NUCLEAR CARDIOLOGY—CONVENTIONAL IMAGING/PET

Regional Blood Flow, Function, and Metabolism in Repetitive Myocardial Stun

Marcello Di Carli, Peter Pecorelli, Richard Vander Heide, Otto Molzik, Teresa Jones, Thomas Mangner, Steven Levine, Joshua Wynne. Wayne State University, Detroit, Michigan.

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” postischemic 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 left anterior descending artery, 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 (WM) was evaluated with 2-D echo and BF with radioisotopic microspheres. Measurements of oxidative metabolism (MVO2) and glucose uptake (during hyperinsulinemia-euglycemia clamp) were derived with PET imaging. Regional WM was severely decreased after the 4 cycles of ischemia, remained severely impaired 2 hours after reperfusion, and normalized after 1 week. During reflow, BF in stunned regions was restored to near-normal levels (0.89 ± 0.2 vs 0.95 ± 0.2 ml/g/min; P < 0.01). Glucose uptake in stunned regions was severely decreased after the 4 cycles of ischemia, remained severely impaired 2 hours after reperfusion, and recovered 1 week after reperfusion (97 ± 5% of control, P = NS). Thus, repetitive stunned myocardium demonstrated a persistent reduction in oxidative metabolism and glucose uptake which recovered as regional wall motion improved. The results may have important implications for detecting stunning in patients with CAD and further suggest a unique metabolic adaptation in “chronic stunning”, different from that typically seen in hibernation.

The Role of Nitric Oxide (NO) in the Beneficial Effects of Chronic Exercise Training on Heart Failure in Awake Dogs


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 LVSP and mean arterial pressure (MAP) and for pacing (P). Dogs were cardiacl paced for 4 weeks and PT on a treadmill (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 increase 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 enhanced increase in LVEDP, unmasking a systemic sign of CHF.

Pressure

<table>
<thead>
<tr>
<th></th>
<th>Control Baseline</th>
<th>NLA Baseline</th>
<th>After P + PT Baseline</th>
<th>NLA Baseline</th>
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<td>LVSP (mmHg)</td>
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<td>7.7 ± 0.2*</td>
<td>7.6 ± 0.9</td>
<td>19.3 ± 3*</td>
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*p < 0.05 vs Baseline, +p < 0.05 vs Control

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PEDIATRIC CARDIOLOGY/CONGENITAL HEART SURGERY

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