732 Accurate timing of mitral valve opening by tissue Doppler imaging for an in all one beat analysis
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Background: Echocardiographic indices of diastolic function are largely dependent on accurate timing of mitral valve opening (MVO). Determination of MVO in the same heart beat as other derived echocardiographic measures is crucial to avoid inaccuracies caused by beat to beat variation. The aim of the study was to investigate if tissue Doppler imaging (TDI) information can be used to determine MVO.

Methods: In an anaesthetised mongrel dogs (n=4) with left atrial (LA) and LV micrometers, MVO was defined as the time of first diastolic LA/LV pressure cros 

Results: In the experimental study MVOTDI showed very good agreement with MVOPCO: mean difference: 1.7±9.8 ms (2SD); correlation: r=0.99, p<0.001. MVOTDI showed excellent agreement with MVO Doppler in the clinical study: mean difference: 0.3±8.1 ms; correlation: r=0.99, p<0.001. The proposed marker in the mitral valve leaflet TDI signal showed excellent agreement with MVO as defined both by pressure cross-over and onset of Doppler flow. MVOTDI thus provides a new method for accurate timing of MVO in the same heart beat as other TDI measurements.

733 Have tissue Doppler parameters improved on conventional echocardiographic parameters for sequential evaluation of LV function?
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Background: Sequential 2D echos (2DE) are often performed to assess LV function over time, but the value of sequential testing is unclear. Conventional measures (eg. EF) have significant test-retest variability, but this is less defined with newer measures (eg. tissue velocity [Em], E/Em and LA size). We sought the variation between measures of LV function in pts referred for sequential 2DE.

Methods: Two sequential 2DE were performed in an unselected group of 357 pts, with measurement of change in LA area, LVEF, Em and E/Em. Pts were classified as clinically stable (n=160) or unstable (n=197) based on their clinical progress. Differences in change of each parameter were compared between stable and unstable groups using a t-test. The degree of variance between measurement of E/Em and each new parameter was assessed with an F-test after mean-correction to make measures comparable.

Results: Change in Em was the only measurement that had a significant mean difference between stable and unstable pts (Table). In stable pts, the coefficient of variation (CV) of Em (83%, F-test p<0.01 vs EF) and LA (81%) were less than ΔEF (102%) and ΔE/Em (105%). Stable patients with either heart failure or ischemic heart disease had the least degree of variance between different measures.

Conclusions: ΔE/Em shows the greatest difference between stable and unstable pts and its CV suggests less variation than the other parameters in stable pts. However, the variance of all measures was high, even in stable pts. More robust markers of LV function are needed for sequential follow-up study.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>ΔE/Em %</th>
<th>ΔLA size (cm³)</th>
<th>ΔEm (cm/sec)</th>
<th>ΔE/Em</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>-0.8±9.6*</td>
<td>0.36±4.9*</td>
<td>-1.4±2.9*</td>
<td>2.3±6.4*</td>
</tr>
<tr>
<td>Unstable</td>
<td>0.61+12.6*</td>
<td>-0.33+5.4*</td>
<td>-0.55+2.7*</td>
<td>1.30+7.3*</td>
</tr>
<tr>
<td>T-test</td>
<td>p=0.24</td>
<td>p=0.29</td>
<td>p=0.004</td>
<td>p=0.15</td>
</tr>
</tbody>
</table>
*statistic p<0.01, *statistic p=NS (for comparison of variance with LVEF)

734 Early diastolic mitral annulus velocity at onset of filling- a new marker of cardiac suction
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Background: Peak early-diastolic mitral annulus velocity (E') by tissue Doppler imaging (TDI) reflects LV diastolic function. We hypothesized that mitral annulus velocity prior to mitral valve opening (E'MVO) is due to LV restoring forces and therefore is a marker of diastolic suction.

Methods: In anesthetized dogs we measured E' by sonomicrometry (n=10) and TDI, and in healthy humans (n=6) we measured E'. Restoring forces were increased by reducing LV end-systolic volume (ESV) by caval constriction in dogs and by lower body negative pressure (LBNP) in humans. In dogs E'MVO was measured at first diastolic left atrial/LV pressure crossover and in humans at onset of mitral flow.

Results: In dogs caval constriction decreased ESV from 31±2 (SEM) to 28±2 cm³ (p<0.05), and transmural LV end-diastolic pressure from 1.3±0.3 to 0±0.3 mm Hg (p<0.05). The negative transmural pressure indicates a diastolic suction force. E'MVO by sonomicrometry increased from 0.3±0.1 to 1.2±0.2 cm/s (p<0.05), and E'MVO in percentage of E' increased from 8.2±2 to 41±6 % (p<0.05). Peak E' decreased from 3.4±0.2 to 2±0.2 cm/s (p<0.05), E' and E'MVO by TDI showed similar changes. In the clinical study LV short-axis diameter decreased from 3.4±0.2 to 3.1±0.2 cm (p<0.05) by applying LBNP of -40 mm Hg, diaStolic volume from 72±5 to 65±5 mL (p<0.05), and E' from 11±1 to 6±1 cm/s (p<0.05). E'MVO increased from 0.9±0.4 to 2.2±0.4 cm/s (p<0.05), and E'MVO in percentage of E' increased from 8.3±3 to 34±3 % (p<0.05).

Conclusions: Left ventricular diastolic suction is associated with LV lengthening prior to mitral valve opening. Mitral annulus velocity at onset of filling is proposed as a new non-invasive marker of diastolic suction.

735 Off-line analysis of color tissue Doppler is a reliable alternative to pulsed wave tissue Doppler for detecting low myocardial velocities
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Background: Low myocardial velocity in early diastole (low Em) is a strong predictor for mortality in cardiac disease. Em was originally measured using pulsed wave tissue Doppler (PWTD), but the more convenient off-line analysis of color tissue Doppler (CTD) is increasingly being used. CTD results in lower values for myocardial velocities than PWTD, and it has been recommended not to use the methods interchangeably. We tested the hypothesis that modern CTD can detect low Em as reliably as PWTD in a clinical population.

Material: Stored echocardiographic data on 64 consecutive patients in sinus rhythm examined in our echocardiography clinic.

Methods: Patients were examined on modern ultrasound equipment. The data was analysed off-line with commercially available software. PWTD curves were obtained with the sample volume placed in the lateral myocardium at the level of the mitral annulus in the apical four-chamber view. When possible, the average value of Em from several cardiac cycles was used. The sample volume for CTD-analysis was placed in the same position during off-line analysis, and one value of Em was obtained.

Results: The patients had left ventricular ejection fractions of 20-60% (mean 44±2% (SD13%)). PWTD resulted in larger values for Em than CTD (8±3.7 cm/sec vs 6.9±3.1 cm/sec; difference 1.57±1.61 cm/sec (p<0.001), which is consistent with earlier published data. The prevalence of impaired early diastolic myocardial velocity (Em <6 cm/sec measured with PWTD) was 25% (16/64). Using a cut-off value of Em ≤5 cm/sec in CTD-analysis diagnosed this condition with a sensitivity of 94% and a specificity of 96%, which is consistent with earlier published data. The prevalence of impaired early diastolic myocardial velocities in the clinical setting.