Results: T2 time was lower in diabetic mice (13.8 ± 2.8 ms versus 18.9 ± 2.3 ms in the control group; p < 0.05). This was associated with a significant increase in collagen deposits, as evaluated by picrosirius red staining, in diabetic mice. Morphologic and functional analysis showed no difference in terms of ejection fraction (60.70 ± 5.8% versus 60.35 ± 4.7%) between the two groups, but end-systolic (1.28 ± 0.26 μL/g versus 1.04 ± 0.24 μL/g) and end-diastolic volumes (3.22 ± 0.60 μL/g versus 2.67 ± 0.65μL/g) were significantly increased in the diabetic group. During the electrophysiological study, 3 non sustained ventricular tachycardias were induced in diabetic mice (none in the control group) and 4 supra-ventricular arrhythmias (none in the control group).

Conclusion: In diabetic cardiomyopathy, T2 assessment can detect the presence of fibrosis at an early stage. Myocardial fibrosis is a potential substrate for the genesis of (supra)-ventricular arrhythmias in diabetes mellitus.

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Does Resting Left Ventricular Longitudinal Function may predict Exercise Pulmonary Hypertension in Organic Mitral Regurgitation?

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Introduction: Exercise pulmonary hypertensive (PHT) can develop in patients with organic mitral regurgitation (OMR), even when resting pulmonay arterial pressure (PAP) is normal. However, systolic PAP is not always available during stress echocardiography. The purpose of this study was to identify echocardiographic predictors of exercise PHT in OMR.

Method and results: Resting and exercise transthoracic echocardiography including Doppler and tissue Doppler imaging (TDI) were performed in 66 consecutive patients (61±15 years, 55% of male) with moderate to severe OMR. LV longitudinal and filling functions were quantified by peak and time-to-peak velocities using TDI for Ea- and Sa-wave. PAP was derived from transtricuspid pressure gradient and was available during exercise in 52 patients (79%). Systolic PAP significantly increased during exercise (from 31±10 to 54±17mmHg, p<0.01) and exercise PHT (exercise PAP ≥60mmHg) was observed in 24 patients (46%). Patients with exercise PHT were significantly older (69±11 vs. 59±15 yrs, p=0.004) and had higher resting PAP (36±9 vs. 27±7mmHg, p=0.0004), higher septal E/Ea ratio (16±2 vs. 13±4, p=0.03), slower TP-Sa (127±27 vs. 153±30ms, p=0.002) and TP-Ea (45±24 vs. 48±3±30ms, p=0.03) and lower septal Ea velocity (6.4±2 vs. 7.4±3cm/s, p=0.01). Exercise PAP was correlated with age (r=0.39, p=0.004), resting TP-Sa (r=0.42, p=0.002) and septal E/Ea ratio (r=0.28, p=0.04). On multivariate analysis, after adjustment for age, sex and septal E/Ea ratio, the independent predictors of exercise PHT were resting systolic PAP (Odd-ratio (OR) =1.25, 95%CI: 1.05-1.4, p=0.003) and TP-Sa (OR=1.04, 95%CI: 1.01-1.1, p=0.03).

Conclusion: This study shows that resting impaired LV longitudinal function is associated with exercise PHT in patients with OMR. The presence of resting subclinical LV dysfunction could play an important role in PHT.

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Left Ventricular Systolic Mechanics is not the only determinant of response to Cardiac resynchronization Therapy

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Background: Diastolic left ventricular (LV) and right ventricular (RV) function are major determinants of outcome in chronic heart failure (CHF) patients. Cardiac resynchronization therapy (CRT) is a major therapy for severe symptomatic CHF-patients. But the way diastolic and RV-functions influence response to CRT remains unknown.

Aim: Prospective evaluation of RV and LV-diastolic functions on LV-remodeling after 6-month of CRT according to current guidelines.

Methods: Thirty-eight consecutive CHF-patients (New York Heart Association class III/IV, left ventricular ejection fraction [LVEF] less than 35%, QRS greater than 120 ms) were studied before and after 6-months of CRT. RV-function was assessed by tricuspid annulus plane systolic velocity (Vs a-wave) with a cut-off of 11.5 cm/s. Diastolic LV function was assessed owing to E/A, mean E/e’ (septal and lateral annulus) and left atrial volume (LAV (ml/m2)).

