curves predict a 80% sensibility and specificity of Δ(IRVT-IRVT'). Δ (RE-E') sensibility and specificity at lateral site are 87% and 93% respectively. E/ \text{SRivv} has a 71% sensibility and a specificity. The incremental diagnostic value of each parameter and BNP in combination with "classic" parameters (E/A, \text{E'}/\text{E}') was evaluated by kappa coefficient. Δ (IRVT-IRVT') at septal site (k=0.777) and Δ(RE-E') (k=0.73) are the most accurate parameters, whereas additional use of E/\text{SRivv} (k=0.41) isn’t more useful than "classic" echocardiographic strategy (k=0.478) such as BNP (k=0.533).

Δ (IRVT-IRVT') and Δ(RE-E') can predict LV filling pressures with reasonable accuracy.

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Importance of ventricular longitudinal function in chronic heart failure

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Aims: Despite its immediate relevance, cardio-pulmonary exercise testing (CPET) is infrequently performed in presence of chronic heart failure (CHF). Previous studies of patients suffering from CHF have found a closer correlation between exercise capacity and measurements of diastolic than systolic ventricular function. We examined the correlation between echocardiographic measurements and a) results of CPET and b) cardiovascular prognosis.

Methods and results: We performed resting two-dimensional echocardiograms and CPET in 140 patients with CHF (mean age = 61±13 years, 111 men). The underlying heart disease was ischemic in 48 patients. They were followed for a mean of 38 months (range 28-52). The mean left ventricular (LV) ejection fraction (EF) was 30±9%, and peak VO₂ 17.2±6.5 ml/kg/min. LV correlated weakly with peak VO₂ (r=0.21), while systolic and early diastolic LV longitudinal function correlated best [early diastolic peak velocity (a'), GLS, right ventricular (RV) systolic strain and left atrial systolic strain (r²=0.38; global longitudinal strain (GLS): r=0.4; p≤0.001 for both]. By multiple variable regression analysis, the best prediction of peak VO₂ was derived from a model based on age, mitral annulus end-diastolic peak velocity (a'), GLS, right ventricular (RV) systolic strain and left atrial systolic strain (r²=0.57; p≤0.0001). The 2 best independent predictors of adverse cardiovascular events at 28 months were GLS (odds ratio 1.31, p=0.01; prognostic cut-off of -7%) and RV systolic strain (odds ratio 1.05, p=0.01; prognostic cut-off of -2%).

Conclusion: Resting RV and LV longitudinal functions explained the presence of exercise intolerance and were more reliable predictors of adverse cardiovascular events than CPET measurements.

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Risk of ventricular arrhythmia and death in heart failure population using global longitudinal strain by speckle tracking.

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Background: Long Ventricular Ejection Fraction (LVEF) is commonly used to identify patients at high risk of sudden cardiac death and ventricular arrhythmia. However LVEF by Simpson biplane method may be challenging in heart failure patients with severe LV deformation and abnormal wall motion. The aim of the study was to assess the additional value of global longitudinal strain by 2D speckle tracking in predicting the occurrence of ventricular arrhythmia.

Methods: The study included 45 heart failure patients (86% men, 64±22 years, 60% ischemic) with left ventricular dysfunction (median 28%, range 13 to 47%) referred for Implantable Cardiac Defibrillator (ICD). LVEF and longitudinal global strain by speckle tracking before ICD implantation was compared to major cardiac outcome (MACE defined by cardiovascular death and ventricular arrhythmia).

Results: Global strain averaged -7±3% (median=7%, range -3 to -13%) and correlated with LVEF (r=0.71, p<0.0001). During the follow-up (380±272days), ventricular arrhythmia (n=17) and death (n=2) occurred in 42% patients. MACE did not differ according to LVEF (52% vs. 36%, p=0.3), and global strain median value (42% vs. 42%, p=0.9). However, in patients with LVEF<28%, MACE tended to be greater when global strain was > - 7% (100% vs. 41%, p=0.06).

Conclusion: Global longitudinal strain by 2D speckle tracking may improve the identification of patients at risk of ventricular arrhythmia and death in heart failure population with severe left ventricular dysfunction.

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Speckle tracking imaging assessment of left ventricular strain in heart transplant patients

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Despite its immediate relevance, cardio-pulmonary exercise testing (CPET) is infrequently performed in presence of chronic heart failure (CHF). We aimed to assess LV twist in heart transplant patients with normal LV ejection fraction (LVEF), and without or with mild acute rejection on cardiac biopsy.

