939-78 Selective Angiotensin II Receptor Antagonism Does not Influence Myocardial Stunning but Augments Ischemic Pre-conditioning in the Pig Heart

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The effects of a new angiotensin II receptor antagonist (EXP 3174, an active carboxylic acid analog of the selective angiotensin II receptor antagonist DuP 753) on infarct size and regional contractile function in an open-chest pig model of ischemia and reperfusion were evaluated. Ischemic preconditioning (PC) was performed by twice 10 min LAD occlusion (CO) and 30 min reperfusion (RP) followed by 1 hour CO and 1.5 hour RP. Infarct size (IS) in the left ventricle in % of risk area (RA) was determined by tetrazolium salts and regional segment shortening (%SS) by subendocardial implanted ultrasonic crystals in the LAD supplied area. Group (Gp) 1 = control (1 h CO + 1.5 h RP), Gp 2 = control + EXP 1 mg/kg iv, Gp 3 = PC, Gp 4 = PC + EXP 0.3 mg/kg iv, group 5 = PC + EXP 1 mg/kg iv. %SS after PC was 22.2 ± 7.2 in Gp 3, 19.9 ± 0.9 in Gp 4, and 17.1 ± 4.5 in Gp 5 ($p > 0.05$).

Gp	n=	RA/LV (%)	IS/RA (%)
1	5	16.1 ± 2.2	71.3 ± 3.8
2	4	22.3 ± 3.3	57.5 ± 3.1
3	7	16.9 ± 1.3	36.5 ± 4*
4	4	15.9 ± 3.8	40.3 ± 5.2*
5	5	13.6 ± 6.3	6.7 ± 3.1**

LV = left ventricle, *$p < 0.05$ vs Gp 1, ** vs Gp 3

Administration of EXP 3174 neither alters IS in controls nor %SS after brief periods of ischemia, however, IS after PC are dosedependent significantly reduced, indicating a supportive role of angiotensin II receptor activation for infarct size limiting effects of ischemic preconditioning in our pig model.

939-79 Role of Collateral Circulation in Protection Afforded by Regional Ischemic Preconditioning to Remote Myocardium

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Repeated brief circumflex (CX) coronary artery occlusions precondition (PC) the left anterior descending (LAD) coronary artery bed in dogs. The mechanism of this protection might be due to transportation, via coronary collaterals, of catabolites produced during ischemia/reperfusion (like adenosine) from the CX bed into the LAD bed. We sought to determine whether this protection might apply to species lacking collateral circulation. Twenty-eight pigs underwent 40 min of LAD occlusion and 2 hours of reperfusion. Prior to this they underwent a 20 min treatment period consisting of either no intervention (control; n = 9), 10 min LAD occlusion/10 min LAD reperfusion (LAD-PC; n = 12) or 10 min CX occlusion/10 min CX reperfusion (CX-PC; n = 7). Area at risk and infarct size were measured by injection of blue dye and triphenyltetrazolium staining, respectively. All three groups had similar area at risk (expressed as % of the LV weight) that averaged 17 ± 6%, 17 ± 3% and 18 ± 4% in the control, LAD-PC and CX-PC groups, respectively (p = NS). As expected, infarct size (expressed as % of the area at risk) was significantly reduced in the LAD-PC group: 9 ± 14%* vs 53 ± 19% in the control group (*$p < 0.05$). In contrast, CX-PC pigs did not display any infarct size limitation: 44 ± 15% vs 53 ± 19% in controls (p = NS). This demonstrates that preconditioning the circumflex bed does not protect the remote LAD myocardium in pigs, and further suggests that the beneficial effect reported in dogs might be partly due to circulation of some mediator throughout the heart via collateral vessels.

939-80 Quantitative Three-Dimensional Echocardiographic Estimation of Ischemic and Non-ischemic Myocardial Mass and its Relation to the Mass of Dysfunctional LV Myocardium During Coronary Occlusion

