

Intraoperative CVA			Postoperative CVA		
Risk Factor	Odds Ratio	p	Risk Factor	Odds Ratio	p
Carotid Disease	4.81	<0.001	Prior Stroke	7.33	<0.001
Renal Disease	4.04	<0.001	Refuse blood	6.68	0.003
Diabetes	2.62	0.003	Cardiac Arrest	6.60	<0.001
MI $\leq$ 30 Days	2.50	0.103	Carotid Disease	3.61	0.012
Age $\geq$ 65 Years	1.91	0.074	Cardiogenic Shock	3.02	0.014
Female Gender	1.80	0.063	Age $\geq$ 75 Years	2.05	0.041

**Conclusions:** (1) The risk of I-CVA or P-CVA is higher for CABG procedures, with or without associated valve procedure, than for isolated valve procedures. (2) Patient age is a predictor for I-CVA and P-CVA. (3) There may be a slightly increased risk for I-CVA in females.

### 920-49 Analysis of the Culprit Lesion and Clinical Events in Post-CABG Patients: Interim Angiographic Results from the Post-CABG Trial

Jozsef Vanyi, Carl W. White, Lucien Campeau, James Forrester, J. Alan Herd, Byron Hoogwerf, Donald Hunninghake, Irvin Goldenberg, Michael Domanski, Genell Knatterud, Post-CABG Investigators. *University of Minnesota, Minneapolis, MN*

Clinical events prompting angiography occur in patients post bypass surgery, and often necessitate repeat revascularization procedures. In these patients the culprit lesion may occur in either the native vessel or the graft. 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 problem, since this study requires an initial angiogram to document baseline graft patency. In a subgroup of Post-CABG patients in whom symptoms prompted an interim "clinically driven" angiogram, we compared the baseline and interim angiograms for the presence or absence of a culprit lesion defined as total occlusion, angiographic clot, lesion change  $\geq$ 50% or lesion  $>$ 75% diameter stenosis. Of 1253 enrolled patients with at least one SVG patent, 127 patients with clinical events and analyzable interim angiograms were evaluated.

#### Results:

Culprit Lesion	None	Graft	Native Vessel
n (pts.)	15 (11.8%)	66 (52.0%)	46 (36.2%)
Age [baseline angio] (yrs)	65.5 (53–76)*	59.8 (45–73) <sup>†</sup>	60.4 (36–74)
Male gender (%)	80	90.9	86.9
Time CABG-interim angio (mo)	77.1 $\pm$ 10	102.6 $\pm$ 3.2 <sup>†</sup>	90.3 $\pm$ 5.1**
Resultant PTCA/CABG (%)	0/0	33.3/31.8	30.4/4.3

\* none vs native vessel, <sup>†</sup> none vs graft, \*\* graft vs native vessel, p < 0.05

Clinical indications for angiography differed depending on the anatomic site of the culprit lesion. Patients with graft culprit lesions more frequently had MI (30.8%) than patients with culprit native vessel lesions (11.1%) p < 0.05, or with no lesions (0%).

**Conclusions:** In Post-CABG patients with clinical events that necessitated repeat angiography, only one-half had graft disease as the identifiable cause. No responsible lesion was found in 12%. Treatment for symptomatic patients following coronary artery bypass surgery may differ substantially depending on the anatomic cause of symptoms.

### 920-50 Do Females have the Same Risk Factors as Males for CABG?

George T. Christakis, Karen Buth, Richard D. Weisel, Vivek Rao, Joan Ivanov, Stephen E. Fremes. *University of Toronto, Toronto, Ontario, Canada*

