with persistent mid-to-late diastolic diameter reduction and increased intracellular myocardial bridges are responsible for a sub-maximal coronary flow reserve in the distal vessel and for clinical symptoms and signs of myocardial ischemia. We sought to approach for quantitative echocardiographic assessment of myocardial function in patients with myocardial bridge by 2-dimensional strain, novel software.

Methods: Novel computer software for tissue tracking echocardiography for advanced wall-motion analyses were performed in 18 symptomatic patients (mean age 57 ± 9.7 years, 10 females) with myocardial bridging of left anterior descending coronary artery. The mean luminal diameters at the site of the myocardial bridge were 2.0 ± 0.5 cm. Maximal lumen diameter reductions were evaluated by quantitative coronary angiography, and there were no angiographic signs of coronary artery disease. 2-dimensional strain is on the basis that the data suggest that a discrete set of tissue velocities are present per each of such small elements on the ultrasound image.

Results: The maximal angiographic systolic lumen diameter reduction within the myocardial bridge was 92.25% at rest, with persistent diameter reduction of 91.11%. Conventional wall-motion scoring was normal in all patients, and they were adequately exercised by the exercise test. Radial strain and displacement of anterior segments were significantly reduced than posterior segments at the papillary muscle level (50 ± 13.9% vs 51 ± 17.3% and 4.7 ± 0.9 vs 5.2 ± 1.5, respectively, p < 0.05, and showed plateau (30% and 30%) or biphasic (50% and 50%) patterns. Peak rotation angle was significantly reduced or positive direction in anterior segments at the systolic phase than posterior segments at papillary muscle level (2.4 ± 0.7 vs -3.2 ± 0.4, respectively, p < 0.05). Time from R wave on electrocardiography to transition from regional systolic to early diastolic lengthening (TR) were significantly delayed in patients with myocardial bridge than controls (497 ± 20 ms vs 348 ± 12.5 ms, p < 0.05).

Conclusion: Delayed systolic contraction and diastolic relaxation is an important mechanism contributing to ischemia in patients with myocardial bridge. 2-dimensional strain can accomplish real-time wall-motion analysis, and has the potential to improve identification and functional quantitation of myocardial bridge.

667 Two-dimensional strain imaging predicts left ventricular remodeling in patients with first myocardial infarction
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Background: Left ventricular remodeling is a complex pathological process of progressive dilatation, leading to systolic dysfunction and heart failure in patients with acute myocardial infarction. We aimed to determine and evaluate myocardial strain echocardiographic parameters, predicting cardiac remodeling process in patients with the first myocardial infarction.

Methods: Forty-five patients, mean age 58.2 ± 11.0 years with a first ST segment elevated acute myocardial infarction were included in the study. Conventional echocardiography with tissue Doppler, mitral color M-mode imaging and strain imaging were performed during initial hospital admission and after 6 month. Peak systolic myocardial velocities (Sml) were recorded from 4 different sites on the mitral annulus corresponding to the septum, lateral, inferior and anterior sites of the left ventricle by pulsed wave Doppler tissue imaging. A mean mitral annular systolic velocity (MVA) value was calculated from these sites. E/A' and E' values, which were derived from transmural flow velocities, tissue Doppler and mitral color M-mode flow propagation velocities were calculated. Left ventricular systolic myocardial deformation indexes (RD) values were measured from 12 segments (apical 2 and 4 chamber loops), and a mean value was calculated from those measurements. The remodeling group was composed of 19 patients, and defined as an increase in left ventricular systolic ejection-fracture time of more than 5 mms from baseline by using modified Simpson method. We compared basal clinical features, classical echocardiographic and new tissue Doppler indices of cardiac function as predictors of LV remodeling. Results: There was no difference in the baseline characteristics or LV ejection fraction (56.7 ± 7.9% vs 56.5 ± 8.5%) between groups. E/A' and E' values were similar in both groups. MVA values were lower in the remodeling group (9.5 ± 12.1 vs 12.0 ± 12.1, p < 0.05). A cut off value of MVA < 9.5 was sensitive 90%, specificity of 61.7% in predicting left ventricular remodeling.