Results: Eighteen patients had RV dysfunction (mean Vs a=7.6 ±1.2cm/s) and 20 had normal RV function (13.6±2.7cm/s). Ejection fraction and LV volumes were not different according to RV-function. Patients with RV-dysfunction had more advanced diastolic dysfunction (mitral inflow E/A=2.2±1.7 vs. 1.2±0.8, p=0.02; E/e’=22.7±7.8 vs. 14.4±4, p<0.01) and largest LAV indexed (63.7±23.9ml/m2 vs. 41.7±13.6 ml/m², p<0.01). Vs a-wave was significantly correlated with parameters of LV diastole (fig1). RV dysfunction was associated and correlated with a weak LV-reverse remodelling at 6-month follow-up (75% vs. 44%, p<0.05 and R=0.46, p<0.05 between delta (pre/6-month post) of LV end systolic volume vs Vs a-wave).

Conclusion: RV-dysfunction and LV diastolic characteristics were correlated. Worse RV function worse was LV-reverse remodelling. RV function and degree of diastolic dysfunction should probably be taking into account when considering patients for CRT.

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Inter-ventricular delay at peak exercise is independently correlated with left ventricular remodeling at three months in heart failure patients selected for cardiac resynchronisation therapy

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Purpose: Cardiac resynchronisation therapy (CRT) is known to improve survival and to induce beneficial left ventricle (LV) remodeling in heart failure (HF) patients presenting with severe LV systolic dysfunction and prolonged QRS interval. Using those selection criteria, about 35 to 40 % of patients remain non-responders to CRT. We assessed whether exercise inter-ventricular dyssynchrony could be a relevant index for the prediction of response to CRT.

Methods: Eighteen HF patients performed a semi-supine symptom-limited exercise echocardiography before device implantation. Inter-ventricular dysynchrony, assessed by inter-ventricular mechanical delay (IVMD) in pulsed wave doppler, was recorded both at rest and peak exercise. We determined correlations between IVMD at exercise and cardiac output, mitral regurgitation, assessed by the effective regurgitant orifice area (ERO), and right ventricular (RV) longitudinal systolic function, assessed by tissue doppler imaging. We looked for correlations between those parameters and the degree of LV reverse remodeling at three months follow-up assessed by the percentage of change in LV end-systolic volume (%Δ ESV) and absolute value of change in ejection fraction (%Δ LVEF).

Results: 39 % of patients were non-responders according to LV remodeling. Exercise-induced changes in IVMD only significantly correlated with RV longitudinal systolic function (r=-0.602, p<0.01) at peak exercise. In a multivariate analysis by stepwise regression, IVMD at peak exercise was
Independently correlated with %ΔESV (β = 0.418, p = 0.01) and ΔLVEF (β = 0.446, p = 0.003) at follow-up. Peak exercise ERO was the only other independent factor correlated with %ΔESV (β = 0.800, p < 0.001) and ΔLVEF (β = -0.404, p = 0.02).

Conclusion: In HF patients, IVMD at peak exercise seems to be a relevant independent predictor of mid-term LV remodeling after CRT. Its relation with RV longitudinal systolic function during exercise could provide a pathophysiological explanation.

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Early ischemia identified by the wasted energy using speckle tracking analysis
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Purpose: Post systolic shortening (PSS) and stretching motion occur early during ischemia. Delayed contraction in PSS and stretching motion does not fully contribute to left ventricular end systolic (ES) function and contribute to the left ventricular dysfunction. The wasted energy can be quantified as the difference between peak strain and end systolic strain and used to identify ischemic segments.

Methods: Acute myocardial ischemia was induced in 9 anesthetized pigs by balloon coronary occlusion (left coronary descending artery, n=6). Circumferential strain by speckle tracking was computed from short axis view during ischemia at 5', 30' and 60'. PSS was defined as peak strain occurring after ES and stretching motion as positive systolic peak strain.

Results: Before induced ischemia, PSS was observed in 38% segments and stretching motion was low (0±1%), then the wasted energy was limited (0±0%). During acute (5') and prolonged (60') coronary occlusion, stretching motion increased (4±2% to 5', and 8±2% at 60') and PSS became more prevalent (54% and 54%, respectively) and delayed in ischemic segment (3% and 12% of RR interval, respectively). This result the wasted energy was greater in ischemic than non ischemic segment (5±1% vs. 1±1% at 5', p<0.001, 9±1% vs. 2±1% at 60', p<0.001). Importantly, using ROC curves, a wasted energy of 25% identify ischemic segment with 70% of sensitivity and 74% of specificity.

