By use of DMI, the following parameters of myocardial function were assessed: systolic peak velocities, pre-contraction time, contraction time, early (E) and late (A) diastolic peak-velocity diameters, and ratio, relaxation time.

Results: The three groups were comparable for age, but ATE at rest showed lower heart rate and systolic blood pressure. LV mass index did not significantly differ between the 2 groups of athletes. However, ATE showed increased wall thickness and relative wall thickness, while LV stroke volume and both LV and RV end-diastolic diameters were greater in ATE. All transtransvalvular and transtricuspid Doppler index values were higher in ATE. DMI analysis showed in ATE higher Em and Em/Am ratio at the level of both RV and LV local walls, in comparison with both ATE and controls. In the overall population of athletes, multiple linear regression models evidenced independent positive association of RV peak Em velocity with both LV stroke volume (β coefficient =0.50, p<0.001) and maximal workload achieved by bicycle ergometry (β coefficient =0.54, p<0.001).

Conclusions: RV early diastolic myocardial function is positively influenced by preload increase in master athletes, and represents an independent determinant of cardiac performance during physical effort. Therefore, the combined use of pulsed DMI and standard DMI echocardiography may be taken into account to distinguish different cardiac adaptation to both endurance and strength sport activities in master athletes, and eventually to quantify RV adaptation degree to long-term training.

3-D ECHO

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Non-standard 2d imaging windows improve visualization of the right ventricle for reconstruction
M.P. Waiss 1; F.H.S. Sheehan 1

1University of Washington, Medicne Dept., Seattle, United States of America

Background: Accurate 3D reconstruction of the right ventricle (RV) for shape analysis requires views that cover the entire RV. Because the RV in adults often does not fit within the sector of volumetric 3D echo equipment, we acquire 2D echo images with transducer position tracking, and reconstruct the RV in 3D using the piecewise smooth subdivision surface (PSSS) method. However standard apical and parasternal views do not visualize the entire RV.

Hypothesis: We hypothesized that non-standard 2D echo views can visualize areas of the RV that are typically difficult to see using only standard views.

Methods: We acquired complete longitudinal and transverse scans of standard and non-standard views in 5 normal subjects. The non-standard views were real time apical and parasternal images with transducer position tracking, and reconstructed the RV in 3D from multiple views using the PSSS method. The borders traced from standard views were overlaid on the 3D surface to gauge each view’s RV coverage. The RV was divided into 11 regions. Coverage of each region was graded from 0 to 3 where 0=no traced borders; 1=minimum (1-2) traced borders; 2=multiple borders but in only one axis; 3=multiple well-spaced longitudinal and transverse borders.

Results: RV coverage improved with the addition of non-standard views (0.1±0.2 vs. 1.0±0.4) at all segments). High parasternal and RUSB views aided visualization of the pulmonary infundibulum and pulmonary valve leaflet attachment. Foreshortened apical and low parasternal images also gave additional infundibular data. Low parasternal images improved coverage of the mid portion of the RV free wall as did apical 4 chamber views that image and center the RV free wall in the sector.

Conclusion: The addition of non-standard 2D views provides significantly better coverage of RV outflow tract and free wall. By enabling more accurate visualization of the RV 3D shape, non-standard views may facilitate analysis of RV remodeling in hemodynamic overload conditions.

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Right ventricular diastolic function in arterial hypertension complicated with heart failure
M. Tsvetareva 1; D. Tsvetareva 1; T. Chachukhishvili 1

1Georgian Medical Academy, Cardiac Rehabilitation & Sports Medicine Dept., Tbilisi, Republic of Georgia; 2Georgian State Medical Academy, Internal Medicine Dept., Tbilisi, Republic of Georgia

Purpose: The aim of this study was to test the changes of right ventricular diastolic function according to pulmonary hypertension in patients with arterial hypertension (AH) complicated with heart failure (HF).

Methods: 759 patients with AH without signs of myocardial infarction, were examined by echocardiography. 211 patients (1 group), had congestive HF (108 female, 103 male). 54 patients had I, II, III, IV - I.F.H. the group had uncomplicated AH (258 female and 290 male). All patients examined by standard EchocG. Right ventricular (RV) diastolic function was studied by PW tricuspid flow Dopplerography and Tissue Doppler Imaging (DTI). Mean pulmonary arterial pressure (PAP) was estimated by pulmonary arterial flow acceleration time.

