

dose of 10 microR/f for an image intensifier format (IIF) of 23 cm. Fluoroscopy times (2.9 ± 1 min for D and 16 ± 6 min for I) number of cine runs (9 ± 2 for D and 17 ± 7 for I) and length of cine runs (5.3 ± 1.5 sec for D and 2.9 ± 2 sec for I) were representative of our standard procedures. A rate of 12.5 f/s was used for cine coronary imaging, with 25 f/s for left ventriculograms in 2 projections. IIF 18 and 13 cm were used for D and I, respectively. Patient absorbed doses (mGy) were [mean \pm s.d.(range)]:

	Thyroid	R + L Thorax/2	Column	Gonads
D	0.6 ± 0.3	18 ± 27 (1.3-127)	21 ± 36	0.08 ± 0.05
I	2.0 ± 0.8	29 ± 50 (1.2-245)	26 ± 19	0.08 ± 0.02

Patient radiation exposure during D and I, despite dose-effective technique, is substantial, especially in areas (thorax) which cannot be shielded. It should be routinely measured since radiation risk may not be negligible when repeated procedures are performed. The risk/benefit ratio of repeated D and I must be weighed.

994-99 Can Late Saphenous Vein Graft Closure Be Predicted by Quantitative Angiographic Analysis Before the Clinical Event?

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Angiographic parameters predicting the likelihood of late occlusion of saphenous vein grafts (SVG) have been infrequently described. The Post-CABG Study, a 5-year trial aimed at reducing SVG closure in minimally symptomatic patients 1-11 years Post-CABG, offers a unique view into this event since this study requires an angiogram to document baseline graft patency. In this preliminary study we performed quantitative angiographic analysis (QAA Reiber) comparing the baseline Post-CABG study angiogram to an unscheduled "clinically driven" angiogram. Of 1253 enrolled patients with at least one patent SVG, 35 developed MI or unstable angina associated angiographically with a changed SVG lesion and either total or subtotal occlusion. Average patient age was 58 ± 2 (SEM) years; 97% were male. Years since SVG placement to baseline angiogram averaged 6.5 ± 0.4 (range 2-14). Time from the baseline to the unscheduled angiogram was 22 ± 2 mo (range 3-47). In 28 patients the involved graft was single and in 7 sequential. The SVG insertion segments involved the LCX in 17, RCA in 15 and LAD in 10.

Results: The initial lesion diameter at the site of the subsequent inciting lesion for all 35 patients averaged 2.58 ± 0.17 mm, or $29.5 \pm 3.6\%$ diam. stenosis. (This was defined as the most severe stenosis in any part of the graft in patients with subsequent total graft occlusion, and the exactly matched graft site in those with subtotal occlusion.) In 8 patients the baseline SVG was entirely normal. The initial lesion was $>50\%$ stenosis in only 4 patients. At the time of the clinical event, the lesion had progressed to $87 \pm 2.6\%$ diam stenosis ($N = 35$). In 16 patients the causal lesion was subtotal, while in 19 the SVG was totally occluded. The mean native vessel — responsible graft anastomotic diameter was 2.33 ± 0.12 mm.

Conclusion: QAA of SVG in asymptomatic patients may not predict subsequent graft closure associated with acute coronary syndromes. The initial site of the lesion is typically of mild-moderate severity, and only later exhibits rapid progression to occlusion.

994-100 Acute Neurological Complications of Cardiac Catheterization: Natural History and Risk Factors

Jason M. Lazar, Andrew Waxler, Barry F. Uretsky, Peter J. Counihan, Bart G. Denys, P.S. Reddy, Michael Ragosta. University of Pittsburgh, Pittsburgh, PA

