Strain echocardiography in the assessment of left ventricular function is not affected by age or sex in healthy subjects

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Background: One-dimensional strain echocardiography (deformation) is a new ultrasound based technique in the assessment of cardiac function. It has been proposed to be less influenced by myocardial traction and tethering, translational artefacts, and less preload dependent compared to tissue Doppler imaging. The aim of the present study was to evaluate how cardiac systolic strain was affected by age and sex in healthy subjects.

Methods: Fifty healthy subjects (mean age 63±12 years, 25 females) were investigated. The subjects were divided in two age-groups; Group 1 (42-58 years, n=20, 12 females) and group 2 (62-87 years, n=30, 12 females). Peak systolic longitudinal strain was measured at the basal levels of the left ventricle (LV) lateral, septal, anterior and inferior walls. Furthermore, right ventricular (RV) free wall strain was measured. Mean frame rate was 103±19 fps.

Results: Strain values ranged between -16 to -22±8-13% in the four segments of the LV, and -28±11% in the RV free wall. No difference in strain was found at any of the measured segments between group 1 and 2, nor did gender affect the strain values in a significant way in any segment. Systolic strain was measurable in 88% to 96% in the five different segments.

Conclusion: We show that ventricular strain at the basal levels of the LV and RV is independent of both age and sex, within an important clinical age span of 42-87 years, in healthy subjects. The results indicate that strain echocardiography is a feasible method to study cardiac function.

MYOCARDIAL VELOCITY IMAGING (DMI) – LV FUNCTION

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Women have a higher regional systolic shortening than men: a strain rate imaging study in healthy subjects

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Background: Myocardial Velocity Imaging (MVI) allows the accurate measurement of regional longitudinal velocities, strain rate and strain. Normal values have been established by several groups, however no significant gender differences could be demonstrated for the measurement of strain rate and strain. The aim of this study was to evaluate gender differences in regional systolic velocities, strain rate and strain in a larger sample size than previously reported.

Methods: Colour Doppler Imaging data (GE, System 7) was acquired (>140 fps) for the analysis of regional longitudinal myocardial deformation. MVI parameters were analysed in 1305 segments from 95 male and 679 segments from 54 female hearts (age 17-79 y) using dedicated software (SPEQLE, Leuven, Belgium). The subjects were volunteers free of any known cardiovascular disease based on a thorough history, physical examination and a normal electrocardiogram. Peak systolic velocity, strain rate and strain were averaged over all segments per patient. LV size, volume, stroke volume, ejection fraction and cardiac output were calculated with standard grey-scale M-mode echocardiography. An unpaired t-test was used to evaluate statistical significance (p<0.05).

Results: As expected, male subjects were taller and heavier, had a higher end-diastolic LV size and volume, stroke volume and cardiac output. When corrected for body surface area (BSA), all these differences disappeared. Female subjects had a higher heart rate (shorter R-R interval) but a longer....
164 Influence of aging and gender on the ratio of early diastolic mitral inflow velocity to early diastolic annular velocity in normal population and derived from quantitative 2-D colour tissue Doppler

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Purpose: The ratio of early diastolic mitral inflow velocity (E) to early diastolic tissue Doppler (TDI) annular velocity (E'), or E/E', is an index of diastolic function. Pulsed wave (PW) TDI measures peak E' and normal range for E/E' has been reported. Colour TDI measures mean E' with different normal range for E/E'. The aim of this study was to obtain normal range for colour TDI derived E/E'.

Methods: Seventy-four healthy controls (age range 24 to 86 years) underwent 2-D colour TDI. E' was measured at septal and lateral sites in apical 4-chamber view and E was then calculated.

Results: Controls were classified into 5 age groups: <50, 50 to 59, 60 to 69, 70 to 79 and >79 years. Septal and lateral annular E' (mean±standard deviation) were respectively (cm/s): 7.1±1.6, 5.1±0.65, 5.01±1.40, and 4.87±1.52. Mean E/E' for septal and lateral annular velocities were 11.7±2.7, 12.77±2.53, 13.07±3.01, and 13.55±3.42, 13.54±2.15, 13.07±2.53, 13.71±3.01, 13.54±3.42, 13.48±4.91, 14.59±2.55, 15.43±6.21. Mean values for septal and lateral E/E', subdivided according to gender are shown in figure1. Median septal E'was less than lateral E' in all groups except in septal E/E' where the possible gender differences were not found.

Conclusion: Colour TDI derived E/E' is higher than published normal ranges obtained by PW TDI. It increases with age, and is higher in women. This should be taken in account while assessing diastolic function of heart.

165 Determinants of subclinical left ventricular dysfunction in premenopausal obese women

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Several lines of evidence suggest that obesity may lead to left ventricular (LV) dysfunction. However, the exact pathomechanism and the influence of potential contributors remain still elusive.

Aim: To investigate LV function in premenopausal obese women with and without insulin resistance (IR) and to establish determinants of potential alterations in LV performance.

Methods: 168 women aged 28.2±4.7 with >30 kg/m2 and without other comorbidities underwent echocardiographic LV strain/strain rate study as well as assessment of metabolic, inflammatory and biochemical markers including serum glucose, insulin, hs-CRP, lipoproteins, urinary albumin excretion (UAE). The prospective study protocol was divided into two groups -with and without IR estimated by the homeostasis model assessment.