Results: PAP, RV wall and cavity dimensions in diastole, was significantly greater in patients with HF. Tricuspid flow E wave velocity (40.52±11.9 vs 45.02±10.5) and E/A ratio (0.97±0.43 vs 1.15±0.34) was significantly lower, tricuspid flow A wave velocity (45.64±14.01 vs 41.39±11.67) was significantly greater and RV early tricuspid deceleration time (DT) shorter in patients with HF. The parameters of RV DTI did not show any difference between groups. 96% of patients with HF and 67.9% without HF had LV diastolic dysfunction (p<0.01). RV diastolic dysfunction was registered frequently in I group (26% vs 10%). Restrictive filling pattern was found in 5.9% of HF patients with RV diastolic dysfunction. It was significant gradual increase in PAP (p<0.001) and decrease DT (<0.005) with increase of HF functional class. It was tendency of gradual increase of late and decrease of early tricuspid flow velocity with increase of HF functional class. The correlation between RV and LV filling parameters was pure.

Conclusion: The patients with AH complicated with HF have significant changes of EchoG parameters of RV diastolic function. RV hypertrophy, elevated PAP and RV diastolic dysfunction is frequently observed in patients with AH complicated with CHF than in patients without this complication.

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Differentialiation between acute and chronic cor pulmonales with midventricular systolic strain of the right ventricle
J.H. Park 1; S.J. Park 1; Y.S. Park 1; J.H. Lee 1; S.W. Choi 1; J.O. Jeong 1; I.W. Seong 1

1Chungnam National University Hospital, Internal Medicine Dept., Daejeon, Republic of Korea

Background: Cor pulmonale (CP) is defined as the structural and functional alternation of the right ventricle (RV) caused by primary disorders of the respiratory system. We aimed to differentiate acute CP complicated with pulmonary thromboembolism (PTE) from chronic form due to chronic obstructive pulmonary disease (COPD) with strain analysis of RV.

Patients and methods: From March 2005 to April 2006, total 49 patients, 24 consecutive patients with acute CP (10 males, mean 68±14 years) and 25 consecutive patients with chronic CP associated with severe COPD (20 males, mean 61±14 years), were included. Echocardiographic data and strain analyses were obtained with GE Vivid 7.

Results: There was no statistical difference in age, fractional area change of RV, TR V_m and Tei index in both groups. However, males were more included in the chronic group. Midventricular systolic strain of RV was significantly decreased in patients with acute CP. Regarding the midventricular systolic strain in the detection of acute CP by the receiver operating curve, the best sensitivity and specificity were obtained when -12.6% was applied as the criterion (less than -12.6% for predicting an acute CP, the sensitivity, specificity and accuracy were 79.2%, 80.0% and 79.9%, respectively).

Conclusions: Midventricular systolic strain of RV can be used in the differentiation between acute and chronic cor pulmonales.

Table 1. Echocardiographic data

<table>
<thead>
<tr>
<th></th>
<th>Acute cor pulmonale (n=24)</th>
<th>Chronic cor pulmonale (n=25)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR V_m (m/sec)</td>
<td>3.6±0.6</td>
<td>3.9±0.7</td>
<td>0.159</td>
</tr>
<tr>
<td>RV fractional area change (%)</td>
<td>20.9±11.5</td>
<td>23.4±7.5</td>
<td>0.280</td>
</tr>
<tr>
<td>RV Tei index</td>
<td>0.57±0.28</td>
<td>0.67±0.17</td>
<td>0.129</td>
</tr>
<tr>
<td>Systolic strain of RV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base</td>
<td>-23.5±15.2</td>
<td>-21.3±9.0</td>
<td>0.550</td>
</tr>
<tr>
<td>Midventricle</td>
<td>-1.1±19.1</td>
<td>-19.0±8.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Apex</td>
<td>-10.8±7.9</td>
<td>-10.0±9.9</td>
<td>0.964</td>
</tr>
<tr>
<td>TR V_m: maximal velocity of tricuspid regurgitation: RV</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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Systolic tricuspid annular motions in various types of right ventricular overloading
M. Gyuric 1; I. Jovanovic 1; V. Parezanovic 1; J. Kajani 1; L.J. Sulovic 1; I. Stefanovic 1; G. Vukomanovic 1

1University Childrens Hospital, Cardiology Dept., Belgrade, Serbia and Montenegro; 2Medical School, Cardiology Dept., Pristina, Serbia and Montenegro

Objectives: The aim of this study was to asses systolic right ventricular (RV) function in children suffering from congenital heart disease (CHD) with various types of RV overloading, by analyzing longitudinal motions of tricuspid annulus (LTM). The pressure in patients with arterial hypertension (AH) complicated with heart failure (HF).

Methods: Study population included 123 children, divided in four groups: Group I: 43 healthy children; Group II: 25 pts with atrial septal defect (ASD) - RV volume overload; Group III: 25 pts with pulmonary stenosis (PS) - pressure RV overload; Group IV: 30 pts operated on for Tetralogy of Fallot (post TOF) - combined volume and pressure overload, with mean pulmonary pressure gradient of 30.7±12.7 mm Hg and pulmonary regurgitation of 1.8±0.3 of 4 grades. The LTM was analyzed both by measuring the annular systolic velocity (Sm)