Conclusions: These findings indicate that in patients with first acute myocardial infarction 2-dimensional strain imaging by an accurate noninvasive and quantitative tool for prediction of post-infarct remodeling.

668 Comparative usefulness of myocardial velocity gradient and tissue Doppler imaging in detecting ischemic myocardium by dobutamine challenge in patients with single vessel coronary artery disease
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Background: Tissue Doppler imaging is a new quantitative technique for identification of CAD as it improves the results of DSE in less expert readers. However, increased translational motion during a dobutamine challenge may affect the result of the endocardial velocities. Myocardial velocity gradient (MVG) is an indicator of regional velocities and is independent of endocardial movement.

Objective: We sought to assess the clinical significance of MVG in detection of ischemic myocardium in patients with single vessel disease.

Methods: we studied thirty patients with confirmed single vessel coronary artery disease undergoing successful reperfusion protocol. We measured the systolic & diastolic endocardial velocities at rest and at high dose dobutamine. We measured the MVG at rest, low dose (10µg/kg/min) and at high dose (30µg/kg/min) dobutamine. Results: While pulse wave-TDI could detect significantly different in the systolic velocities in the ischemic basal & mid territories at rest, it failed to detect statistically significant difference between the ischemic & non-ischemic territories in the systolic velocities at peak stress. There was no statistically significant difference in the systolic velocities in the ischemic and non ischemic territories at peak stress except in the inferior and posterior walls that showed significant decrease in the ischemic territories velocity. So PW-TDI could differentiate between the ischemic and non ischemic territories in the systolic velocities at baseline and at peak stress. The differences were statistically significant. MVG failed to distinguish the ischemic from non-ischemic segments at the rest study. At low dose dobutamine mean MVG in ischemic mid anterior septal segment was (1.7±0.5) vs (2.7±0.7) for the corresponding non-ischemic mid anterior septal segments, (P<0.05). Also the mean MVG in the ischemic mid posterior segments at low dose was (2.0±5) vs (3.4±0.7) in the corresponding non-ischemic mid posterior segments, (P<0.05). So, MVG could differentiate the ischemic and non-ischemic segments at low dose dobutamine stress. Mean while, the response of MVG to dobutamine could differentiate the ischemic, non-ischemic territories. In this study we could create a potential cutoff value of mean MVG for differentiating the ischemic segments in the mid-anterior septal segments equals 1.7 and in the mid posterior segments equals 1.95.

Conclusion: Detecting the mean MVG with sub-maximal dobutamine protocol would be a very safe and sensitive method of detecting ischemic myocardium in patients with single vessel disease.

669 Association between left ventricular hypertrophy and prognosis in patients with acute myocardial infarction undergoing successful repertusion
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The association of left ventricular hypertrophy (LVH) and adverse prognosis in patients following acute myocardial infarction (AMI) remains controversial. The ratio of early transmural flow velocity (E) to early diastolic mitral annulus velocity (E/E') and plasma B-Type Natriuretic Peptide (BNP) are associated with elevated left ventricular (LV) filling pressures and share a well documented prognostic value in AMI patients. The present study was designed to estimate the association of LVH with E/E' and BNP in the setting of AMI.

Methods: Fifty-five patients (mean age 58±12, 48 males, mean Ejection Fraction 41±12%) with a first anterior ST segment elevation AMI, who underwent successful repertusion, with thrombolyis, angioplasty or surgery, comprised the study population. Hypertrophy was assessed by the thickness index, calculated as the difference of the epicardial and endocardial radius, obtained by 2D echo LV filling pressures were estimated by assessing E/E' index. Additionally, BNP plasma levels were recorded at the same day, using a specific immunocassay. Furthermore, LV Ejection fraction (EF), wall motion index (WMI), left ventricular end-systolic volume index (ESVI) and systolic (Sm) and late diastolic (Am) mitral annulus velocities and their ratio were measured. All variables were reassessed 3 months following discharge.

Results: A statistical significant positive correlation was documented between thickness index and BNP levels (r=0.46, p=0.012) and E/E' (r=0.383, p=0.05) while a negative correlation was evidenced with E/Am ratio at baseline (r=-0.447, p=0.017) and at follow up (r=-0.703, p=0.001). No correlation was observed between the grade of hypertrophy and systolic or remodeling indices. Regression analysis revealed that BNP levels (b=0.81, p=0.002) and E/Am (b=2.88, p=0.009) were the major predictors of LV hypertrophy.