Females (F) present for CABG with a different demographic profile than males (M) and have a higher incidence of mortality (OM) and low output syndrome (LOS). Females may not have the same predictors of OM and LOS as males. This study was designed to assess the determinants of OM and LOS for F and M proceeding to isolated CABG. Between 1990 and 1994 pre and perioperative data were prospectively collected on 7,633 CABG patients (M = 6168, F = 1465). Differences in preoperative risk variables between M and F were assessed by univariate statistics. The following were significant (p < 0.05) gender differences: F were older (F = 64  $\pm$  9, M = 60  $\pm$  9), and had a higher incidence of urgent surgery US (F = 22%, M = 14%), class IV symptoms (F = 53%, M = 36%), preoperative myocardial infarction PMI (F = 18%, M = 14%, p = 0.001), diabetes DM (F = 31%, M = 20%), hypertension (F = 62%, M = 46%), peripheral vascular disease PVD (F = 15%, M = 12%, p = 0.002), hypercholesterolemia (F = 57%, M = 51%), smoking history SMO (F = 52%, M = 77%), preoperative strokes (F = 9%, M = 6%, p = 0.001), single vessel disease (F = 9%, M = 5%), left ventricular ejection fraction (LVEF)  $>$ 40% (F = 83%, M = 78%). Females had a lower incidence of reoperative surgery REDO (F = 3.6%, M = 6.6%). Postoperatively F had a higher (p < 0.001) incidence of OM (F = 3.5%, M = 1.8%), LOS (F = 15%, M = 6.6%), and MI (F = 5.5%, M = 2.8%). The multivariable risk factors (odds ratios) for

OM in M were: age  $>$  70 (2.7), LVEF  $<$  40% (2.6), DM (1.6), PVD (2.3), SMO (1.9), renal failure (2.5), PMI (2.0) and for F the predictors were: age  $>$  70 (2.0), US (2.5), LV grade (3.2), PVD (2.8). The predictors of LOS in M were: age  $>$  70 (1.6), LVEF  $<$  40% (2.2), REDO (5.6), left main LMS (1.3), endarterectomy EA (1.8), DM (1.6), congestive failure (2.1), PMI (2.0). LOS predictors for F were: US (1.6), LVEF  $<$  40% (2.5), LMS (1.7), REDO (4.2), EA (3.2).

**Conclusion:** Risk factors for OM and LOS were similar for males and females. Increased risk of surgery for F may be related to differences in method of atherosclerosis development.

### 920-51 Indobufen Versus ASA + Dipyridamole on Coronary Artery Bypass Graft Patency: Combined Analysis of Two Multicenter Trials

Gabriella Cataldo, S.M. Rajah, SINBA and UK Indobufen Multicenter Study. *Department of Cardiology, Niguarda Hospital, Milan, Italy*

Two prospective randomized double blind clinical trials, performed in United Kingdom (UK) and in Italy (IT) showed that indobufen (INB reversible cyclooxygenase inhibitor) is as effective as, and safer than, the association of Aspirin plus Dipyridamole in preventing the occlusion of saphenous vein (SV) coronary artery bypass grafts (CABG).

The power of each of the two trials was 80% for a difference in graft occlusion of 10%. We present the results of the analysis, carried out by properly combining the information given by the two trials in order to increase the precision of the estimates both of efficacy and of safety. The analysis was performed on total 934 patients who underwent 1 year angiography (2258 SV distal anastomosis).

UK and IT patients had similar clinical characteristics, UK pts had higher number of grafts per patient and smaller vessel diameters, distal anastomosis occlusion rates were 19.8% (UK) and 20.9% (IT), small vessel diameter ( $<$ 1.5 mm) and right coronary artery location adversely affected graft patency in both groups.

Combined analysis showed that: a) the Odds Ratio of distal anastomosis occlusion of INB vs ASA + DIP group is: OR = 1.05 (95% CL: 0.85 – 1.29) suggesting that the efficacy of the two treatments is comparable and b) INB had significantly fewer side effects than ASA + DIP.

