Background: Myocardial velocity gradient or strain rate has been used to assess regional myocardial contraction. However these methods are susceptible to noise since they are defined as the spatial derivative of local velocities determined by tissue Doppler imaging. Accurate Detection of Regional Contraction Using Angle-Corrected Tissue Strain and Displacement Imaging Combined With Two-Dimensional Tissue Doppler Tracking Technique

Methods: Ventricular velocity distribution was numerically modeled from the following conditions to generate the parasternal short axis TDI data: end diastolic wall thickness (10mm), linear velocity gradient with constant velocity (60mm/sec) at endocardium, and systolic wall thickness (15-25mm). A contraction point was set at the center of the left ventricular cavity and velocity was automatically angle-corrected. The myocardial velocities were obtained throughout the cardiac cycle with and without TDI technique. Then, displacement was obtained by integrating angle-corrected velocity over time. Finally, strain is obtained as spatial derivative of the displacement.

Results: Compared with the theoretically estimated values, both the error of peak position (PP) and the error of peak displacement were significantly smaller with TDD (p<0.05) than without that. TDD (PP error: TDD(+)=2.3±0.2 mm, TDD(-)=8.1±2.5 mm; peak displacement error: TDD(+)=2.3±0.1 mm, TDD(-)=1.3±0.8 mm) Similar results were confirmed with strain.

Conclusion: The newly developed angle-corrected tissue strain/displacement imaging could accurately detect the regional strain/displacement when combined with TTD. It is important to utilize 2D tissue Doppler tracking technique to obtain accurate detection of regional contraction.

Regional Myocardial Velocity Gradient and Histologic Analysis of Experimentally Altered Myocardial Energetics

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The purpose of this study was to examine if myocardial velocity gradients (MVG) could quantitate regional changes associated with experimentally altered myocardial energetics and to relate these changes to histology. Methods: Echo and tissue velocity images were obtained from 10 open-chest pigs at baseline and immediately afterwards. Regional myocardial tissue with lactate dehydrogenase (IAD), a potent inhibitor of creatine kinase (CK) and glycogenolysis dehydrogenase (GAPDH), inhibition of CK results in uncoupling myocardial contraction, reduced crossbridge cycling, and impaired calcium handling. MVG from normal and IAD infused myocardium were compared. Myocardial biopsies of normal and IAD zones were obtained, rapidly cooled, assayed for CK and GAPDH activity, and examined histologically. Results: Following IAD infusion, we observed increased echolocogenicity and wall thickness, and decreased regional wall motion. MVG analysis revealed decreased systolic shortening of the regional myocardium, and the development of regional diastolic dysfunction (post systolic shortening). Histologic findings are shown below. Enzyme analysis showed a near 100% reduction in CK and GAPDH activity occurring at a dose of 130 mg/kg myocardium. Conclusion: In this novel selective metabolic inhibition of myocardium, we demonstrate parallel changes in local function related to histologic changes and measurable by myocardial velocity gradient analysis.
silicon parameters. CC was quantified using a volumetric score and the annualized percent change was calculated. To determine its influence on progression, LDL-cholesterol, hypertension, diabetes, smoking and family history were included as independent variables in a multivariate regression analysis.

Results: Mean CC was 396 ± 692 mm3 in the initial EBT scan and 454 ± 753 mm3 at follow-up, the mean annualized progression of CC was 21.8 ± 33.9%. Only LDL (slope 0.29; 95% confidence interval 0.0-0.3%) could be identified as a predictor with an independent influence on the progression of CC. The overall data fit of the model for progression of CC was (r2 = 0.08). In a second analysis, patients were divided into quartiles according to LDL (McCabe et al, Circulation 2005). Progression of CC in the two highest quartiles (28.2 ± 22% and 43.1 ± 51%, respectively) was significantly more pronounced than in the lowest quartile (13.5 ± 24%, p < 0.01).