Methods: Twenty biopsies and echocardiographic studies were performed in 10 heart transplant patients (mean age: 40±17 years) a median of 6 months after transplantation (range: 1 to 120 months). No patients had evidence of cardiac allograft vasculopathy. The mean age of the donor heart at the time of echocardiography was 37±14 years. Routine endomyocardiac biopsy was performed 24 hours after echocardiography. Ten age-matched controls (43±15 years) were also studied. Short axis views were analyzed using speckle tracking software. LV twist was defined as the difference between the apical and basal rotation.

Results: Eight biopsies were on grade 0 (no rejection) and 12 on grade 1a (mild rejection). The transplant groups and the control group did not differ in terms of LVEF (Grade 0: 66±7%, grade 1R: 67±11% and controls: 66±6%) and in systolic mitral annular velocities (8.5±1.6 cm/s, 7.7±2.1 cm/s and 8.4±1.4 cm/s, respectively, p=NS). Peak LV twist was reduced in patients with grade 0 and grade 1a (6.0±3.3° and 7.1±3.6°, respectively) as compared to controls (12.1±2.9°, p=0.005 for both comparison). A reduction in apical rotation accounted for most of this alteration (4.5±2.7° for grade 0, 4.7±3.3° for grade 1a and 8.9±3.1° for controls, p=0.017). There was no difference in peak LV twist among the transplant groups. Early diastolic LV untwisting (at 5%, 10% and 15% of diastole) did not significantly differ between the three groups.

Conclusions: Speckle tracking imaging allows to detect a reduced LV twist in the transplanted heart. A reduced apical rotation accounts for most this alteration. However, our data suggests that the assessment of LV twist does not allow to detect the early stage of rejection.

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Relation between global longitudinal strain in patients with aortic stenosis: relation with severity and symptoms

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Background: Patient with aortic stenosis (AS) and reduced ejection fraction (EF) should be promptly operated on. Global longitudinal strain (GLS) has been proposed as a subtle subclinical marker of left ventricular (LV) systolic dysfunction.
dysfunction and a potential prognostic factor in asymptomatic patients with AS. However, the relation between GLS, AS severity and symptoms has not been fully evaluated.

Methods: Eighty-six patients (74±11 years, 35% female) with at least mild AS were prospectively enrolled. Clinical evaluation included the assessment of symptoms (angina, syncope, and dyspnea) and a physical examination. All patients had a comprehensive transthoracic echocardiography (TTE). GLS was measured offline using a dedicated station and software (EchoPac, General Electric) blinded of any clinical and TTE information.

Results: Forty-three patients (43%) were asymptomatic. AS range was wide with a mean aortic valve area (AVA) of 1.06±0.42 cm² [0.33-2.3] and 55 patients (64%) had a severe AS (AVA<1cm²). Mean EF was 63±6 and 8 patients (9%) and a reduced EF (<60%). We divided our population into 4 subgroups, asymptomatic non-severe AS (group 1), asymptomatic severe AS and normal EF (group 2), symptomatic severe AS and normal EF (group 3) and symptomatic severe AS and reduced EF (group 4). Overall GLS decreased from group 1 to 4 (p<0.0001) (Table) and a correlation between AS severity and GLS was observed (r=0.40, r²=0.0002). However, GLS was not significantly different between patients with symptomatic and asymptomatic severe AS (group 2 and 3, p=0.32).

Conclusions: In the present study we show that GLS was significantly correlated with AS severity and reduced in patients impaired EF. However, GLS was not different between patients with symptomatic and asymptomatic severe AS. These preliminary data deserve further confirmation but raise caution regarding the potential prognostic value of GLS in patients with asymptomatic AS.

<table>
<thead>
<tr>
<th>Group 1 (n=31)</th>
<th>Group 2 (n=12)</th>
<th>Group 3 (n=35)</th>
<th>Group 4 (n=8)</th>
<th>P between groups</th>
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<tbody>
<tr>
<td>GLS</td>
<td>-19.1±2.9</td>
<td>-18.7±4.6</td>
<td>-17.5±3.2</td>
<td>-12.5±4.0</td>
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</tbody>
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Myocardial function assessment for patients with severe organic mitral regurgitation

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Objective: Recovery of ventricular function after surgical correction of mitral regurgitation (MR) is an important clinical issue. The best timing for mitral valve surgery is sometimes controversial. We studied echocardiographic characteristics of left ventricular (LV) function in 80 patients with severe (regurgitant orifice area ≥ 40mm²) and preserved ejection fraction (LV EF ≥ 60%) and compared our finding with 30 normal controls similar in age, sex and body mass index.