#### Conclusions

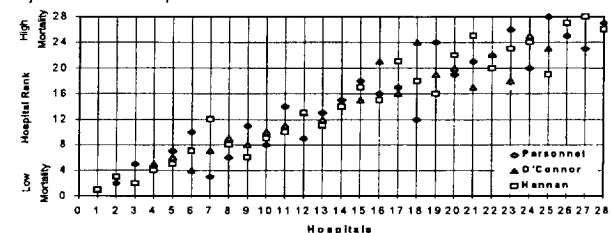
— two multicenter CABG studies performed in different countries accruing patients with similar clinical characteristics showed similar graft patency;

— combined analysis confirmed on a wide population that INB is as effective as the association of ASA + DIP on graft patency and is much better tolerated.

### 920-52 Are Provider Profiles Affected by Risk-adjustment Methodology? Results from the Cooperative Cardiovascular Project

Eric D. Peterson, Lawrence H. Muhlbauer, Elizabeth R. DeLong, Allison B. Rosen, Donald F. Fortin, Edward F. Ellerbeck, Stephen F. Jencks, David B. Pryor. *Duke University Medical Center, Durham, NC*

Health care payors and consumers have a growing interest in risk-adjusted provider profiles. Using chart-abstracted clinical data from the Cooperative Cardiovascular Project, we ranked 28 hospitals performing bypass surgery in Alabama and Iowa by their risk-adjusted surgical mortality rates using three published risk-adjustment methodologies: Parsonnet (P), O'Connor (O) and Hannan (H). In total, 3653 bypass surgery cases performed from 6/92 to 3/93 were reviewed (mean 130 cases/hospital). The discriminatory abilities of each method for predicting surgical mortality were quite similar (area under ROC curves 0.72–0.75). Below, we display the risk-adjusted hospital rankings (comparing observed with expected mortality) by these three risk-adjustment techniques:



In terms of hospital rankings, there was generally close correlation between any two of the methods (Spearman's R = 0.87, 0.88, and 0.93, comparing P-O, P-H, and H-O). Rankings for an individual hospital varied, however, an average of  $\pm$ 3.3 ranks (range 0–12 ranks) depending on which risk-adjustment methodology was used.

**Conclusion:** In general, published methods of risk-adjustment for bypass surgery accurately identify institutions with low, moderate and high adjusted

mortality outcomes. The precise ranking of an individual hospital, however, may vary depending on the risk adjustment method applied.

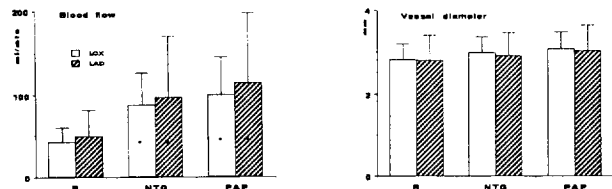
**920-53 Does Postoperative Flow Reserve in Internal Mammary Artery Grafts Depends on the Area Under Supply?**

M.H. Lins, G. Herrmann, J. Cremer<sup>1</sup>, W. Harringer<sup>1</sup>, R.W. Simon. *Dept. of Cardiology, Univ. of Kiel, Germany; <sup>1</sup> Dept. of Cardiovasc. Surgery, Univ. of Kiel, Germany*

During a prospective study 28 left (LIMA) and 22 right internal mammary arteries (RIMA) were investigated in 29 pts 8 to 10 days postoperatively. Using 6F catheters LIMA and RIMA were selectively intubated and after diagnostic angiography flow velocity was measured with a 18/1000 inch flow wire (12 MHz, Cardiometrics). Average peak velocity (APV, cm/sec) and diastolic/systolic ratio (DSVR) at rest (R), after 0.2 mg nitroglycerin (NTG) and after 12.5 mg papaverine (PAP), administered directly into the graft, was assessed. Luminal diameter (LD, mm) was measured by quantitative coronary angiography (DCI, Philips) and blood flow (Q, ml/min) was calculated. There were no significant differences between RIMA and LIMA concerning APV, DSVR and Q. The table gives the results for IMA to LAD (n = 24) and IMA to LCX (n = 26): mean ± SD:

