Echocardiographic determinants of maximal exercise capacity in asymptomatic patients with primary mitral regurgitation

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Background: Despite a symptom-based management recommended by current guidelines in patients with primary mitral regurgitation (MR), the assessment of maximal exercise capacity (MEC) is rarely performed. MEC is relatively unexplored in these patients and its exercise determinants remain unknown.

Method and results: We prospectively studied 63 asymptomatic patients (60±13 years, 52% of male) with at least moderate MR and with preserved left ventricular (LV) systolic function in whom comprehensive resting and exercise echocardiography and cardiopulmonary exercise test were performed. MEC was assessed using peak exercise VO2 and widely varied over patients (mean: 23.6±7.1, median: 22.7, range: 10.2–42.4 ml/kg/min). According to the median of peak VO2, patients with reduced MEC were significantly older (p=0.0052) and were more frequently women (p=0.02). There was no other significant difference between the 2 groups (reduced vs. preserved MEC) regarding demographic and clinical data and medication. During exercise, Peak VO2 was significantly correlated with exercise LV stroke volume (r=–0.33, p=0.02) and there was a trend for significant correlation with exercise RegV and effective regurgitant orifice area (r=–0.32, p=0.05 and r=–0.3, p=0.07, respectively). In addition, the best correlations with peak VO2 were found with exercise SPAP (r=–0.52, p=0.0001) and exercise LA volume (r=–0.59, p=0.0001). In multiple regression analysis (model r²=0.67), after adjustment for exercise LV stroke volume and resting E/Ea, age (β=–0.17±0.07, p=0.002); sex (β=–3.1±0.8, p=0.0006), exercise LA volume (β=–0.12±0.03, p=0.02) and exercise SPAP (β=–0.15±0.06, p=0.0003) were identified as independent predictors of peak exercise VO2.

Conclusion: In asymptomatic patients with primary MR and preserved LV systolic function, MEC may vary considerably. The main independent determinants of MEC are related to MR consequences on LA and SPAP, in particular during exercise.

Haemodialysis: effects of acute decrease in preload on echocardiographic indices of systolic and diastolic function of the left ventricle in chronically uremic patients

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Conventional echocardiographic (ECHO) parameters of left ventricular (LV) systolic and diastolic function have been shown to be load-dependent; however, the impact of preload reduction on tissue Doppler (TD) parameters of LV function is incompletely understood.

Objective: The aim of this study was to evaluate the effect of a single hemodialysis (HD) session on left ventricular systolic and diastolic function using conventional pulsed-Doppler echocardiography and pulsed tissue Doppler imaging (TDI) in hemodialysis patients.

Methods: Eighty-one chronically uremic patients (40 males; aged 52.43±16.35 years) on maintenance hemodialysis (HD) participated in the study. Pulse wave velocity and the ratio of early to late Doppler velocities of mitral inflow (E/A) were measured using continuous wave Doppler. The diagnosis of the mitral annulus decreased significantly after HD (p<0.013; p=0.007 and p=0.008, respectively).

Velocity of flow progression (Vp) during diastole was not affected by preload reduction. Pulmonary artery systolic pressure and the diameter of the inferior vena cava decreased significantly (p<0.001 and p<0.001; respectively) after HD.

Conclusions: Most of Doppler-derived indices of diastolic function are preload-dependent. Velocity of flow progression was not or minimally affected by preload reduction in hemodialysis patients.

Comparison of gated SPECT ejection fraction measured immediately and more than 40 minutes after stress resting using a fast camera acquisition and Technetium labelled Tetrosformin

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The aim of this study is to compare the gated SPECT ejection fraction (EF) measured a few minutes (nm) after stress and more than 40 nm after stress by using Myoview as tracer and a gamma camera with fast acquisition (GE discovery). It is generally accepted that patients without severe ischemia and without a post stress ejection fraction equal to the post rest one. It is also accepted that a difference of more than 5% in absolute value between 2 EF is considered as significantly different.

Methods and results: In our study 111 patients, mean age 59.7 years, without known coronary artery disease (CAD), had first a 4 nm fast camera acquisition. The mean delay between myoview injection and beginning of SPECT imaging was 3,83 mn±2,98 with a mean cardiac rate of 86,86±26 bpm. The second acquisition was done after 42,89 nm+/− 19 mn and the mean cardiac rate was 74,34+/− 22 bpm. Mean difference in the delay is 39 mn (Max 64, Min 22). The average value of the immediate EF (computed from the first scan) was 71,55+/−17,4% and the average value of the delayed EF (computed from the second scan) was 64,68+/− 16,8%. The resulting mean difference is 6,86+/−14 which is significant. Mean difference between the end diastolic volume is −5,16 and −7,26 for the end systolic volume. Myocardial perfusion was normal in all the patients.

Conclusion: The EF value measured on a scan done just after the stress test is significantly higher than the one measured after a delay of about 40 mn This is an interesting result as a lower than expected ejection fraction value after stress compared to the rest one may be an argument for a severe CAD.

Benefit of transoesophageal echocardiography in cardiac surgery: change in diagnosis and surgery planned

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Introduction: The value of routine use of transesophageal echocardiography (TOE) in cardiac surgery has been rarely studied in a consecutive series of patients. The aim of this study was to evaluate the contribution of perioperatively TOE in cardiac surgery.

