Three-dimensional echocardiography

Friday, 9 December 2005, 15:30–16:30
Location: Poster Area

851
Head-to-head comparison of 2D and 3D transthoracic, and 2D and 3D transoesophageal echocardiography in the localization of mitral valve prolapse

G. Tamborini1, M. Pisi1, A. Malagoli2, C.A. Galli2, L. Salvi2, E. Sisillo2, M. Nallano2, F. Aiammanni1, F. Milano, Italy; 1IRCCS, Centro Cardiologico Monzino, Milano, Italy

A prospective assessment of mitral valve (MV) anatomy is essential to surgical decision in patients undergoing MV repair for MV prolapse (P). Although 2D transthoracic (TTE) and transoesophageal echocardiography (TOE) provide precise informations regarding MV anatomy, 3D TTE and TOE could increase the understanding of more complex abnormalities of MV apparatus and individual scallop identification. Aim of this study was to evaluate feasibility and accuracy of 2D vs 3D TTE and TOE in the localization of MVP in patients referred to surgical repair. One-hundred and two patients (mean age 60±10) with MVP underwent a routine 2DTTE exam including 3DTTE acquisitions the day before surgery and 2D and 3D TOE interoperatively. Individual scallops were examined and anatomical characteristics such as billowing, flail, chordal rupture and annular calcification were annotated and compared to surgical inspection. Sensitivity (SENS), specificity (SPEC) and accuracy (ACC) were calculated.

Results: mean number of 3DTTE acquisitions/patient was 6±4 and mean acquisition-analysis time was 7±4 min. 3DTTE acquisition time was 4±1, and off-line 3DTTE reconstruction time 3.5±1 min. Quality of 3DTTE was insufficient in 8%, sufficient in 16%, good in 55%, and optimal in 21%, respectively. Quality of 3DOTE was insufficient in 7%, sufficient in 13%, good in 35%, and optimal in 45%, respectively. Table shows SENS, SPEC and ACC for the evaluation of the scallops of the posterior and anterior MV of the 4 techniques.

<table>
<thead>
<tr>
<th>Technique</th>
<th>PML</th>
<th>AML</th>
<th>P+AML</th>
<th>PML</th>
<th>AML</th>
<th>P+AML</th>
<th>PML</th>
<th>AML</th>
<th>P+AML</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sens</td>
<td>74%</td>
<td>71%</td>
<td>71%</td>
<td>79%</td>
<td>79%</td>
<td>79%</td>
<td>68%</td>
<td>68%</td>
<td>68%</td>
</tr>
<tr>
<td>Spec</td>
<td>74%</td>
<td>71%</td>
<td>71%</td>
<td>79%</td>
<td>79%</td>
<td>79%</td>
<td>68%</td>
<td>68%</td>
<td>68%</td>
</tr>
<tr>
<td>Acc</td>
<td>74%</td>
<td>71%</td>
<td>71%</td>
<td>79%</td>
<td>79%</td>
<td>79%</td>
<td>68%</td>
<td>68%</td>
<td>68%</td>
</tr>
</tbody>
</table>

3DOTTE: SENS 74%, SPEC 74%, ACC 74%.
2DTTE: SENS 87%, SPEC 87%, ACC 87%.
2DOTE: SENS 63%, SPEC 63%, ACC 63%.
3DOTE: SENS 97%, SPEC 97%, ACC 97%.

Conclusions: 3DOTE and 2DOTE are feasible and not time consuming. 3D methods provide a detailed anatomic depiction of the MVP particularly in complex cases. 3DOTTE and 3DOTE are superior, in comparison with 2DTTE and 2DOTE imaging, for the accurate localization of MV pathology.

852
Quantification of regional left ventricular function by real-time 3D echocardiography: validation by magnetic resonance imaging and clinical utility

C. Corsi1, L. Sugeng1, H.-J. Nassen2, L. Weenin1, J. Niell1, C. Eber1, R.M. Lang1, V. Mor-Avi1, 1University of Chicago, Cardiology, Chicago, United States of America; 2Public Hospital Elisabethinum, Linz, Austria

Background: Quantitative information on regional left ventricular (LV) volumes from real-time 3D echocardiographic (RT3DE) images has significant clinical potential, but needs validation. Our goals were to: (1) validate these measurements against cardiac magnetic resonance (CMR) and (2) test the feasibility of automated detection of regional wall motion (RWM) abnormalities (RWMA) from RT3DE data.

Methods: RT3DE (Philips 7500) and CMR (Siemens 1.5T) images were obtained in 31 pts and analyzed using prototype software (Tormec) to calculate regional (R) indices: end-systolic and end-diastolic volumes (RESV, REDV), ejection fraction (REF), and volumes at half-ejection and half-filling times (RV[1/2et], RV[1/2ft]). Indices were compared between RT3DE and CMR (linear regression, Bland-Altman). Additionally, CMR images were reviewed by an expert, whose RWMA grades (normal or abnormal, 16 segments) were used as a reference for automated detection of RWMA from RT3DE and from CMR images. For each modality, normal REF values were obtained in 15 pts with normal WM (NL). In the remaining 16 pts (AbNL), REFs were compared with thresholds derived from NL and optimized using ROC analysis.

Results: RT3DE measurements resulted in good agreement with CMR (Table). REF calculated in NL varied between segments, but were similar between modalities. In AbNL, RWMA was graded as abnormal in 74% segments (9 pts; global LV dysfunction; 7 pts; isolated RWMA). CMR and RT3DE thresholds were similar (16-segment average: 55±10% and 56±7%). Automated detection resulted in high levels of agreement with expert interpretation, similar for CMR and RT3DE (sensitivity: 0.85 and 0.84; specificity: 0.81 and 0.78; accuracy: 0.84 and 0.84, respectively).

Conclusions: Analysis of RT3DE data provides accurate quantification of regional LV function and allows automated detection of RWMA, which is as accurate as the same algorithm applied to CMR images. This technique may prove clinically useful.

853
3D real-time dobutamine stress echocardiography vs 2D strain rate stress echocardiography in patients suspected of coronary artery disease

P. Skalski1, J. Kochanowski2, D. Kosior2, G. Opolski2, 1Warsaw, Poland; 2The Warsaw Medical University, Dept of Cardiology, Warsaw, Poland

The aim of the study was to assess a new 3D real-time quantification method used during diagnostic dobutamine stress echocardiography at patients with suspicion of coronary artery disease. We analyzed 37 patients (pts) referred to diagnostic stress echocardiography (DSE) before planned coronarography. DSE was done using full dose protocol (0-10-20-30-40 mcg/min dobutamine + atropine if needed in 5-3-3-3 minutes) on Philips iE33 system with 3D Glab advanced package. On the end of each step 2D (2DODE) and 3D (3DODE) full volume were digitally recorded.

First independent observer assessed LV contractility using standard 17 segment model (subjective classification: normo, hipo, akinesis) and analyzed strain rate in 3 views: apical 4, 3 and 2 chamber in each segment using curved M-moda. Second independent observer, using 3D Advanced tool reconstructed 17 segments 3DLV shape. Contractility of each segment 3DLV were analyzed using contractility curves.