NUCLEAR CARDIOLOGY–CONVENTIONAL IMAGING/PET

901-103 Regional Blood Flow, Function, and Metabolism in Repetitive Myocardial Stunning
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It has been suggested that hibernation, a condition of chronic perfusion-contraction down-regulation with preserved viability, results from recurrent episodes of reversible ischemia and "chronic" posts ischemic dysfunction. We examined the interrelation between flow, metabolism, and function in an acute model of repetitive stunning. Nine dogs underwent four 5 min balloon occlusions of the LAD or circulations arteries, each separated by 5 min of reperfusion. Regional blood flow (BF), metabolism and function were evaluated 2 hours after reperfusion in 5 dogs, and 2 hours, 24 hours, and 1 week post-reperfusion in 4 dogs. Regional wall motion (WMI) was evaluated with 2-D echo and BF with radiolabeled microspheres. Measurements of oxidative metabolism (MVO2) and glucose uptake (during hypoglycemia) with 2-D echo and 8F with radiotracers micraspheres. Measurements of acute model of repetitive stunning. Nine dogs underwent four 5 min balloon occlusions of the LAD or circulations arteries, each separated by 5 min of reperfusion. Regional blood flow (BF), metabolism and function were evaluated 2 hours after reperfusion in 5 dogs, and 2 hours, 24 hours, and 1 week post-reperfusion in 4 dogs. Regional wall motion (WMI) was evaluated with 2-D echo and BF with radiolabeled microspheres. Measurements of oxidative metabolism (MVO2) and glucose uptake (during hypoglycemia) with 2-D echo and 8F with radiotracers micraspheres. Measurements of oxidative metabolism (MVO2) and glucose uptake (during hypoglycemia) with 2-D echo and 8F with radiotracers micraspheres.

Pressure (in mmHg) Baseline NLA Baseline NLA
LVEDP 4.9 ± 0.6 7.7 ± 0.9* 7.6 ± 0.9 19.3 ± 3.6*
LVSP 134 ± 4 167 ± 6* 137 ± 7 158 ± 9*
MAP 102 ± 2 24 ± 4* 97 ± 2 128 ± 8*

*p < 0.05 vs Baseline, *p < 0.05 vs Control

These data suggest that PT maintains NO production in P induced CHF and this is an important mediator of the benefits of PT.

901-104 Tc-99m-Labeled Ap4A for Early Gamma Scintigraphic Visualization of Experimental Atherosclerotic Lesions
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Substances related to ATP such as diadenosine tetraphosphate (Ap4A) bind to purine receptors in vascular smooth muscle cells. Since proliferating smooth muscle cells are an obligatory component of atherosclerotic lesions, Tc-99m-Ap4A was used to assess whether purine receptors are upregulated and can detect atherosclerotic lesions in vivo. Experimental atherosclerotic lesions were induced in 8 of 5 NZW rabbits by balloon orlando catalyst of abdominal aorta followed by hyperlipidemic diet for > 16 weeks. Two rabbits were used as normal controls. Ap4A was radiolabeled with 111mCi of Tc-99m by stannous reduction method, HPLC-purified, dried and brought up in saline for i.v. injection. Serial gamma images were obtained for the ensuing 3 H and serial blood samples were obtained. After the last imaging session, the rabbits were sacrificed. The aortas were removed, imaged ex-vivo, and radioactivity counted. Unequivocal in vivo visualization of atherosclerotic lesions in the abdominal aorta was possible at 1/2 H in all 3 animals. No activity of Tc-99m-Ap4A was seen in abdominal aorta of the 2 normal rabbits. The ex vivo images of the aortas correlated significantly with in vivo distribution. The %sdeepgram uptake of Ap4A was as follows:

Animals (n) Visualisation of Lesions % Injected Dose/gram Abdominal Ao. Thoracic Ao.
Atherosclerotic (3) 3/0 0.001 ± 0.006 0.006 ± 0.003 p = 0.003
Normal (2) 0/0 0.0006 ± 0.003 0.005 ± 0.004 p = 0.12

The present study demonstrates that targeting of purine receptors is possible with Tc-99m-Ap4A and enables visualization of experimental atherosclerotic lesions within 15–20 minutes after i.v. administration.

901-105 The Role of Nitric Oxide (NO) in the Beneficial Effects of Chronic Exercise Training on Heart Failure in Awake Dogs
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Physical training (PT) improves exercise tolerance in heart failure (CHF).

Results of previous studies suggest that these effects may not be related to a marked beneficial effect of PT on intrinsic heart properties. On the other hand, PT restores the ability of the endothelium to generate and liberate NO. However, whether the beneficial effects of ET on systemic hemodynamics, are mediated by NO is not known. 7 dogs were instrumented to measure LVFP and mean aortic pressure (MAP) and for pacing (P). Dogs were cardiac paced for 4 weeks and PT on a treadmil (4.4 ± 0.3 km/h, 2 hours/day). To assess the contribution of basal NO release to systemic hemodynamics following PT, we infused the NO inhibitor nitro-L-arginine (NLA) prior to and after the 4 wks of P plus PT. The results (Table) indicate for the control (pre-CHF) state that NLA increased LVSP and MAP significantly with only a small increased in LVEDP. It has been shown previously that NLA has no effect on these parameters in P induced CHF due to blunted NO production. In contrast, PT resulted in normal increases in LVSP and MAP and a markedly increased increase in LVEDP, unmasking a systemic sign of CHF.