IMA	LD	APV	Q	DSVR
LAD-R	2.81 ± 0.59	24 ± 11	49 ± 32	1.17 ± 0.31
-NTG	2.91 ± 0.56	43 ± 14*	96 ± 74*	1.57 ± 0.48*
-PAP	3.03 ± 0.62	46 ± 16*	113 ± 85*	1.63 ± 0.47*
LCX-R	2.83 ± 0.39	22 ± 7	42 ± 18	0.96 ± 0.29
-NTG	2.98 ± 0.40	39 ± 12*	87 ± 39*	1.29 ± 0.37*
-PAP	3.08 ± 0.41	41 ± 14*	99 ± 46*	1.31 ± 0.31*

\*P < 0.05 vs. R



**Conclusion:** In contrast to native coronary arteries and venous bypass grafts LIMA/RIMA show a DSVR of 1.0, which may be due to the length of the arterial graft. Q at rest is lower in IMA-grafts to the LCX than in those to LAD. NTG and PAP yield a sign. Increase in Q for both IMA-grafts independent of the coronary vessel supplied by the graft.

**921 Pediatric Interventional Catheterization**

Monday, March 20, 1995, 3:00 p.m.–5:00 p.m.  
Ernest N. Morial Convention Center, Hall E  
Presentation Hour: 4:00 p.m.–5:00 p.m.

**921-68 Transcatheter Valvotomy of Aortic Stenosis with Dilated Left Ventricle in the Newborn: Long Term Results**

Jean-François Piéchaud, Angelica Delogu, Jean Kachaner, Daniel Sidi, Laurence Iserin, Yacine Aggoun. *Hôpital Necker/Enfants-malades, Paris, France*

We do prefer dilation of the aortic valve rather than surgery in the newborn infant with critical aortic stenosis (CAS). Immediate results are satisfactory when there is a well developed though hypokinetic left ventricle (LV). We studied the long term fate of 20 consecutive patients with CAS, an aortic ring >5 mm in diameter, a mitral anulus >8 mm, and a LV end-diastolic diameter >11 mm (m = 19.1 ± 4.5). They underwent aortic dilation at the mean age of 10.6 ± 10.9 days. The procedure was successful in 18, with a drop of transvalvular pressure gradient (TPG) from 54.8 ± 31.4 to 12.9 ± 14.9 mmHg, while the LV systolic function improved. Aortic regurgitation (AR) appeared in 10 patients, mild in 4, moderate in 1, severe in 5. There were 4 deaths 0.2, 3, 6 and 24 months after the procedure, related to endocardial fibroelastosis (2), congenital mitral stenosis (1), or severe aortic insufficiency leading to a Ross procedure (1). The remaining 14 patients are alive and doing well 37.4 ± 25 months later. None developed significant restenosis (TPG = 39.3 ± 11.2 mmHg) and all have a nearly normal LV as far as systolic function, dimension and wall thickness are concerned. An AR is still present in 6 children, mild in 3, moderate in 2 and severe in 1. A severe mitral regurgitation appeared in 2 patients who underwent successful mitral valve replacement. In conclusion,

**921-69 Transcatheter Closure of the Persistently Patent Ductus Arteriosus Using Occluding Coils**

Ziad R. Bulbul, Thomas Doyle, John Fahey, William E. Hellenbrand. *Yale University, New Haven, CT*

Transcatheter coil closure (TCC) of the Patent Ductus Arteriosus (PDA) was attempted in 29 patients (pts) with a median age of 3.2 years (6 months–55 years) and a median weight of 14.0 kg (4.3–81 kg). Previously, 114 pts with PDA underwent closure with the Rashkind umbrella device in our institution but this device is no longer available. Ducti measured 0.5–5.0 mm (mean = 1.8 mm) at the narrowest point. A single coil was implanted in 12 pts, two in 15 and three in 2. The first coil implanted had a diameter twice the minimal internal diameter of the PDA and a length sufficient for at least 4 loops. One to 1.5 loops were delivered in the main pulmonary artery, and the remaining loops were released in the aortic ductal diverticulum. Coil embolization occurred in 3 pts: all coils were successfully retrieved. In another patient 3 coils were removed from the PDA, after proper placement, because of left pulmonary artery obstruction. Coil re-implantation was successful in all of these patients.