The development of an acute neurological deficit (ND) is a rare but dreaded complication of left heart catheterization. The natural history and predisposing risk factors for their development are not well known. We sought to determine the incidence, clinical outcome and variables associated with the development of ND from diagnostic left heart catheterization (LHC), angioplasty (PTCA) or valvuloplasty (V) in 6465 consecutive patients (pts) in the modern era. All cases of ND developing within 36 hours of LHC ($n = 5245$), PTCA ($n = 1159$) and V ($n = 61$) were collected prospectively. The clinical features and natural history of these events were studied and, using a case control method, each case was matched by month to 10, randomly chosen pts without ND, and the variables associated with developing ND were determined. Twenty-seven pts (0.4%) suffered a neurological deficit. The most common symptoms were: visual disturbances ($n = 7$; 26%), hemiparesis ($n = 7$; 26%), and facial droop ($n = 7$; 26%). Seizures occurred in 3 (11%), and one pt each developed dysequilibrium, transient global amnesia and transient unresponsiveness. Sixteen pts (59%) completely resolved at long-term follow-up with the majority (13/16) resolving within 24 hours. An additional 4 pts (15%) had minimal persistent deficits (diplopia, $n = 2$; homonymous

hemianopsia, $n = 2$). Four pts (15%) had major deficits at follow-up (hemiparesis, $n = 3$; right upper extremity weakness, $n = 1$) and 3 pts (11%) died as a sequela. Clinical variables associated with ND and the odds ratio and confidence intervals:

Female Sex	3.2; (1.4, 7.4)*
Vascular Disease	3.1; (1.2, 8.0)**
≥ 2 Coronaries Diseased	3.0; (1.2, 7.4)**
Ejection Fraction	0.4; (0.2, 1.0)**
Left Ventricular Hypertrophy (LVH)	2.9; (1.2, 7.3)**

*p < 0.01, **p < 0.05

As a predictor of ND, female gender was independent of body surface area. Variables not associated with the development of ND included age, diabetes, hypertension, prior infarction or stroke, procedure performed, heparin dose and number of catheter exchanges.

We conclude that ND occurred in 0.4% of left heart procedures and 59% resolved completely. Females have a threefold greater risk than males, and this risk is independent of body surface area. Pts with vascular disease, extensive coronary disease, LVH and poor ventricular function are at increased risk for a neurological complication of catheterization.

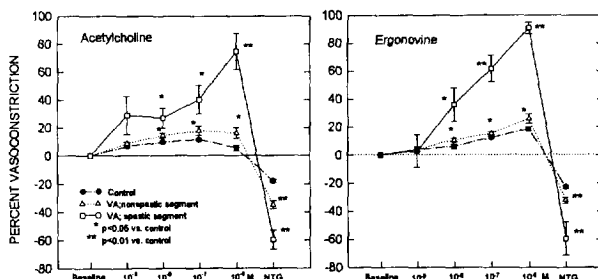
995 Factors Affecting Coronary Flow

Wednesday, March 22, 1995, 9:00 a.m.-11:00 a.m.
Ernest N. Morial Convention Center, Hall E
Presentation Hour: 10:00 a.m.-11:00 a.m.

995-16 Endothelial Dysfunction of Spasm-related Coronary Artery in Patients with Variant Angina

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To investigate endothelial function in pts with variant angina (VA) with angiographically near normal coronary arteries, quantitative coronary angiographic study was done with continuous intracoronary infusion of incremental dose (from 10^{-9} to 10^{-6} M) of acetylcholine (Ach) and ergonovine (Erg). Changes in luminal diameter in spastic and nonspastic segments of spasm related artery of pts with VA ($n = 28$, mean age = 53) was compared to those of normal control pts ($n = 21$, mean age = 41). The results were as the following figures.



Data are expressed as mean \pm SEM, NTG = nitroglycerine
Conclusions: The magnitude of vasoconstrictive response to Ach or Erg was greater at both spastic and nonspastic segments of spasm-related artery compared to control pts. The vasodilatory response to NTG was also exaggerated in the spasm-related artery. These findings suggest that both basal and stimulated releases of EDRF may be decreased in the spasm related artery. This impaired endothelial function may also be related to the development of coronary spasm in pts with variant angina.

995-17 Are Intracoronary Doppler Flow Velocity Measurements Accurate for Assessment of Coronary Flow Reserve?

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Coronary flow reserve (CFR) measurements are useful for assessment of coronary stenoses and microvascular function in patients. Intracoronary Doppler probes are commonly used for CFR measurement, but changes in flow velocity reflect volumetric flow only if the conduit vessel size is constant. We hypothesized that potent resistance vessel dilators used for CFR measurement also produce conduit artery dilation that perturbs the relationship between coronary flow velocity and volumetric flow.

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