901-106 The PDA Coil Registry: 250 Patient-Years of Follow-Up
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Follow-up information was solicited on patients enrolled in the PDA Coil Registry to further characterize the efficacy and safety of coil occlusion for patent ductus arteriosus (PDA). Of the 405 follow-up data forms received, 7 patients did not have coils implanted in their PDA (6 patients had surgical ligation) and reported follow-up duration was < 1 week in 27. The remaining 371 coil occlusion patients have been followed 8.1 ± 7.8 months (mean ± SD, range 1 week–5 years, median 6.3 months), for a total of 250 patient-years of follow-up.

Efficacy: Spontaneous closure of residual shunts occurred in 82 patients and repeat coil procedures were performed in 10 patients; no patient had had surgery for PDA. At most recent follow-up, 3 patients have clinically evident residual PDA shunts, and 19 have shunts by Doppler only. The prevalence of residual shunts at follow-up (5.7%, CL95 3.6–6.8%) is significantly (p < 0.001) less than the 30.4% prevalence reported immediately after coil occlusion. Residual shunts were reported in 13/168 (7.7%, CL95 4.1–12.8%) patients followed ≤ 6 months and in 8/201 (4%, CL95 1.7–7.8%) patients followed > 6 months (p < 0.10).

Safety: Late death (unrelated to PDA) was reported in 4/405 patients (1%). Mild left pulmonary artery stenosis was reported in 6 patients, incidence 2.4/100 patient-years, CL95 0.9–5.2%. No cases of late coil migration, hemolysis, coarctation, infectious or thromboembolic complications, or PDA recanalization were reported (Incidence CL95 0–1.5/100 patient-years).

Conclusion: PDA coil occlusion is a safe and effective procedure. Complete occlusion at follow-up was achieved in 94.3%, although 2.7% required repeat coil procedures. No clinically significant complications of the procedure were reported, although the rare patients with mild left pulmonary artery stenosis require continued observation.

901-107 Prospective Analysis of HLA Immunogenicity of Cryopreserved Valved Allografts Used in Pediatric Heart Surgery

To determine the immunogenicity of cryopreserved valved allografts used in pediatric heart surgery, we prospectively measured the frequency of panels-reactive antibodies (PRA) before, one month, and 3 months after allograft implantation in 9 children, (5.4 ± 2.1 years, mean ± SE) (diagnoses truncus arteriosus [4], aortic regurgitation [3], tetralogy of Fallot [1], pulmonary stenosis [1] and after open heart surgery without allograft implantation in

ABSTRACTS—Poster

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11 age-matched controls (4.0 ± 1.5 years). PRA was determined against an HLA-select lymphocyte panel using the antiglobulin cytotoxicity technique. All blood products were irradiated and leukocyte-filtered. After allotransplantation, PRA increased from 3.2 ± 2.7% (before surgery) to 63.3 ± 12% (26 ± 2 days after surgery) and 93.7 ± 0.3% (3.4 ± 0.3 months after surgery). Use of dithiothreitol to remove IgM resulted in a modest decrease in PRA at one month (33.2 ± 13%) but no change in PRA at 3 months (93.0 ± 3.4%), suggesting initial PRA is partially IgM but becomes almost exclusively IgG by 3 months. By 3 months, PRA was found to be specific against HLA Class I antigens. PRA is partially IgM but becomes almost exclusively IgG by 3 months. By 3 months, PRA was found to be specific against HLA Class I antigens.

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**901-108** Predictors of Hypertension in Long Term Survivors of Repaired Coarctation of the Aorta

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To evaluate factors associated with the development of systemic hypertension (HBP) in pts following coarctation of the aorta (COA), we evaluated 68 operative survivors of COA repair. From 1952 to 1972, 277 pts survived COA repair at the Univ. of MN. Sixty-six pts were lost to follow-up and 68/277 operative survivors were randomly selected to participate in this study. Blood pressure was retrospectively determined from the first post-operative visit (V1) [median 0.25 yrs post repair] and the last recorded visit (V2) [median 5.9 yrs post repair]. Blood pressure was prospectively measured using the random zero method in 56/68 pts (V3) [median 24.9 yrs post-op]. Pts were divided in two groups based on the presence of HBP at their most recent visit (HBP Group vs Non-HBP Group). HBP was defined as systolic or diastolic blood pressure > 95th %ile for age and sex or being treated with HBP medications.