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While measurement of non-perfused LV mass is possible in autopsied hearts with pre-injected radionuclide agents, *in vivo* measurement of the mass of ischemic (ISC) myocardial (M) regions has not been feasible. 2D echo with contrast depicts ISC regions but does not provide 3-dimensional mass of these regions. Advances in volume-rendered 3D echo (3DE) provide an opportunity to estimate not only global but also regional LV mass. 3DE's ability to measure LV mass has been validated. In this study, we evaluated the relation between ISC M mass and the mass of dysfunctional M using a newer ultrasound contrast agent FS069 (MBI) that provides prolonged contrast effect. In 7 dogs, 3DE was performed with computer-controlled sequential scanning, at baseline and following aortic root injection of FS069. Baseline and contrast data were acquired in the control state and following occlusion of the LAD, PDA and OM coronary artery branches (10 occlusions). From volume-rendered 3DE, we were able to extract ISC (contrast defects) and non-ISC regions and measure the myocardial volume of these regions without any geometric assumptions. Multiplication by M density yielded M mass of the ISC, non-ISC and whole M. From dynamic 3DE, we were also able to demarcate the region of dysfunctional M in all dimensions, and measure its mass. The extracted ISC territories when visualized in 3 dimensions from different orientations appeared as curved M walls of various shapes and sizes, depending on the amount of ischemic M. The location, size and geometry of the hypoperfused regions corresponded well with those of dyssynergic zones. The mass of non-perfused M in the 7 dogs was 13.9 ± 8 grams (range 3.6–26.3) representing 18 ± 9% of total LV mass. The mass of abnormally contracting M, calculated independently, was 12 ± 7.4 g (range 0–21), or 17 ± 10% of the whole LV. There was an excellent correlation between the ischemic mass (x) and dyssynergic mass (y), $y = 0.114x + 0.85$, $r = 0.92$ $p < 0.001$. *Conclusion:* Using volume-rendered 3D Echo, the actual mass of ischemic and non-ischemic M regions and its relation to dysfunctional M can be defined and quantified. Such a quantitative 3DE approach may assist in the studies of ischemia, thrombolysis and reperfusion.

939-81 Thrombolysis Enhanced by Ultrasound on Intracoronary Thrombus

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The synergistic effect of combined usage of ultrasonic irradiation and t-PA was examined on intracoronary thrombus, produced in the canine left anterior descending artery (LAD). t-PA was given as a bolus dose of 0.1 mg/kg followed by an infusion of 0.9 mg/kg in one hour, until recanalization (TIMI 2). Canines were randomly divided into two groups, one of which (n = 5) received continuous ultrasonic irradiation (200 kHz, 0.25W/cm^2) directly to the LAD occluded by thrombus. The other group (n = 4) served as the unirradiated control. Ultrasonic irradiation significantly reduced both the time required for recanalization (irradiated 13.6 ± 6.0 min. vs. control 36.0 ± 18.0 min.; $p < 0.05$) and the administered dose of t-PA (0.32 ± 0.11 mg/kg vs. control 0.64 ± 0.27 mg/kg; $p < 0.05$). Upon electron microscopical examination, ultrasonic irradiation had no damage on the tissue morphology. This simple method safely could enhance the thrombolytic effect of t-PA and could make rapid coronary recanalization and reduction the dose of t-PA. We expect this method may be applied to the treatment of acute myocardial infarction.

939-82 Efficacy of Gadolinium-BOPTA in Magnetic Resonance Imaging to Assess Acute Myocardial Infarction in Man

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To assess the efficacy of the newly developed contrast agent gadolinium (Gd) benzyloxy propionic tetraacetic-acid BOPTA to detect acute myocardial infarction in patients using magnetic resonance imaging (MRI), 24 patients (age 53.3 ± 8.3) were examined 9.3 ± 3.7 days after a first myocardial infarction. Short axis T1 weighted images were obtained at 3 slice levels, before, immediately after injection of Gd-BOPTA, and after 15 min, 30 min, 45 min. Patients were divided into 2 groups according to the dose of Gd-BOPTA (0.05 mmol/kg and 0.1 mmol/kg). Contrast to noise ratio, signal intensity enhancement of normal and infarcted myocardium and signal intensity of infarcted to signal intensity of normal myocardium (SI inf/norm) was quantified. Contrast to noise ratio was not affected by the type of dosage (0.05 mmol/kg, 5.75 ± 0.85 vs. 0.1 mmol/kg, 5.32 ± 0.69). Enhancement of normal and infarcted myocardium increased immediately after administration of 0.05 mmol/kg Gd-BOPTA and gradually decreased thereafter ($p < 0.002$ for normal myocardium) (see Figure). After 0.1 mmol/kg Gd-BOPTA administration, myocardial enhancement increased rapidly but showed no decrease within 45 minutes after administration (see Figure). Mean SI inf/norm was significantly improved after Gd-BOPTA ad-