Methods: We evaluated the controls and the organic MR patients at rest and during a standardized exercise stress echocardiography. Patients were imaged at rest and after 8 minutes of sub maximal exercise (heart rate [100-120 b/m]). All the echocardiographies were prospectively performed by the same team, the same echo-mechine and protocol. It provided conventional echocardiographic indices but also new ones like the global longitudinal strain.

Results: The LV volume were significantly larger in the MR group (diastolic: 134±39ml vs 69±21; p 0.001; systolic: 43±16 vs 25±9ml, p<0.001). At rest, the EF was 68±7 % in MR group vs 65±6 in the controls (p=0.005). E/e' was 13±6 vs 10±2; p=0.007; the global longitudinal strain (GLS) was 18±4 % vs 21±3; p=0.01. During the exercise, the evolution of the GLS was clearly different in the MR group versus the controls. A slight or no increase in GLS was observed in the MR group: 19±8%. In opposite, the control’s GLS improved: 26±3 % during the exercise; p<0.001. If we considered GLS indexed to LV end diastolic volume, the difference in GLS was even greater. In comparison, exercise EF was none significantly different between groups (MR group 72±9% vs 75±7 controls, p=0.177).

Conclusion: Independently of the LV geometry changes, GLS appears to be a promising new index of LV systolic function in MR patients. Better than EF, especially during an exercise, GLS performed highly better than EF distinguishing LV characteristics of patients with a significant severe MR vs. controls. GLS might have to be tested to best select MR patients justifying an early repair to protect LV systolic competence.

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Real-time 3D transoesophageal echocardiography evaluation of the mitral valve area in patients with mitral stenosis

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Aims: Planimetry measured by two-dimensional transthoracic echocardiography (TTE, MVA₄₀) is the reference method for the evaluation of the severity of mitral stenosis (MS) but is significantly less reliable when performed by non-experienced operators and when transthoracic echocardiography is poor. Real-time three-dimensional transoesophageal echocardiography (RT3DTEE, MVA₃₀) may overcome those limitations but its accuracy has never been evaluated.

Methods: We prospectively enrolled 43 patients (59±15 years, 86% female) referred for MS evaluation who underwent the same day a TTE and a RT3DTEE. MVA₃₀ was assessed by experienced operators, MVA₄₀ was measured by one experienced (Level III) and one non-experienced operator (Level I) blinded of any clinical and TTE information. RT3DTEE images were digitally stored and analysed offline on a workstation using dedicated software (QLab Philips) in a random order. MVA₃₀ was measured at the best cross section of the mitral valve defined as the most perpendicular and smallest orifice.

Results: MVA₃₀ was measured by the experienced operator (1.07±0.31 cm² [range 0.45-1.85]) did not differ from and correlated well with MVA₄₀ (1.08±0.32 cm² [range 0.54-2.00]; r²=0.84, r=0.71, p<0.001; mean difference was small (+0.1±0.24 cm²). Similarly, the MVAₙ₃₀ measured by the non-experienced operator (1.03±0.31 cm² [range 0.45-1.69]) did not differ from and correlated well with MVA₄₀ (p=0.27, r=0.66, p=0.001; mean difference -0.05±0.26 cm²). RT3DTEE inter and intraobserver (between experienced and non-experienced operators) variability were respectively 0.13±0.10 cm² and 0.19±0.14 cm².

Conclusion: RT3DTEE provides accurate and reproducible MVA measurements similar to 2D planimetry performed by experienced operators. Thus, RT3DTEE should be considered as an alternative tool for the evaluation of MS severity, especially in patients with poor echocardiographic windows or for team less accustomed to evaluate patients with MS.

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Right heart function evolution after successful balloon mitral valvuloplasty

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Background: The evolution of right ventricular function in patients with rheumatic mitral stenosis treated with balloon mitral valvuloplasty (BMV) is not clearly defined. The aim of this study was to assess the evolution of systolic, diastolic and global function of the right ventricle (RV) immediately and one month after BMV using a standard Doppler echocardiographic approach combined with tissue Doppler imaging (TDI).

Methods: Thirty three consecutive patients (70% women; age 31±8 years; range 19-45) with moderate to severe mitral stenosis (mitral valve area ≤1.5 cm²) in sinus rhythm who underwent successful BMV were included prospectively. Echocardiographic parameters of RV function were determined before BMV, 24 hours after BMV and one month after BMV and included pulsed wave TDI (S velocity, isovolumic relaxation time (IVRT), Tei index), tricuspid annular plane systolic excursion (TAPSE), RV fractional area change (RVFAC), and pulmonary vascular resistance (PVR). The control group included 14 healthy subjects (64% women, age 32±5 years; range 23-45).

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