**Gp** | **N** | **Sex** | **Age-op** | **SBP yrs follow-up** | **Mean age** | **Resting arm/leg grad**
---|---|---|---|---|---|---
HBP | 32 | 25/11 | 6.1 ± 12.6 | 141 ± 19 | 23 ± 18 | 35 ± 10 | 0.8 ± 1.1
Non-HBP | 36 | 26/10 | 7.2 ± 5.9 | 113 ± 16 | 23 ± 18 | 41 ± 18 | 0.8 ± 0.6
P | 58 | NS | 0.0001 | NS | 0.07 | 0.1 | 0.01

Although age at operation and resting arm/leg grad were significantly different between the two groups, when all of the above factors were entered in a multiple logistic regression analysis, SBP at V1 was the only significant predictor of HBP at V3 (p = 0.004). Notably, 16 out of 32 hypertensive patients had been hypertensive at V1. In summary, HBP is a common problem in children and may be treated with HBP medications.

**PERIPHERAL VASCULAR DISEASE/THROMBOSIS/EMBOLISM—CLINICAL**

**901-109** Revascularization Achieved by Therapeutic Angiogenesis Is Associated With Improvement of Tissue Perfusion

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The efficacy of “therapeutic” angiogenesis to induce macrovascular revascularization and to improve hemodynamic parameters has been demonstrated in different ischemic models. However, its efficacy to significantly improve the perfusion at a tissue level has been questioned. Accordingly, we investigated the effect of angiogenic therapy with vascular endothelial growth factor (VEGF) on muscle perfusion in a rabbit model of chronic hindlimb ischemia. In addition we evaluated the relationship between muscle perfusion and the other parameters of revascularization (collateral formation, blood pressure and blood flow). Muscle perfusion was assessed by quantification of colored microspheres (15 μm diameter) trapped in hindlimb muscles following an intracardiac administration. Sixteen New Zealand rabbits underwent resection of one femoral artery. Ten days later (day 0), baseline measurements of calf blood pressure index; angiographic score of collateral formation; intravascular Doppler wire analysis of iliac blood flow; and microsphere-based analysis of muscle perfusion were measured. Each animal then received Intrathecally VEGF (500 μg, n = 6) or vehicle (n = 8), followed by the same dose i.v. at days 2 and 4. At day 30 all measurements were repeated and the animals sacrificed.

**901-110** Evidence for the Intracardiovascular Hypercoagulating State Induced by Atrial Fibrillation Itself

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To evaluate whether the intracardiovascular hypercoagulating state would be induced by atrial fibrillation (AF) itself rather than organic heart disease, plasma levels of D-dimer, thrombin-antithrombin III complexes (TAT) and alpha2-antiplasmin inhibitor-plasmin complexes (PIC) were measured in consecutive 17 patients (pts) with paroxysmal atrial fibrillation (PAF). The 17 pts (male/female = 11/6, 62 ± 14 y.o.), four had ischemic heart disease, three had valvular heart disease, two had peri- or myocardial, one had sick sinus syndrome and the remaining 7 pts had no organic heart diseases. PAF was converted to sinus rhythm (SR) by electrical cardioversion (n = 5) or spontaneously (n = 12). The plasma D-dimer, TAT and PIC values were measured by enzyme immunosay at the end of PAF (End of PAF) and 24 hours after conversion to SR (24 H After). The mean duration of PAF was 48hrs (3-350 hrs). The results were as shown below:

<table>
<thead>
<tr>
<th>D-dimer (ng/ml)</th>
<th>TAT (ng/ml)</th>
<th>PIC (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of PAF</td>
<td>169 ± 39</td>
<td>8.2 ± 2.5</td>
</tr>
<tr>
<td>24 H After</td>
<td>122 ± 26*</td>
<td>3.1 ± 0.5*</td>
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</tbody>
</table>

mean ± SE, *p < 0.05 vs End of PAF

The D-dimer and TAT values 24 hrs after conversion from AF to SR were significantly lower than those at the end of AF. Furthermore, the changes in plasma levels of D-dimer, TAT, and PIC did not show significant differences between pts with and without organic heart diseases. On the other hand, none of D-dimer, TAT or PIC values at the end of AF significantly correlated with the duration of AF. These results indicate that fibrinolysis for itself would contribute to increase the intracardiovascular clotting and that the anticoagulation therapy for PAF might be recommended if the duration of AF would be over 3 hours.

**901-111** Soluble Adhesion Molecule P-Selectin, Von Willebrand Factor and Fibrinogen in Acute Stroke: Evidence for Early Endothelial and Haemorrhagic Dysfunction — The West Birmingham Stroke Project

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To investigate endothelial function and haemorrhagic abnormalities in stroke, we measured levels of the soluble adhesion molecule P-selectin (ELISA, R&D Systems; associated with endothelial and platelet activity/function), von Willebrand factor (VWF; DAKO; a marker of endothelial dysfunction), fibrinogen (CLAUS) and other haemorrhagic indices (plasma viscosity, factor V, fibrinogen, prothrombin time) in acute stroke and control subjects. In the acute stroke group, there was a significant decrease in soluble adhesion molecule P-selectin (35%, p = 0.001), von Willebrand factor (30%, p = 0.001), fibrinogen (25%, p = 0.001), and factor V (18%, p = 0.001), with a marked increase in plasma viscosity (18%, p = 0.001). These results demonstrate that acute stroke is associated with early endothelial dysfunction and haemorrhagic dysfunction, and that antiplatelets and anti-inflammatory therapy may be beneficial in reducing the risk of recurrence and improving stroke outcome.