Conclusions: LVH is associated with elevated LV filling pressures early after repertusion in AMI patients with a relative preserved systolic function and may represent an independent risk factor in this specific cohort of patients. Having no major effect on systolic performance and on LV geometry, this effect may be attributed to LV diastolic relaxation impairment and possibly to repertusion injury.

670 Assessment of regional left ventricular diastolic function in patients with preserved systolic function before and after angioplasty-TDE study
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Objective: Distortion of left ventricular diastolic function is an early sign of ischemia. Tissue Doppler Echocardiography (TDE) allows regional assessment of diastolic function. To assess the influence of coronary angioplasty (CA) on regional diastolic function, we compared changes of conventional and tissue Doppler echocardiographic parameters in patients before and after angioplasty by means of TDE.

Methods: Studied group comprised 31 males and 9 females (age 49±8.6 yrs), who were preserved systolic function patients, who underwent coronary angioplasty and were divided into two groups: group I – artery stenosis < 70%, group II – artery stenosis > 70%. Regional wall diastolic function was assessed by TDE one day before (exam 1) and 2 days after successful CA (exam 2). TDE myocardial diastolic velocities (E’ and Am wave, E/A and Am ratio) and time intervals (systolic acceleration time - IVT, early filling time - IF, atrial filling time - AF) were measured in the long axis.

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Results: Regional Em was increased between exam 1 and 2 for the whole group (0.61 ± 0.15 vs 0.65 ± 0.17, p < 0.05), but in separating groups only for group II (0.60 ± 0.15 vs 0.65 ± 0.17, p < 0.01), the same as Em/Atm ratio (0.10 ± 0.0 vs 0.13 ± 0.0, p > 0.05). There were no significant changes in Am, RFT and AFT IRT for any patient. TDI data showed that 100% of segments were assigned to group II (121±92 ms vs 97±92 ms, p < 0.01). Differences in Em and IRT were noted between groups in first examination (0.66±1.2 cm/s vs 0.62±1.5 cm/s, p < 0.01 and 95±25 ms vs 125±105 ms, p < 0.05, respectively). After successful angioplasty there were no differences between assessed parameters.

Conclusions: In patients with coronary artery stenosis after successful CA regional diastolic function showed improvement as assessed by TOE. Significant improvement of diastolic function was apparent only for significant stenosis (> 70%).

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Doppler-derived indexes of left ventricular function predicts cardiac allograft vasculopathy in heart transplantation recipients with normal coronary angiograms

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Cardiac allograft vasculopathy (CAV) is the main limiting factor of long-term survival after heart transplantation (HT). Aim of this study was to determine whether Doppler-derived indexes of left ventricular (LV) function have any value in predicting CAV onset in HT patients with normal coronary angiograms. We studied 145 stable HT patients (65 men, age 58 ± 13 years, follow-up 164 ± 6 years) without any angiographic lesion. Mean DT and Tel indices were 140-4-31 ms and 0.454-0.18 respectively. Mean follow up from Doppler examination to angiography was 36 ± 6 months. Kaplan-Meyer analysis was used for the probability of CAV onset. Log rank method was used for the comparison of curves. Multivariate analysis was performed by Cox regression model. A p-value < 0.05 was considered to be significant. The study comprised patients with normal coronary angiograms, and excluded patients with any previous event of CAV, and those with a previous history of myocardial infarction. A total of 71 patients were studied.

Results: Significant differences between groups were observed for LV ejection fraction (63±4 vs 65±4, p < 0.01), free from acute rejection (AIR) and without CAV. Doppler parameters were mitral diastolic deceleration time (DT) and Tei index, defined by subtracting ejection time from the time between cessation and onset of mitral inflow and dividing by ejection time. CAV was defined as any angioscopic lesion. Mean follow up from Doppler examination to angiography was 36 ± 6 months. Kaplan-Meyer analysis was used for the probability of CAV onset. Log rank method was used for the comparison of curves. Multivariate analysis was performed by Cox regression model. A p-value < 0.05 was considered to be significant. The study comprised patients with normal coronary angiograms, and excluded patients with any previous event of CAV, and those with a previous history of myocardial infarction. A total of 71 patients were studied.

