Assessment of Left Ventricular Segmental Function Using 9-Slice Short Axis Imaging Derived From 3-Dimensional Echocardiography

Yoram Agmon, Diab Mutlak, Shimon Reisner

Cardiology Department, Echocardiography, Rambam Health Care Campus, Haifa, Israel

Background: The left ventricle (LV) can be displayed in multiple simultaneous short axis cine-loops using 3-dimensional echocardiography (3DE). We examined whether it is feasible to assess LV segmental function using this application of 3DE.

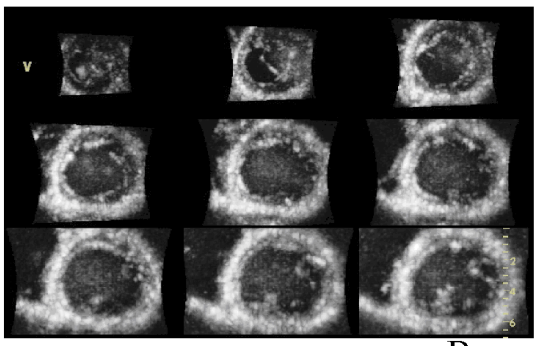
Methods: Fifty arbitrarily selected patients (age 57±15 yrs, 60% men) were examined by both 2-dimensional echocardiography (2DE) and 3DE using a Vivid 7 ultrasound machine equipped with a 3DE transthoracic matrix probe (GE Healthcare, Wauwatosa, WI). LV segmental wall motion was determined by standard 2DE imaging from parasternal and apical windows. Using a 16-segment model, each segment was coded as normal, hypokinetic, or akinetic (the latter category included dyskinetic and aneurysmal segments). Subsequently, 3DE was performed and full volume 3DE datasets were acquired from the cardiac apex during breath-holding (ECG-gated sum of volumetric data from 4 consecutive cardiac cycles). The heart was displayed in a 9-slice short axis cine-loop format from apex to base, with 3 slices at each LV level (apex, mid, and base; *Figure*). Segmental function was determined by the average function of the 3 slices within each segment. 3DE segmental analysis was blindly assessed without knowledge of the of the 2DE interpretation.

Results: By 2DE (the "gold standard" for segmental analysis) – segmental LV dysfunction was evident in 22 patients (44%): 619 segments were normal (77.4% of 800 segments) and 181 were abnormal (22.6%; 99 hypokinetic [12.4%] and 82 akinetic segments [10.2%]). When segments were analyzed as normal, hypokinetic, or akinetic – the 2 techniques agreed in 87% of segments and when segments were dichotomized to normal or abnormal segments (the latter combining hypokinetic and akinetic segments) the 2 techniques agreed in 90% of segments. The sensitivity, sensitivity, positive, and negative predictive values of 3DE to detect an abnormal segment by 2DE were 95%, 74%, 82%, and 93%, respectively. The most common discrepancy between the 2 techniques was in the interpretation of basal inferior wall segmental function (disagreement in 9 patients [18%]). Six of 7 patients with segmental wall motion abnormalities in multi-vessel distribution were correctly identified by 3DE.

Conclusions: Segmental LV wall motion analysis is feasible via 3DE with a 9-slice short axis display. This technique may supplement and assist the standard assessment of LV segmental function via 2DE.

End-diastole

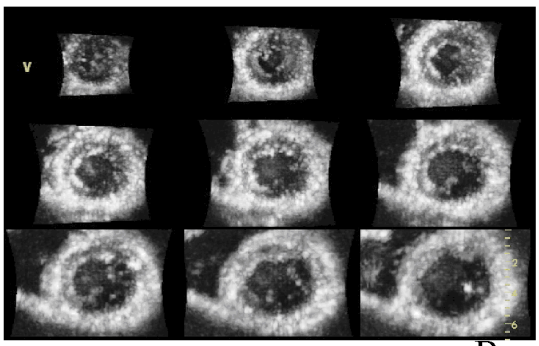
Apex



Base

End-systole

Apex



Base