

FURTHER VALIDATION OF CATHETER-BASED INTRAVASCULAR ULTRASOUND IMAGING IN THE DETAILED ASSESSMENT OF ARTERIAL SIZE, SHAPE, AND WALL THICKNESS.

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Our previous work has shown the feasibility of intraluminal ultrasound imaging of blood vessels. To evaluate the quantitative accuracy of this new, intraluminal ultrasound imaging technique, ultrasound angioscopy, in providing detailed assessment of arterial morphology and shape in vessels of various size and shape, we used a prototype, catheter-based, high-frequency ultrasound imaging device in 48 sections of aorta, iliac, and femoral, carotid and coronary arteries in vitro. The vessels varied from 2.7 to 12 mm in diameter (anatomic). The device, with its 20 MHz transducer, mechanically rotated at 1800 rpm within the tip of a 6 Fr catheter, provided high-resolution, circumferential, two-dimensional images of all vessels. We derived detailed measurements from calibrated ultrasound images and compared these data to immediate anatomic measurements. Results: Excellent correlations were obtained between anatomic (X) and ultrasound angiographic (Y) data as follow:

Lumen area	$y=1.00x+5.14$	$r=0.96$	$p<0.001$
Diameter	$y=0.85x+1.00$	$r=0.94$	$p<0.001$
Wall Thickness (WT)	$y=0.70x+4.10$	$r=0.79$	$p<0.001$
Eccentricity ratio:	$y=0.86x+0.17$	$r=0.90$	$p<0.001$
Radius -WT ratio:	$y=0.64x+0.8$	$r=0.66$	$p<0.01$

We conclude that accurate cross-sectional assessment of vascular morphology, including wall thickness, and lumen eccentricity and shape, can be obtained by intravascular ultrasound imaging.

RESTENOSIS AFTER SUCCESSFUL MECHANICAL ROTARY ATHERECTOMY WITH THE AUTH ROTABLATOR

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Mechanical rotary atherectomy (MRA) offers an alternative to angioplasty (PTCA) techniques and the possibility of reducing the rate of restenosis. Accordingly, the rate of restenosis after successful MRA was assessed in 26 consecutive pts treated with the Auth Rotablator. Quantitative analysis was performed on baseline, post-MRA and 6-month follow-up cine angiograms. Results were available in 22 of 26 pts (85%); 1 Pt required urgent bypass surgery and 3 asymptomatic pts refused repeat study. Variables analyzed included age, sex, extent of coronary artery disease, use of adjunctive PTCA and % residual stenosis. Lesional characteristics included eccentricity, length, calcification, ulceration and intraluminal thrombus, dissection, kinking, bridging, ectasia, and delayed flow.

Eleven pts with successful MRA had no evidence of restenosis and 11 (50%) pts had return of > 50% luminal narrowing. There were no statistically significant differences between the no-restenosis and restenosis group with respect to age (51 vs 58 yrs), female gender (45% vs 18%), multivessel coronary artery disease (77% vs 80%) and use of adjunctive PTCA (45% vs 55%). Percent stenosis after MRA in the no-restenosis group was 36% and in the restenosis group 35% (p=NS). There were no significant predictors of restenosis based on luminal architecture. In conclusion, the frequency of restenosis following successful MRA may be as high as 50%. Clinical or angiographic predictors of restenosis remain undefined.

RESTENOSIS FOLLOWING CORONARY ATHERECTOMY: ANGIOGRAPHIC FOLLOW-UP AND PATHOLOGIC CORRELATES

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Through April, 1989, directional coronary atherectomy (DCA) was used in 42 pts at Emory University Hospital. Successful tissue removal without adjunctive PTCA was achieved in 34 pts (81%). Of those, clinical follow-up only was available in 8 pts: 1 died, 4 had a negative exercise test, and 3 remained asymptomatic. Coronary arteriography was repeated in the remaining 26 pts with a mean follow-up of 137 days (range=40-330 days): restenosis was present in 12 pts (46%) and absent in 14 (54%). Clinical, angiographic, and pathologic variables were compared in the 2 groups (mean \pm SD).

	Restenosis Group (N=12)	No Restenosis Group (N=14)
Number of prior PTCA	2.1 \pm 1.1	1.4 \pm 0.8
Residual stenosis post DCA (%)	12 \pm 10	13 \pm 7
Specimens obtained with DCA	9.6 \pm 2.4	6.8 \pm 3.6*
Attached thrombus by pathology	6	6
Media present by pathology	5	3

*p<0.04

Restenosis following DCA was more common with saphenous vein grafts (6/8=75%) than native lesions (6/18=33%) with a trend toward significance (p=0.12). The recurrent graft lesions tend to be more diffuse than the original. We conclude that 1) the restenosis rate following DCA of native vessels may be comparable to conventional PTCA but could be higher for graft lesions, and 2) an aggressive tissue removal strategy with DCA may not necessarily reduce the restenosis rate.

COMPLICATIONS OF HUMAN CORONARY ROTABLATION

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The Rotablator (R) treats patients with coronary artery disease (CAD) by selectively abrading atherosclerotic plaque. We examined the complications of R in 40 patients (pts) who were suboptimal candidates for balloon angioplasty. Most had diffuse CAD with mean stenotic segment length = 6-78 mm (mean=31). Ischemic complications included: transient angina = 17 (43%), ST segment shifts = 12 (30%), transient reduction in coronary flow = 6 (15%), CK-MB elevation = 8 (20%). Peak CK elevation ranged from 495-936 U/l (mean=683). There were no Q wave myocardial infarctions (MI). Immediate post-R LV angiograms showed reduced contractility in 5 of 8 pts with elevated CK. LV contractility returned to baseline at follow-up in all. Most CK elevations occurred in early study subjects. By univariate analysis lesion length, angina and ST segment shifts were significantly related to elevated CK (p < 0.05). Neither age, sex, diabetes, vessel treated, prior restenosis, total R time, burr size, burr staging or post-R spasm were associated with CK elevation.

In conclusion, R can cause non-Q wave MI probably due to embolic debris. Long, diffusely diseased arterial segments with increased plaque burden increase risk of CK elevation. However, complications are transient with no sustained LV dysfunction. With improved patient selection and R modification complication rate has been reduced.