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The temporal relationship between mitral and atrial valves opening and closure and the myocardial velocity curve.
A. Ouss, P.A. Van der Wouw. Onze Lieve Vrouwe Gasthuis, Cardiology, Amsterdam, Netherlands

Isovolumetric contraction (IVC) in a tissue Doppler imaging (TDI) curve is defined as a period between the onset of the Q wave on ECG and the onset of the systolic wave (Sm). Isovolumetric relaxation (IVR), correspondingly, from the end of the Sm wave to the onset of the early diastolic wave (Em). This assumes that the mitral valve (MV) closes at the onset of ORS, the aortic valve (AV) opens at the onset and closes at the end of the Sm wave and the MV opens at the onset of the Em wave. The aim of this study was to verify this assumption.

Methods: Color TDI (CTDI) of the apical long axis view, 180 frames per second, was performed with a Vingmed System V in 50 patients (48±19 years) without obvious heart disease referred for a standard echocardiogram. The moment of closure (C) was defined as the last frame during closing movement when the valve moved with aliasing velocity, the moment of opening (O) was defined as the first frame during the opening movement when the valve acquired aliasing velocity. Velocity traces of the aortic annulus (AA) were derived from CTDI using EchoPac. Time intervals between expected and observed moments of opening and closure were measured.

Results: MVC occurred 36 ms (17 to 53) later than expected, AVO 0 ms (-7 to 6), AVC 29 ms (13 to 41) later than expected, MVO 30 ms (-43 to 6) earlier than expected. Interestingly, the MV and the AV closed within 11 ms after the onset of AA acceleration directed basally during IVC and apically during IVR (figure).

Conclusions: The IVC and IVR periods in a TDI curve do not represent “real” isovolumetric intervals. The MV and the AV close shortly after the onset of respectively early systolic basally directed and early diastolic apically directed AA acceleration.

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Cardiac resynchronization therapy: which place in the treatment of heart failure patients?
G. Girod, M. Frinaz-Arbane, X. Lyon, M. Fromer, L. Kappenberger. CHU Vaudois, Service de Cardiologie, Lausanne, Switzerland

Background: Among patients (pts) who present left ventricular dysfunction and symptoms of heart failure although optimal medical therapy, several showed also signs of cardiac dyssynchrony. Wide QRS complex is a clear manifestation of this phenomenon.

The aim of this study was to determine the incidence of pts eligible for cardiac resynchronization therapy among pts in a tertiary university hospital centre.

Methods: We retrospectively analysed all hospitalised pts with moderate to severe left ventricular dysfunction should find advantage from biventricular resynchronization therapy. Nevertheless, one third of those pts were brought to severe left ventricular dysfunction should find advantage from biventricular pacing. Indeed, this therapy showed clear benefit on symptoms in heart failure pts.

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Use of pulsed Doppler tissue imaging for the monitoring of cardiac resynchronization therapy.

Limited data are available concerning the effect of cardiac resynchronization therapy (CRT) on left ventricular systolic myocardial velocities and the intraventricular systolic asynchrony (LVSAs) in patients (pts) with dilated cardiomyopathy (DCM).

Methods: Before biventricular pacemaker implantation 22 pts with DCM and heart failure NYHA class III underwent a standard and pulsed Doppler tissue imaging (PDTI) echocardiography examination. We measured the peak myocardial systolic velocity (PSV), the interval between Q wave in the electrocardiogram and the beginning of the systolic velocity profile (Q – Sm) recorded from 4 basal segments [septal, lateral, anterior, inferior] of the left ventricular wall from an apical approach. Follow up echocardiography examination was done 1 and 6 months after biventricular pacemaker implantation. LVSa was calculated from the maximal Q-Sb difference.

Results: Of 22 patients undergoing CRT 2 patients (9%) died because of worsening heart failure during follow up period. In the surviving 20 patients there was a significant improvement in LVEF (19±5% vs 26±6%, p<0.001), LV diastolic filling time (VSm) from 43±7 ms to 37±4 ms (p<0.001), peak systolic velocities were significantly higher in septal (4.1±1.5 cm/s vs 6.2±2.0 cm/s, p<0.001) and LV inferior (4.7±1.5 cm/s vs 6.5±1.7 cm/s, p<0.001) segments in contrast to LV anterior (5.6±1.4 cm/s vs 6.3±1.7 cm/s, p<0.001) and lateral (5.7±2.2 cm/s vs 6.0±1.9 cm/s, p<0.001) segments.