Conclusions: The wasted energy related to PSS and stretching motion appears accurate to identify early ischemic segments.

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How to Use Dose Modulation Protocols to Reduce Radiation Doses of Cardiac CT Scan?
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Background: Multislices Cardiac CT scan (MSCT) is a current non invasive coronary arteries imaging modality which is increasingly used. Radiation dose to which the patient is exposed remains a major problematic issue. Prospective Dose modulation protocol (DMP) allows marked dose reduction when correctly used.

Aim and Methods: in order to figure out how DMP impacts Dose radiation to patient in daily life practice we prospectively studied 187 consecutive patients referred to our center for a 64 slices MSCT over a 2 months period. DMP was variably used according to the operator’s discretion whether to modulate (1 to 3 EKG phases) or not based on patient’s heart rate. Radiation measured by Dose length product (DLP), percent of modulation induced dose reduction, qualitative quality of the image (assessed by two blinded expert cardiologists) and signal on noise ratio were compared for each patient according to the DMP status.

Results: MSCTs were divided in modulated vs non modulated acquisition and the modulated group was divided in 4 groups according to the dose modulation protocol used : no DMP (n=24), DMP 1 phase (n=97), DMP 2 phases (n=51), DMP 3 (n=15) phases. All groups were comparable considering age, sex ratio and body mass index. Kilovolt and intensity were comparable between groups. DLP was significantly lower in the modulated group compared to non modulated (734 ± 311 mGy.cm vs 1100 ± 371 mGy.cm, p<0.0001). Percent of dose reduction was only significantly higher for DMP 1 phase compared to other groups (-40 ±7% DMP 1 vs -15 ±5 ± 6 DMP 2, -10 ±3 DMP 3, 0 DMP 0; p<0.0001). Global image quality was significantly better in the modulated vs non modulated group (p=0.0016) and there was no quality difference between DMP 1 vs others. S/N ratio was not affected by the use or not of DMP.

Conclusion: DMP has a very positive impact in MSCT dose reduction with no deterioration of image quality. DMP allows the best dose reduction when modulation is conducted over 1 phase and should be used in that way.

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Dobutamine stress echocardiography and coronary artery spasm: a missed link
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Aims: To assess whether abnormal dobutamine stress echocardiography (DSE) can be a consequence of dobutamine-induced coronary spasm in patients with angiographically documented vasospastic coronary arteries.

Methods: Between January 2004 and April 2008, we prospectively evaluated all patients with known or suspected coronary artery disease (CAD) referred to the echocardiography laboratory for dobutamine stress tests (6061 examinations). Those with abnormal DSE underwent coronary angiogram with a systematic methylergometrine intracoronary injection in the presence of absence of significant coronary stenosis or spontaneous occlusive coronary spasm. Patients who had spontaneous occlusive coronary spasm or positive methylergometrine test, but no significant stenoses, were ultimately included in this study.

Results: About 581 patients had abnormal DSE, among them only 20 (3.4%) fulfilled the inclusion criteria. There were 15 males and 5 females, and mean age was 64.35 years (range 52-85); 8 patients had a known history of CAD and all of them had at least two established cardiovascular risk factors. The culprit vessel was the left anterior descending artery in 10 cases (50%), right coronary artery in 8 cases (40%), and left circumflex in 2 cases (10%). There was a systematic correspondence between the culprit arteries and dobutamine-induced wall motion abnormality territories. No complications occurred during examination or during the provocation test. All the patients were discharged with a calcium channel blocker and were doing well after 13 months of mean follow-up.

Conclusion: Coronary artery spasm can be induced at DSE, but is a rare finding; it could, though, be clinically relevant as it may partly explain some erroneously labelled ‘false-positive’ examinations. Methylergometrine provocation test is a safe and advisable approach in such situations.

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Interest of tricuspid annular displacement “TAD” in evaluation of right ventricular ejection fraction
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The ultrasound assessment of right ventricular (RV) function is often suboptimal. The range of excursions of the mitral or tricuspid annulus measured in m-mode 2D or TM mode echocardiography has been shown to reflect the systolic function of both ventricles.