Results: We found out significantly longer longitudinal systolic strain, peak systolic strain rate (SRs) and peak early diastolic strain rate (SRe) in IR women as compared with those without IR indicating both systolic and diastolic LV dysfunction. SRs was independently predicted by fasting insulin (beta =-0.30, p<0.003), UAE (beta =-0.38, p <0.0001), hs-CRP (beta =-0.26, p<0.006) and apolipoprotein B/apolipoprotein A1 (beta =-0.18, p<0.04), whereas SRe by fasting insulin (beta =-0.24, p<0.01), UAE (beta =-0.41, p<0.0001), apolipoprotein A1 (beta = 0.31, p<0.001) and hs-CRP (beta =-0.22, p<0.02).

Conclusions: LV dysfunction in premenopausal obese women is determined by the presence of IR and subclinical inflammation. Independent predictors of abnormalities of LV performance are fasting insulin, UAE, hs-CRP, apolipoprotein A1 and apolipoprotein B/apolipoprotein A1.

166 Longitudinal diastolic myocardial functions are affected by obesity in young people: a study of color tissue doppler imaging

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119 Mayis University, Cardiology Dept., Samsun, Turkey

Aim: Obesity is associated with increased cardiovascular morbidity and mortality. In this study, we compared left ventricular diastolic functions in young obese adults (body mass index=BMI >30 kg/m2) with those in young non-obese adults (BMI <30 kg/m2) by color tissue doppler parameters.

Material and methods: There were 18 adults with BMI 730 kg/m2 (mean age 29 ±4 years) and 18 adults with BMI <30 kg/m2 (mean age 28 ±2 years). All cases were both 20 and 35 years old. Mean E was 38.8±6.5 cm/s in the obese group whereas that was 24.3±4 kg/m2 in the non-obese group. For color 2-dimensional tissue Doppler imaging, sample volumes were placed on the mid left ventricle in the inlet of the myocardium at the septum, lateral, inferior, and anterior walls. The peak early diastolic strain rate (E-SR), peak late diastolic SR (A-SR), peak early diastolic tissue velocity (E-TV) and peak late diastolic TV (A-TV) values were measured. In addition, E-SR/A-SR and E-TV/A-TV ratios were calculated.

Results: E-SR, A-TV, E-SR/A-SR and E-TV/A-TV values were significantly different between the groups (Table 1). Although there was a trend towards higher A-SR and towards lower E-TV in the obese adults, they were not reaching the statistical significance (Table 1).

Conclusion: Obesity in young people causes significant alterations at left ventricular longitudinal diastolic myocardial function parameters evaluated by color tissue doppler imaging. These results may indicate early changes in cardiac structure and function in young obese adults.

Table 1

<table>
<thead>
<tr>
<th>E/SR (1/sec)</th>
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<tr>
<td>2.1±0.7</td>
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FUNCTION – OTHER

167 Comparative analysis of integrated backscatter data obtained with two different imaging and analysis systems

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Background: Ultrasonic myocardial integrated backscatter (IBS) has been demonstrated to reveal changes within the myocardium at pre-clinical stages in conditions such as diabetes, obesity, and ischemia. Traditionally, IBS for tissue variation (CV) measurements have been obtained using the Acoustic Densitometry™ (AD) software package from Philips imaging system. We sought to determine whether the imaging and analysis package available from GE-Vivid 7 system offers comparable results in IBS measurements.

Methods: We measured the magnitude of the systolic-to-diastolic CV of myocardial ultrasonic integrated backscatter in the septum and posterior wall in 16 healthy volunteers ages 23 to 53. Simultaneous measurements were obtained with both the Philips 5500 system and the GE-Vivid 7 system for each subject. The AD software package was utilized for the image analysis of the Philips 5500 system and the Echopac software was utilized for the image analysis of the GE-Vivid 7 system.

Results: The CV measurements obtained by the two different systems and analysis packages were comparable and not significantly different. Mean
164 Influence of aging and gender on the ratio of early diastolic mitral inflow velocity to early diastolic annular velocity in normal population

W. Khan1; A. Borg1; S. Deepak1; D. Fox1; S.G. Williams1; N.H. Brooks1; M. Przewlocka-Kosmala1; G. Bednarek-Tupikowska1; W. Mazurek1

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2St. Louis, Department of Medicine, University of Missouri-Columbia, Missouri, United States of America

Purpose: To investigate LV function in premenopausal obese women with and without insulin resistance (IR) and to establish determinants of potential alterations in LV performance.

Methods: Seventy-four healthy controls (age range 24 to 86 years) underwent 2-D colour TDI. E' was measured at septal and lateral sites in apical 4-chamber view and E/e' was then calculated.

Results: Controls were classified into age groups: <50, 50 to 59, 60 to 69, 70 to 79 and ≥80 years. Septal annular E' (mean±standard deviation) were respectively (cm/s): 7.1±1.6, 5.8±0.6, 5.0±1.4, 4.8±1.2 and lateral annular E' 9.8±3.5, 7.8±1.6, 7.5±1.4, 7.3±1.1. Mean values for septal and lateral E/e' were 11.0±4.8, 9.6±3.9 and 16.6±6.5, 16.3±5.7, respectively. Differences in E/e' were significant between the groups (Table 1). Although there was a trend towards higher A-SR in the obese group, they did not reach the statistical significance (Table 1).

Conclusion: Obesity in young people causes significant alterations at left ventricular longitudinal diastolic function parameters evaluated by color tissue doppler imaging. These results may indicate early changes in cardiac structure and function in young obese adults.

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W. Kosmala1; R. Plaks1; J. Kulickowska-Plaks2; M. Przewlocka-Kosmala1; G. Bednarek-Tupikowska1; W. Maziorek3

1Medical University, Cardiology Dept., Wroclaw, Poland
2Medical University, Cardiology Dept., Samsun, Turkey
3University of Missouri-Columbia, Missouri, United States of America

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119 Mayis University, Cardiology Dept., Samsun, Turkey

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