Coronary Perfusion and Cardiac Function in LVH Cardiomyopathies

Date: 8/12/00, from 11:00 to 12:30

Location: Room 7A

Chairpersons:

I. Cikes (Zagreb/HR)
D. Gilon (Jerusalem/IL)

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Myocardial vascularity reserve, LV geometry, myocardial and chamber function in hypertensive patients with left ventricular hypertrophy

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Left ventricular hypertrophy (LVH) is associated with an impairment in coronary vasodilator capacity and sometimes also with reduced myocardial function. The aim of the study was to evaluate the relationship between myocardial vascularity reserve (MVR) assessed by myocardial contrast echocardiography (MCE) and indexes of LV chamber and myocardial function; the former measured as endocardial fractional shortening (FS), the latter as midwall fractional shortening corrected for end-systolic wall stress (MFS/ESS) and cyclic variation (CV) of the integrated backscatter signal (IBS).

Methods: 12 never treated asymptomatic hypertensive patients with LVH (age 52±7 years, LV mass index 182±26 g/sqm) were studied by M-mode echocardiography, IBS and MCE. Using as cut-off for relative wall thickness (RWT) 0.45, LVH was classified as eccentric (EcH) in five and concentric (CoH) in seven patients. MCE was performed in Harmonic Mode (HP, Sonos 5500, 1.8/3.6 MHz, contrast agent Leovist, Schering AG) at baseline and at the end of high-dose dipyridamole infusion (0.84 mg/kg/8 min). Mean grey-level intensity within interventricular septum (IVS) was measured at steady state at baseline and after dipyridamole using previously developed algorithm. After background subtraction (blood grey level intensity) MVR was calculated. CV-IBS was measured in the corresponding area of IVS in parasternal long-axis view at baseline.

Results: Hypertensive patients with EcH and CoH were comparable for age, BP, FS and CV-IBS. Compared to EcH, CoH had higher LV mass index (172±25 vs 206±23 g/sqm, p<0.01) and lower MVR (1.82±0.31 vs 1.44±0.17, p<0.05) and MFS/ESS (110.4±10 vs 76.7±17%, p<0.01). In the overall population, MVR was directly related to basal FS (r=0.69, p<0.01), MFS/ESS (r=0.67, p<0.01), CV-IBS (r=0.72, p<0.01) and inversely to RWT (r=-0.66, p<0.01).

Conclusion: Our results with MCE technique suggests a tight interrelation between LV myocardial and chamber function and perfusion reserve in hypertensive patients with LVH. In addition, concentric pattern of LVH is associated with a lower MVR than the eccentric one.

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Non-invasive assessment of coronary flow velocities and reserve by transthoracic Doppler echocardiography in patients with hypertrophic cardiomyopathy

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Aim of the study: to evaluate coronary flow velocities (CF) and reserve (CFR) in patients with Hypertrophic Cardiomyopathy (HC) by Transthoracic Doppler Echocardiography (TTE) (Acuson Sequoia).

Methods: 13 patients with HC (9 M; 19–71 years) referred for angina and 14 age-matched control subjects, all without significant coronary artery stenosis at angiographic study. They underwent standard Doppler Echocardiography and measurement of CF, at rest and after low-dose dipyridamole infusion, in order to assess CFR in the distal portion of left anterior descending coronary artery. Diastolic and systolic peak velocities (DPV, SPV; m/s) and integrals (DVI, SVI; m/s) were measured. CFR was obtained by the ratio of Dip to baseline DPV.

Results: among systolic parameters, both rest and Dip SPV as well as Dip SVI were significantly reduced in HC compared with controls (Rest: SPV=0.15±0.08 vs 0.21±0.07, p<0.05; SVI=0.03±0.01 vs 0.042±0.016, p=NS; Dip: SPV=0.18±0.02 vs 0.46±0.02, p<0.001; SVI=0.05±0.01 vs 0.093±0.003 p< 0.01, respectively). A significant reduction of Dip DPV and DVI was also found in HC compared with controls (0.55±0.2 vs 0.82±0.2, p<0.05, and 0.16±0.07 vs 0.25±0.06, p<0.05, respectively). On the other hand, rest DPV and DVI showed higher, even not statistically significant, values in HC. CFR appeared to be reduced in HC (1.49±0.4 vs 2.3±0.3 in control group; p< 0.001) as a result of combined abnormal baseline and hyperemic CF response. Furthermore, a weak negative correlation was found between septal wall thickness and SPV (r = -0.35; p<0.01).