Conclusion: In this retrospective analysis, hypercholesterolemia was found to be a significant predictor of progression of coronary calcification. Over a wide range of LDL-cholesterol levels, progression of calcification increased with increasing LDL.

1166-57 Direct Comparison of Electron Beam Tomography and Dobutamine Stress Echocardiography for the Detection of Significant Coronary Artery Disease

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We directly compared the accuracy of electron beam tomography (EBT) and dobutamine stress echocardiography (DSE) to detect significant coronary artery disease (presence of stenosis > 70% diameter reduction).

Methods: 101 patients (43 women, 58 men; mean age 63 y) who were admitted for primary coronary angiography were studied. By EBT, coronary calcification was assessed and quantified using the Agatston Score. In addition, noninvasive coronary angiography was performed after i.v. injection of contrast agent. Presence of significant coronary artery disease (CAD) was assumed if the calcium score exceeded 400 or the contrast-enhanced EBT images displayed significant lumen reduction. DSE was performed using a standard protocol (5 to 40 µg/kg/min dobutamine plus atropine if necessary). Wall motion analysis adhered to the 16 segment model of the American Society of Echocardiography. EBT and DSE were independently evaluated and results were compared to invasive coronary angiography.

Results: In EBT, 2 patients and in DSE, 7 patients were unevaluable and excluded from analysis. In the remaining 92 patients, 41 (45%) showed significant CAD by invasive angiography, EBT demonstrated higher sensitivity but lower specificity than DSE for the detection of significant CAD (see table). By combining EBT and DSE, the sensitivity increased to 96% with a specificity of 59%.

Conclusion: In a direct comparison, EBT demonstrated higher sensitivity but lower specificity than DSE for the detection of significant CAD.

Sensitivity Specificity Accuracy Positive Predictive Value Negative Predictive Value

EBT 90% (37/41) 73% (37/51) 80% (74/92) 73% (37/51) 90% (37/41)

DSE 73% (37/51) 92% (74/92) 73% (37/51) 73% (37/51)

EBT and DSE 95% (37/39) 56% (20/35) 76% (30/40) 66% (19/30) 97% (28/28)

1166-58 Coronary Calcium Predicts Presence and Extent But Not Localization of Exercise-Induced Myocardial Perfusion Defects

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Background: Coronary calcium determined by electron-beam computed tomography (EBCT) represents underlying coronary atherosclerotic plaque burden. Myocardial perfusion scintigraphy examines the physiologic consequences of flow-limiting stenoses. EBCT and Scintigraphy may yield complementary information, but the relationship between the topographic distribution of calcified plaques and scintigraphic perfusion defects has not been assessed.

Methods & Results: One-hundred and twelve patients (53 ± 10 years, 63% men) with suspected coronary artery disease underwent EBCT and Thallium-scintigraphy (rest and bicycle-exercise) using a digital triple head scanner within one day. The EBCT-derived calcium score (Agaston criteria) was calculated for each of the major coronary arteries. Scintigraphic redoundocile redistribution, paradoxical distribution, and lack of uptake were scored on a scale from 0 - 4 in each of 28 myocardial segments. An overall perfusion score representing the number of diseased segments was computed. This score was also separately calculated for the perfusion territory of the major coronary arteries. In a multivariate analysis incorporating age, sex, the established coronary risk factors, and the EBCT calcium score, the latter was the only independent predictor of the perfusion score (r = 0.29, p < 0.004). Fourteen patients with a calcium score > 400 all had 5 or more segments with perfusion defects. The highest calcium score was most frequently observed in the LAD (42%), whereas the highest perfusion score was most frequently observed in the RCA-territory (49%). In a patient analysis, there was no relationship between the major coronary artery with the highest calcium score and the myocardial perfusion territory with the highest score.

Conclusion: Overall coronary calcium plaque burden as determined by EBCT is associated with exercise-induced myocardial perfusion defects but is unable to predict their localization. Even extensive localized plaque formation does not necessarily result in a myocardial perfusion defect.