Conclusions: Pulsed Doppler tissue imaging is a very useful tool for selection and follow up monitoring of patients with CRT. PDTI demonstrates two main mechanism of improvement of cardiac function during CRT: left ventricular resynchronization and increasing of systolic velocities in septal and LV- inferior segments.

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Cardiac resynchronisation therapy in refractory heart failure: effect on LV reverse remodelling and BNP levels.
G. Belotti, M.E. Bellebono, A. Pili. Cardiology Department, Treviso, Italy

Background: Heart failure (HF) is associated with increase of brain natriuretic peptide (BNP) levels. Cardiac resynchronisation therapy (CRT) showed to improve cardiac function in refractory HF. However, the impact of CRT on the BNP levels in relation to the effect of CRT on cardiac function is not known.

Methods: We studied 33 pts (mean age 68±4 yrs) with ischaemic or idiopathic cardiomyopathy underwent CRT for refractory HF. NYHA class III or IV despite optimal drug treatment. QRS duration >150ms and echocardiographic interventricular mechanical delay >120ms. LV end-diastolic volume (LVEDV) was measured before CRT and after 1,3,6,12 months; we performed BNP levels assessment (Triage BNP, Biosite) and Doppler echocardiography before CRT and after 1,3,6,12 months; we measured inter-d, LV eccentricity index (ratio of longitudinal to transverse diameter, apical 4-chamber) and septal LV systolic (LV-S) and diastolic (LV-D) function by pulsed Doppler tissue imaging (PDI) and Doppler echocardiography before and after CRT; LV end-diastolic diameter (EDD) and volume (EDV), ejection fraction (EF) and diastolic function by measuring the ratio of E and A-wave (E/A), isovolumic relaxation time (IVRT) and E-deceleration time (E-dt) on transmirtal flow and the ratio of the systolic and diastolic component of pulmonary venous flow (SD). We performed BNP levels assessment before and after CRT; LV end-diastolic volume (LVEDV) was measured before CRT and after 1,3,6,12 months; we measured inter-d, LV eccentricity index (ratio of longitudinal to transverse diameter, apical 4-chamber) and septal LV systolic (LV-S) and diastolic (LV-D) function by pulsed Doppler tissue imaging (PDI) and Doppler echocardiography before and after CRT; LV end-diastolic diameter (EDD) and volume (EDV), ejection fraction (EF) and diastolic function by measuring the ratio of E and A-wave (E/A), isovolumic relaxation time (IVRT) and E-deceleration time (E-dt) on transmirtal flow and the ratio of the systolic and diastolic component of pulmonary venous flow (SD).

Results: After one month, we observed significant increase of EF(31.5±7 vs 25±6, p<0.01), reduction of E/A (1.1±0.5 vs 1.8±0.9, p<0.001) and LS (194±65 vs 133±34, p<0.05), IVRT (110±33 vs 95±35, p<0.02) and SD (1.3±0.7 vs 0.8±0.5, p<0.001), persistent after three months. After 6 months, we also had a significant reduction of ESS (25±10 vs 26±2,18cm, p<0.01), LV diastolic volume (182±66 vs 194±27 ml, p<0.001), with improvement of S-EI (1.0±0.6 vs 1.5±0.2, p<0.02) and E-dt (1.8±1.2 vs 1.4±0.3, p<0.02); all modifications persisted after 12 months. The BNP showed a progressive reduction that became significant after 12 months (base: 719±215 pg/ml, 1 mo: 653±203, 3 mos: 405±267, 6 mo: 506±120, 12 mos: 278±134 pg/ml, p=0.03).

Conclusions: In this selected population, the mechanical resynchronisation by biventricular pacing resulted in early improvement of systolic and diastolic function with later reduction of the LV dimensions and of the LV spherical shape. CRT was associated with a significant BNP reduction, after a sustained ventricular global reverse remodeling. The LV function and shape modifications associated with neurohormonal compensation might have prognostic implications.