Material and methods: This is a prospective study of thirty two consecutive patients undergoing cardiac surgery, in a programmed manner. The data of TOE were compared with preoperative diagnosis retained. In some cases, changing diagnostic led to a modification of the planned intervention. The contributions of TOE were to elucidate of the mechanism of valvular disease, assess its severity, to diagnose morphological, guiding surgery and checking results at the end of the intervention.

Results: The main types of interventions were: valve replacement or valvuloplasty (51%), CABG (37%), aortic surgery (12%). The diagnosis...
made preoperatively was modified in 10% of cases (n=21). In 54% of cases, TOE confirmed the diagnosis previously established by transthoracic echocardiography, in 10% of cases the diagnosis made preoperatively was changed, and in 28% of TOE has provided diagnostic and therapeutic solution. The results found for each type of surgical pathology are reported in Table 129.

<table>
<thead>
<tr>
<th>Coronary artery disease</th>
<th>Pathology of the mitral valve</th>
<th>Pathology of the tricuspid valve</th>
<th>Pathology of the aorta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in diagnosis</td>
<td>3%</td>
<td>20%</td>
<td>11%</td>
</tr>
<tr>
<td>Change in the intervention planned</td>
<td>1%</td>
<td>13%</td>
<td>9%</td>
</tr>
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</table>

Discussion: TOE performed routinely during cardiac surgery may lead to changes in surgery, particularly in the aortic pathology and valvular diseases. In about half of the indications for which review is requested, the supply of TOE is decisive and modifies the treatment instituted.

Conclusion: Our study confirms the value of TOE in cardiac surgery, in addition to the indications found in our series of patients, others such as aortic dissection or pulmonary embolism major benefit from the addition of TOE.

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Accuracy of a new method for semi-quantitative assessment of right ventricular ejection fraction by cardiac MRI: right ventricle fractional diameter change.

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Background: Cardiovascular magnetic resonance (CMR) with endocardial delineation of the right ventricle is the gold standard to measure right ventricular ejection fraction (RVEF). Longitudinal shortening is historically known to be the predominant part of its global systolic function and less attention has been paid to the transversal contraction. The aim of this study was to evaluate RV transverse motion in a large cohort of patients referred for CMR and assess its relationship with RVEF.

Method: We retrospectively analyzed the CMR scans of 300 consecutive patients referred for CMR between January and December 2010. Reference RV ejection fraction was determined from short axis sequence after delineating endocardial contours. Transverse parameters called RV fractional diameter changes were calculated after measuring RV diastolic and systolic diameters at basal and mediol level in short axis view (respectively FBDC and FMDC). We also measured the tricuspid annular plane systolic excursion (TAPSE) in the four chambers view as a longitudinal reference.

Results: Population was divided into 2 groups according the RVEF. 250 patients had a preserved RVEF (40%) and 50 had a RV dysfunction (RVEF<40%). Both transverse and longitudinal motions were significantly reduced in the group with RV dysfunction (p<0.0001). After ROC analysis, areas under the curve for FBDC, FMDC and TAPSE, were respectively 0.79, 0.82 and 0.72 with the highest sensitivity and specificity of 68% and 88% for FMDC (threshold at 19.9%) to predict RVEF. Above all, FMDC had a 93% negative predictive value of altered RVEF.

Conclusion: Right ventricular transversal systolic function markers, especially at the mediol level, appear to be accurate for assessment of RV function by CMR. They are reliable to rule out an RV dysfunction in clinical practice.

Keywords: Right ventricular ejection fraction, transversal systolic function, semi-quantitative assessment, cardiac magnetic resonance.

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Ivabradine physiological effect on myocardial function during dobutamine infusion in healthy subjects

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Introduction: Ivabradine is a selective heart-rate-lowering agent that acts on the sinoatrial node without influence on myocardial contractility and cardiac output. Physiological effects of ivabradine during dobutamine infusion have never been studied.

Methods: The study included 11 healthy subjects (82% men, aged 29.1± 4.7 years). All underwent dobutamine transthoracic echocardiography before and after ivabradine (3 hours after 5 mg of ivabradine). Baseline left ventricular global longitudinal strain by speckle tracking and stroke volume at rest and during low dose of dobutamine (when heart rate increased by more than 10 points from baseline) were compared to those obtained under ivabradine.

Results: Baseline heart rate (64±8 bpm) decreased in 7 subjects (68±7 bpm vs. 60±6 bpm, P=0.009) but paradoxically increased in 3. Dobutamine rate required to increase the heart rate by 10 points was similar with and without ivabradine (11±2 kg/min vs. 12±3 kg/min, P=0.4). Overall, global strain increased under low dose dobutamine before (–20±2% vs. –23±2%, P=0.008) and after ivabradine (–21±2% vs. –23±3%, P< 0.001). Interestingly, in the 7 subjects that responded to ivabradine, global strain (–23±2% vs. –25±1%, P=0.006) and stroke volume (102±17 ml vs. 110±20 ml, P=0.05) more increased under dobutamine with ivabradine.

Conclusion: In healthy subjects, heart rate reduction obtained by ivabradine allows to increase myocardial contractility and stroke volume for a similar rate of dobutamine. This propriety may be useful in decompensate heart failure patients with rapid tachycardia induced by catecholamine infusion.