Vascular Morphology Following Coronary Atherectomy

Kirk N. Garratt, M.D., David R. Holmes, Jr., M.D., William D. Edwards, M.D., John F. Bresnahan, M.D., Malcolm R. Bell, M.B., B.S. Mayo Clinic, Rochester, Minnesota

The vascular morphology following directional coronary atherectomy (DCA) in humans is unknown. We examined vascular segments from 3 patients who expired after angiographically successful DCA. Patient #1 died 12 hours after DCA of the left anterior descending artery. Fresh occlusive thrombus was seen adherent to mural thrombus overlying an area of intimal resection. Patient #2 died of bowel infarction 28 days after DCA of a saphenous vein graft to the right coronary artery. Intimal and medial resection was evident. Fibroproliferative tissue (FPT) extended from the resection sites and obstructed the vessel lumen by 25%. Patient #3 died of myocardial infarction 85 days after DCA of a sequential vein graft. Resection defects extending into adventitia were filled with FPT which obstructed the vessel lumen by 80%. Microscopic examination of the tissue extracted by DCA confirmed the depth of resection indicated by post-mortem examination. Vascular tissues adjacent to DCA sites were not disrupted in the manner associated with balloon angioplasty.

Conclusions: DCA may be associated with acute mural thrombus deposition. Focal defects created may fill with FPT which can obstruct the the vessel lumen and may be implicated in subsequent myocardial ischemia. The pattern of intimal, medial and adventitial injury created at sites of DCA appears distinct from that associated with balloon angioplasty.

Presenter's address: Kirk N. Garratt, MD, Cardiac Catheterization Lab, Mayo Clinic Rochester, Minnesota 55905.

A SUPERIOR ANIMAL MODEL FOR HUMAN CORONARY ARTERY RESTENOSIS AFTER PTCA: THE STENTED ATHEROSCLEROTIC MINI-PIG

Rodgers GP, Raizner AE, Woolbert SC, Wright K, Guyton J, Roubin GS, Robinson K, Cromeens D, Stephens LC, Minor ST. Baylor College of Medicine, Houston, Texas

Localized intimal hyperplasia at the site of PTCA or other mechanical interventions complicates a significant percentage of intracoronary procedures. The understanding of this complex phenomenon requires an animal model in which intimal hyperplasia can be induced within a human-like atherosclerotic coronary artery.

Twenty-eight Hanford miniature swine were placed on a 2% cholesterol, 15% fat and 1.5% sodium cholate diet and underwent abrasion of the LAD. After four months, a flexible balloon-expandable coil stent was inserted in the LAD at the site of abrasion. Repeat angiography and sacrifice were done one month later.

Angiograms showed a mean luminal area reduction of 59%. Quantitative morphometric analysis after pressure fixation showed a mean luminal area reduction of 39% at the stent versus a mean area of 4% distal to the stent. Intimal lesions within stents showed marked smooth muscle proliferation.

Thus, this atherosclerotic swine model exhibits the same tissue response to mechanical injury as is seen in the human. We conclude that this model will be beneficial in evaluating various drug and catheter-delivered technologies designed to reduce restenosis after PTCA.

Presenter's address: George P. Rodgers, MD. 1015 East 32nd Street, Suite 508, Austin, Texas 78705.

DOES DILTIAZEM REDUCE COMPLICATIONS OR RESTENOSIS AFTER CORONARY ANGIOPLASTY: A RANDOMIZED BLINDED, PLACEBO-CONTROLLED TRIAL.

James H. O'Keefe, Jr., M.D., Lee V. Giorgi, M.D., Ben D. McCallister, M.D., Robert W. Ligon, M.A., Geoffrey O. Hartzler, M.D., Cardiovascular Consultants, Inc., Mid America Heart Institute, Kansas City, Missouri.

The efficacy of high dose diltiazem (D) (240–360 mg/d) on restenosis (RS) following PTCA was studied prospectively in 201 pts randomized to D or placebo (P). All pts also received ASA and dipyridamole. Coronary stenoses were measured pre-PTCA, post-PTCA and at followup, using computer-assisted quantitative angiography. The two groups were similar with respect to age, extensiveness of coronary disease, smoking history and lipid levels at baseline. Procedural complications including death (1 vs 1), Q wave infarction (0 vs 3), acute occlusion (5 vs 5) and focal spasm (8 vs 0) were not different in the D and P pts respectively. Freedom from all acute complications was noted in 85% of pts in both groups. One year angiographic followup was obtained in 61 D pts and 59 P pts (60%). The restenosis rate was 36% for D pts and 32% in P pts (P = NS). Incidence of late events including death, infarction and need for late bypass surgery was similar in the two groups.

% AREA STENOSIS BY QUANTITATIVE ANGIOGRAPHY

	Pre PTCA	Post PTCA	1 Year
D (110 lesions)	85 ± 9%	52 ± 17%	67 ± 23%
P (96 lesions)	85 ± 8%	48 ± 18%	60 ± 26%

Conclusions: Diltiazem was ineffective in preventing restenosis, acute closure, and late events after PTCA.

Presenter's address: Jas. H. O'Keefe, Jr., MD, Cardiovascular Consultants, Inc., 4320 Wornall Road, Suite 20-11, Kansas City, Missouri 64111.

RESTENOSIS THAT PRESENTS AS A NEW TOTAL OCCLUSION: IS REPEAT ANGIOPLASTY EFFECTIVE?

M.R. Mooney, J. Fishman Mooney, R.E. Shaw, J.R. Lesser, S.H. Startzer, R.K. Hyler, R.A. Van Tassel, Minneapolis Heart Institute, Minneapolis, MN.

Although repeat coronary angioplasty (PTCA) is considered to be safe and effective treatment for restenosis, the predictive factors and treatment outcome for pts with a new total occlusion (TO) at the prior sub-total PTCA site have not been studied. Evaluation of angiographic records from 2 centers showed that 81 of 3,360 pts (2%) had a new TO at the site of prior PTCA. Pts with PTCA of an initial TO were excluded from the study. Compared to a randomly selected sample of concurrent pts with sub-total restenosis, pts with TO restenosis were more likely to have had a myocardial infarction (MI) during the follow-up period (10% vs 0%, P < .001). In multivariate analysis of factors assessed at the initial PTCA, TO pts were more likely to have had: 1) graft dilatation (P < .001), 2) greater diameter stenosis before PTCA (P < .05), and 3) prior MI (P < .01). Fifty of the 81 TO pts underwent repeat PTCA. Compared to the pts with sub-total restenosis who had repeat PTCA, success was lower (68.0% vs 97.6%, P < .0001) and incidence of cardiac event (q-wave MI or emergent bypass surgery) was higher (8.0% vs 1.2%, P < .05). There were no deaths in either group. In conclusion, pts with PTCA of grafts, severe stenosis and prior MI are at higher risk for sub-total stenoses progressing to TO at follow-up. Repeat PTCA in these pts appears to be less successful and more complications are noted than in pts with sub-total recurrences. These findings may suggest a role for new devices in the treatment of TO recurrences.

Presenter's address: Michael R. Mooney, MD, Minneapolis Heart Institute, 920 E. 28th Street, Suite 300, Minneapolis, Minnesota 55407.