Physiological range of left ventricular asynchrony: an ultrasonic velocity and strain rate imaging study.

T. Poerem, B. Goebel, T. Geiger, T. Stiebebeck, M. Borgreffe, K.K. Haase, University Hospital of Mainz, Mainz, Germany; 1Dept of Medicine, Mannheim, Germany.

Background: Left ventricular (LV) asynchrony occurring in patients with heart failure can be successfully restored by cardiac resynchronisation therapy (CRT). However, there is still lack of consensus regarding the choice of the most suitable parameter to quantify asynchrony and to guide CRT.

Aim of the study was to assess the physiological ranges of systolic and diastolic mechanical asynchrony in normal hearts.

Methods: Sixty-one subjects aged 40-84 years with normal coronary angiograms and 12-lead ECG recordings, without LV hypertrophy or wall motion abnormalities underwent tissue Doppler and strain rate imaging. Long-axis function was determined at rest in 4 basal and 4 mid-wall LV segments. Maximal differences between systolic and diastolic time-to-peak tissue displacement (async_D), respectively time-to-peak strain (async_S) and time-to-peak systolic (async_Vs) and early diastolic (async_Ve) velocities were measured and expressed as values corrected for heart rate (after dividing by the square root of the cardiac cycle duration).

Results: The highest values were found for async_S (168±141 ms), followed by async_D (80±92 ms), async_Vs (66±43 ms) and async_Ve (48±24 ms). Async_S and async_Vs correlated linearly with the age of the patients (r = 0.63, p<0.001 for async_S and r = 0.53, p=0.004 for async_Vs), while async_D and async_Ve were not age-dependent. All parameters reached their maximal values between the basal segments.

Conclusions: 1. Peak systolic strain showed the highest degree of asynchrony under physiologic conditions. 2. A certain delay between LV walls in peak long-axis displacement (~150 ms) can be accepted as a normal finding. 3. Systolic asynchrony improves with time and especially deformation increases proportionally with the age, reflecting the degree of cardiac heterogeneity. 4. In normal hearts peak relaxation is affected less by intraventricular mechanical asynchrony compared to the myocardial contraction.

Echocardiographic follow-up of patients after surgical correction of atrioventricular septal defect.

A.D.J. Ien harkel1, B.C.C. Heinerman1, A.J.C.J. Bogers2, W.Y.C. Hop3, A.H. Crome-Dijkhuis4, S. Sophia Childrens Hospital, Pediatric Cardiology, Rotterdam, Netherlands; 2Erasmus MC Cardiothoracic Surgery, Rotterdam, Netherlands; 3Erasmus MC, Epidemiology and statistics, Rotterdam, Netherlands.

Introduction: Patients who are operated for atrioventricular septal defect (AVSD) can develop left-sided atrioventricular valve regurgitation (LAVVR) during follow-up. This LAVVR is the main indication for reoperation in these patients. Until now, the ideal time for reoperation is difficult to assess. We sought to determine the outcome of severe LAVVR, both medically treated or reoperated.

Methods: Retrospective review of echocardiographic, clinical and operative data of 49 patients, who were operated in our institute and followed up after reoperation. Echocardiography was performed at regular intervals, using a Sonos 5500 (Philips Medical Systems, Andover, Massachusetts). The degree of LAVVR was measured by color Doppler echocardiography. It was graded as none or mild (a thin jet extending to the wall of the atrium), moderate (a broad jet extending to the wall of the atrium) or severe (a broad jet occupying more than half of the left atrium). At least two investigators reviewed all studies. All echocardiograms were reviewed and assessed independently by two examiners.

Results: During follow-up (9 months to 12 years; median 6 years), 30 patients (19%) developed severe LAVVR. Sixteen of these patients had severe LAVVR in the immediate postoperative period, and 2 patients were lost to follow-up. Ninety-four patients (60%) had Down syndrome. During follow-up (9 months to 12 years; median 6 years), 30 patients (19%) developed severe LAVVR. Sixteen of these patients had severe LAVVR in the immediate postoperative period. Of these 16 patients 4 patients showed spontaneous regression to near-normal valve function during follow-up. The other 14 patients developed severe LAVVR during further follow-up. Sixteen out of 30 patients with severe LAVVR were reoperated. Of these 16 patients 11 underwent valvuloplasty of the mitral valve once, in 2 patients valvuloplasty was necessary twice, in 2 patients valvuloplasty was performed by mitral valve replacement, and one patient underwent primary valve replacement. After reoperation 3/16 (19%) patients died, all 3 because of severe congestive heart failure related to persistent mitral insufficiency.

Conclusions: 1. Risk factors for the development of severe LAVVR and reoperation at the primary operation were severe preoperative LAVVR and when no valvuloplasty was performed.

Impact of pulmonary regurgitation and age at surgical repair on textural and functional right ventricular myocardial properties in patients operated on tetralogy of Fallot.

G. Pacileo1, M. Verreggia 1, G. Di Salvo2, V. Limatolla1, A. Resa1, D. Mutone1, A. Rossi1, P. Calabro1, M.G. Russo1, R. Calabro 1, 2, Second University of Naples, Paediatric Cardiology, Naples, Italy; 3Second University of Naples, Department of Cardiology, Naples, Italy.

Study aim was to identify non-invasively the potential impact of pulmonary regurgitation and age at surgical repair on the right ventricular (RV) textural and functional myocardial properties in pts operated on tetralogy of Fallot (TOF).

Methods: We assessed the averaged intensity (Int.IB) and the cyclic variation (CVIB) of the echo backscatter curve in 30 pts (mean age 16±2±3 yrs), who had undergone corrective surgery for TOF (mean age at repair 3.2±2.6 yrs, range 0.2-11 yrs). They were divided into three age- and BSA-matched subgroups according to the results of the surgical repair: 12 pts had no significant postoperative sequelae (Group I), 12 pts had isolated moderate-severe pulmonary regurgitation (Group II) and 6 pts had pulmonary regurgitation associated with significant (>30 mmHg) RV after tract obstruction (Group III). In addition, 30 age-, sex- and BSA-matched normal subjects were identified as the controls.

Results: CVIB was decreased (7.8±6.2±5 vs 10.6±1.4 dB; p<0.001) and Int.IB was increased (18.6±14±1 vs 21±2±8 dB;p<0.01) compared to controls. Comparison between controls and each subgroup of TOF pts showed: a) comparable values of CVIB and Int.IB in Group I; b) Int.IB significantly differed only in Group III (p<0.001) c) CVIB differed either in Group II and Group III (p<0.001). Group III pts, which had the highest significant RV dilatation, compared to Group II (p<0.038) and Group I (p<0.001), showed the lowest values of CVIB (5.6±1±8 dB) and the highest values of Int.IB (13±3±4±6 dB). Finally, in our study population, both the degree of RV dilatation and the age at surgical repair significantly correlated with Int.IB (r = 0.5±1±4, p<0.05 and 0.5±3; p=0.002 and 0.003 respectively).

Conclusions: In pts operated on TOF a) IVB analysis is able to identify pts with significant RV myocardial abnormalities related to postoperative sequelae: b) residual PR, particularly if associated to pulmonary stenosis, strongly affects RV myocardial properties; c) an earlier repair of TOF may result in better preservation of myocardial characteristics.