Aortography, performed 10 minutes after coil implantation, showed complete closure in 25/29 pts (86%). Four hours after the procedure, 27/29 pts (93%) had no evidence of PDA by color flow Doppler. Thirteen pts were done as outpatients, 13 were discharged in 24 hr, and 3 had prolonged hospitalization for other medical problems. Follow-up ranged from 1 month to 4 years in 27/29 pts. None had detectable murmurs. Small residual PDA shunt by color flow Doppler persisted in 2 pts. No aortic obstruction, pulmonary artery stenosis, hemolysis, or late coil migration has been observed. These results compare favourably with our Rashkind device occlusion results where the closure rate was 52% by angiography (p < 0.01) and 71% by color flow Doppler (p = 0.02) at discharge. Furthermore, the cost of TCC was 25% less than the Rashkind device occlusion, and 40% less than surgical closure.

**Conclusion:** TCC of small to moderate PDA is an effective technique without significant morbidity. It appears significantly more effective and cost-efficient than the Rashkind device occlusion, and it can be done safely as an outpatient procedure.

**921-70 Right and Left Pulmonary Artery Size and Flow Disturbances After Patent Ductus Arteriosus Coil Occlusion: A Serial Echocardiographic Study**

Louise M. Carey, Achi Ludomirsky, Roger P. Vermilion, David Shim, Thomas R. Lloyd, Robert H. Beekman. *C.S. Mott Children's Hospital, The University of Michigan, Ann Arbor, MI*

Transcatheter closure of patent ductus arteriosus (PDA) with Gianturco coils may potentially impinge on adjacent vascular structures. The purpose of this study was to assess flow disturbances and size of the left pulmonary artery (LPA), right pulmonary artery (RPA), and descending aorta (DAo) following PDA coil occlusion. Serial echocardiographic follow-up was available in 25 children (age range 0.4–13 years, mean 4.4 years; weight range 3.4–37 kg, mean 16.5 kg), who underwent successful coil implantation. Complete two dimensional and Doppler echocardiography (EC) examination was performed before, immediately after (19/25), and at >6 months (range 8–21 months) in 12/25. The main pulmonary artery (MPA), LPA and RPA diameters were measured by electronic calipers and indexed to patient weight. LPA index is defined as LPA diameter (cm) divided by weight (kg) and RPA index is calculated by the same method. LPA index was then compared to RPA index for each follow-up EC examination. Doppler interrogation was performed across MPA, LPA, RPA and DAo during each study.

The coil could be visualized near the origin of the LPA in 9/12 (75%) and in the DAo in 5/12 (42%). A significant increase in LPA flow velocity was noted in 4/12 (33%), pre coil velocity 0.9–1.1 m/sec, and post coil velocity 1.5–2.1 m/sec, p < 0.05. The velocity increase persisted in 3/4 patients and resolved in 1/4 at 12 months follow-up. There was a significant velocity increase in the DAo in 1/12 (8%), (2.2 m/sec), that resolved at 14 months follow-up. There was no significant increase in flow velocity in the RPA or MPA. Four of 12 patients (33%) had decreased relative size of the LPA (mean LPA index pre 0.073 and post 0.056) compared to the RPA size (RPA index mean pre 0.076 and post 0.070) at follow-up (12–15 months). One patient had mild coil related stenosis of the origin of the LPA (increase in velocity 0.9 m/sec pre to 2.1 m/sec post coil); this was persistent at 12 month follow-up.

**Conclusions:** 1. LPA relative size may decrease following PDA coil occlusion, hence serial follow-up echocardiography is recommended to assess long term LPA growth. 2. Minor flow disturbances may be seen in the LPA and DAo post PDA coil occlusion.

MONDAY P.M.