Conclusions: The purpose of this study was to determine the influence of the number of transplanted monoculture bone marrow cells (MBM) on myocardial function in patients after acute myocardial infarction (MI).

Methods: The study comprised patients with the first acute MI treated with coronary angioplasty and stent implantation (resultant TIMI III flow). Only patients with the evidence of irreversible damage of infarcted myocardium proved by dobutamine echocardiography and/or wall motion score index by TDE. The patients were newly admitted to 3 groups: Group A patients (n = 16) were transplanted with a higher number of MBM (100 000 000 cells). Group B patients (n = 15) received a lower number of MBM (10 000 000 cells). Twenty patients who were not treated with cell transplantation were served as controls (Group C). Cell transplantation was performed by intracoronary catheter implantation: 5 days after the onset of MI. Longitudinal myocardial velocities of cells was determined by Doppler tissue imaging 1-4 days before the cell transplantation and 3 months later.

Results: The peak systolic velocity of the longitudinal contraction of infarcted wall (Sa) increased from 1.8 cm/s to 5.0 cm/s in group A (p < 0.01), but did not change significantly in groups B (from 4.5 cm/s to 4.8 cm/s, p = NS) and C (from 4.9 cm/s to 4.7 cm/s, p = NS). The differences in pre- and post-transplant values of Sa differed significantly among groups A and B (p < 0.05) and A versus C (p < 0.01). The peak early diastolic velocity of the longitudinal contraction of infarcted wall (Ea) increased in groups A (from 4.9 cm/s to 5.6 cm/s, p = 0.06) and B (from 4.5 cm/s to 5.5 cm/s, p < 0.05) but did not change significantly in group C (from 5.1 cm/s to 5.6 cm/s, p = NS). The post-transplant changes in Sa did not differ among the groups (all p = NS).

Conclusion: Intracoronary implantation of MBM improves regional myocardial systolic function of the acutely infarcted myocardium in a dose-dependent manner.

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Speckle tracking, a powerful tool for the detection of myocardial ischemia: a pilot study in the catheterization laboratory during PCI

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Background: The novel 2D strain modality, using speckle tracking analysis, has allowed for detection of myocardial movement and deformation in both longitudinal and transversal direction during 2D echocardiography, thus allowing for measurement of both radial and circumferential myocardial velocities. Animal studies and case reports have indicated that circumferential strain and strain rate analyses in short axis view might be a sensitive marker of myocardial ischemia. In order to study the ischemic response in radial compared to circumferential myocardial deformation we performed a study during ten balloon inflations in the catheterization laboratory during invasive PCI procedures.

Methods: Recordings using speckle-tracking software (2D strain) were collected during balloon inflation in parasternal short axis view at the papillary muscle level. Post processing of one heart cycle from the recording made at each two time points, the first at the start of balloon inflation, and the second heart cycle immediately before deflation. The echocardiographic equipment used for the study was GE Vivid 7. Speckle tracking analyses was made using the GE Echocap workstation. Calculation of maximum percentage decrease in circumferential and radial strain, displacement and rotation were made in the ischemic area, as well as measurement of maximum time delay of peak motion in respective area, compared to before the balloon was inflated.

Results: All parameters showed statistically significant changes during ischemia. Both circumferential and radial strain, displacement and rotation decreased significantly during ischemia, 36±23%, 27±23%, 42±27%, and 49±27%, respectively. Peak-values of radial and circumferential strain, as well as radial displacement and the timing of maximal rotation were significantly delayed during ischemia, at mean from 70±19 ms to 202±101 ms. The most consistent changes in this study were increase of peak rotation and peak rotation time and the timing of maximal rotation and radial strain.

Conclusion: Decrease in regional circumferential strain and rotation as well as delay in time in maximal regional strain and delayed maximal rotation seem to be more sensitive parameters for detecting ischemia compared to radial displacement, strain and delay in maximal radial strain.