with the help of a specially designed centering balloon.

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

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Radioiodinated mAbs/human chimeric antibody ZD303 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 ZD303 allowed enhanced target visualization with very high specific radioactivity and reduced background activity. To evaluate its usefulness, negative charge-modified ZD303 F(ab')2 was administered to 11 patients undergoing carotid endarterectomy. Each patient received 250 mcg of ZD303 labeled with 5 mCi of In-111 i.v. Serial gamma images, blood and urine samples were obtained for 72 H after injection. Carotid endarterectomy was performed within 48 H after the last imaging session. The sites of stenosis seen arteriographically was compared to location of the most intense antibody uptake. Endarterectomy specimens were imaged ex-vivo and characterized immunohistologically.

The concentration of the antibody was seen in all patients in the region of the carotid plaques. Uptake was local 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 ZD303 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.

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 dissection) and stent margin (stent and intimal hyperplasia (IH) areas). 29 lesions had focal restenosis involving one or both margins.

<table>
<thead>
<tr>
<th>Restenosis</th>
<th>No Restenosis</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-stent Ref arterial area</td>
<td>15.8 ± 6.8</td>
<td>18.6 ± 7.5</td>
</tr>
<tr>
<td>lumen area</td>
<td>6.5 ± 3.4</td>
<td>10.6 ± 5.3</td>
</tr>
<tr>
<td>plaque burden</td>
<td>46.1 ± 13</td>
<td>43.1 ± 12</td>
</tr>
<tr>
<td>Ref remodeling</td>
<td>2.2 ± 1.8</td>
<td>1.2 ± 2.4</td>
</tr>
<tr>
<td>Stent area</td>
<td>3.7 ± 0.6</td>
<td>10.4 ± 0.4</td>
</tr>
<tr>
<td>IH area within stent</td>
<td>2.5 ± 0.7</td>
<td>2.1 ± 1.8</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 recall (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 stent areas; greater plaque burden). Superimposed Ref segment remodeling and neointimal tissue accumulation within smaller stent margins results in stenosis. These findings underline 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.

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

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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™ Solmed; 1783 ± 185 IU during 30 ± 3 min) was successfully performed in 117 patients (79 men, 82 ± 10 years) following balloon angioplasty. No acute cardiac event were observed during hospital stay. Meanwhile 43 patients (52 men, 68 ± 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 dilatation at the site of heparin delivery was observed. MLD measured by quantitative analysis system (CAAS II) in matched projections changed from 1.15 ± 0.20 mm (pre) to 2.03 ± 0.44 mm (post) to 1.75 ± 0.62 mm (at 6 month follow-up).

Two patients had an acute myocardial infarction during revascularization. Nine patients (21%) required a re-PTCA and 1 patient required surgery (2%) of the treated segment. No myocardial infarction and no death were observed.

Conclusion: Local heparin delivery following balloon angioplasty by means of the coil-balloon may reduce on longterm the incidence of restenosis and decrease the need for re-vascularization.