Conclusions: patients with HC and symptomatic for angina showed abnormalities of systolic and diastolic CF and impairment of CFR despite angiographically normal coronary arteries. As TTE represent a non-invasive and easy repeatable tool, this technique may allow the evaluation of the effects of different therapeutic approaches in these patients.
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Quantitative myocardial contrast echocardiography in the evaluation of coronary microcirculation in athletes’ heart
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Aim of this study is analysis of Coronary Microcirculation (CM) in Athlete’s heart in basal condition and after vasoconstrictor stimulus (dipyridamole), with quantitative myocardial contrast echocardiography (MCE). Ten healthy subjects (C) and 11 Athletes (Biathletes) (A), all males, age=26.9+6.7 yr, without CAD, hypertension, diabetes or obesity. Sonos 5500 (Agilent Technologies) with S4 harmonic transducer was used. Levotrian as ultrasound contrast agent (400mg/ml) was e.v. Injected. Using an infusion pump, Digitalized images of MCE were collected in four chamber views with Power Harmonic Doppler (Angio) mode after an end-systolic frame. After 5 minutes of the injection of contrast, coronary hyperemia was induced with e.v. Injection of 0.56 mg/kg of dipyridamole, two minutes after dipyridamole infusion, another Levotrian injection was adminstered, according to previous protocol. Using dedicated PC software, Angio images, in a colored scale, was analysed placing a ROI on septum. MCE analysis resulted in a time-intensity curve (polynomial fit). The following parameters were analysed: peak intensity (P1), P1 half-time (HT), area under curve of appearance (AUCA) and disappearance of microbubbles at 2/3 of P1 (AUCAw); ratio between P1 and AUCA after dipyridamole and P1 and AUCAw at rest, were obtained. The Indexed left ventricular mass (LVMi) was significantly higher in A (125+28 vs. 25 105.5+11 in C, p<0.001). P1 significantly increases after dipyridamole both in C (p<0.001) and in A (p<0.02); the absolute value of P1 is significantly higher in A both in basal state (p<0.001) and after dipyridamole (p<0.005). AUCAw is significantly higher in athletes both at rest (p<0.001) and after dipyridamole (p<0.001); AUCAw significantly decreases in athletes (p<0.02), while in C is substantially the same. AUCAw is significantly higher in athletes both at rest (p<0.003) and after dipyridamole (p<0.02); AUCAw significantly increases both in A (p<0.002) and in C (p<0.003). No difference are detectable between the two groups regarding the ratio of PI and AUCAw: considered as indirect expression of coronary reserve. Athletes exhibit an higher number of microbubbles both at rest and after vasodilatory stimulus, also with the normalization of AUCAw and AUCAw by LVM. These findings demonstrate, in athletes, a large myocardial capillary bed distribution, which is typical of the physiological type of left ventricular hypertrophy. Both groups show a similar coronary reactivity in response to a vasodilator stimulus.

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Relationship of left ventricular regional wall motion abnormalities to 123I-Metaiodobenzylguanidine myocardial uptake in patients with idiopathic dilated cardiomyopathy
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The myocardial fixation of 1I-metaiodobenzylguanidine(MIBG) is recently being used to evaluate the myocardial adrenergic innervation (ADI) and have been found to be reduced in heart failure. This study was undertaken to correlate MIBG cardiac uptake with echocardiographic wall motion score index (WMSI) in patients with idiopathic dilated cardiomyopathy (ID). Methods: We studied 10 pts (51.+-12.4 years), on sinus rhythm, with echocardiographic wall motion abnormalities to 123-I-Metaiodobenzylguanidine (123I-MIBG). The heart to mediastinum (H/M) ratio was calculated to quantify myocardial uptake in patients with idiopathic dilated cardiomyopathy, and shows improvement of this parameter after 3-month bisoprolol therapy.

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Changes of coronary flow reserve assessed using transoesophageal Doppler echocardiography in patients with dilated cardiomyopathy during bisoprolol therapy
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Aim of this study was to evaluate the effect of 3-month bisoprolol therapy on coronary flow reserve (CFR) assessed using transoesophageal Doppler echocardiography (TEE-DOPPLER) in patients (pts) with dilated cardiomyopathy (DC). Material and method: CFR was assessed in 14 male pts (mean age 54±11 years) with DC before treatment, 2 weeks and 3 months after start of bisoprolol therapy. All pts had angiographically normal coronary arteries. At rest and after intravenous infusion of dipyridamole (0.84 mg/kg/10 min), peak systolic and diastolic coronary microvascular resistance (CMR) was calculated. CFR was significantly increased in 8/14 pts after 2 weeks and in 13/14 pts after 3 months bisoprolol therapy. The results of sCFR and dCFR for study group before and after bisoprolol treatment are presented in the table below.

BEFORE THERAPY AFTER THERAPY

2 weeks 3 months
sCFR 1.40±0.43 1.36±0.27 1.67±0.52
dCFR 1.32±0.34 1.49±0.33 1.69±0.25

*CFR before therapy vs CFR after 3-month therapy – p<0.003
Conclusions: The study confirms the decrease of coronary flow reserve in patients with dilated cardiomyopathy, and shows improvement of this parameter after 3-month bisoprolol therapy.

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Relation of coronary vasodilator capacity to left ventricular geometric pattern in arterial hypertension
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In patients with systemic hypertension LV geometric pattern has been shown to be related to LV systolic function at midwall level (MFS) and to cardiovascular risk. The aim of the study was to evaluate coronary vasodilator capacity in hypertensive subjects with different LV geometry and MFS, and to compare them with data obtained in normotensive controls (NC).
Methods: Fifty-four subjects were studied, including 11 NC and 43 hypertensive patients – 8 with normal LV mass and geometry (NG), 16 with concentric remodeling (CoR) and 19 with concentric LV hypertrophy (CoH). CFR was calculated as a ratio of maximal systolic and diastolic coronary flow velocity after dipyridamole infusion to maximal systolic and diastolic coronary flow velocity at baseline. Results: Systolic and diastolic coronary flow reserve (sCFR, dCFR) were signifi-cantly lower in studied pts before and 2 weeks after bisoprolol treatment compared with the same pts after 3 months bisoprolol therapy. The results of sCFR and dCFR for study group before and after bisoprolol treatment are presented in the table below.