

(12 segments in apical view) was independently assessed in both methods. Results: Heart rate increased from 68 bpm at baseline to 135 bpm (87% of age predicted maximal heart rate) at peak stress. CK image was successfully obtained in all patients at baseline and 33/36 patients at peak stress. CK tracked endocardial motion accurately in 93% (402/432) of LV segments at baseline and 86% (371/432) at peak stress. Concordance rate of normal and abnormal WM between two methods was 86% (344/402, Kappa 0.59) at baseline and 84% (313/371, Kappa 0.56) at peak stress. Among 33 patients who had completed both methods, standard quad screen display showed abnormal DSE results in 13/33 patients and 21/99 vascular territories. Sensitivity, specificity and diagnostic accuracy of CK for detecting abnormal findings were 69% (9/13), 90% (18/20) and 82% (27/33) in patients and 57% (12/21), 96% (75/78) and 88% (87/99) in vascular territories. Conclusion: The application of CK was highly feasible during contrast-enhanced DSE and would provide objective assessment of WM. This method may result in a valuable adjunct to conventional visual interpretation of DSE.

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Risk Stratification and Prognosis in Patients With Known or Suspected Ischemic Heart Disease: A Stress Echocardiographic Study of 1,425 Patients

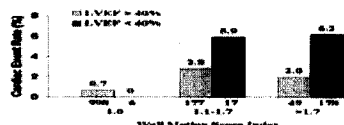
Siu-Sun Yao, Marcin Kowalski, Asif Malik, Ramzan Zakir, Ehtasham Qureshi, Vijay Patel, Binoy Singh, Farooq A. Chaudhry, *St. Luke's Roosevelt Hospital Center and Columbia University, New York, New York*.

Background: Stress echo is an established technique for the diagnosis of CAD. However, risk stratification and prognosis using stress echo are not defined.

Methods: We evaluated 1425 pts (59±13 yrs, 51% male) undergoing stress echo (34% treadmill, 66% dobutamine). Resting left ventricular ejection fraction (LVEF) and regional wall motion was assessed by consensus of 2 readers. LV was divided as standard 16-segment model, 5-point scale for wall motion. Peak wall motion score index (WMSI) following stress was derived from cumulative sum score of 16 segments divided by number of visualized segments. 1 year followup (mean 2.6±0.9 yrs) for confirmed myocardial infarction (n=11) and cardiac death (n=14) were obtained.

Results: By univariate analysis, peak WMSI ($p<0.0001$) and LVEF ($p<0.0001$) were significant predictors of cardiac events. Peak WMSI effectively risk stratified pts into low (0.7%), intermediate (3.1%) and high risk (5.3%) groups for cardiac events ($p<0.0001$). An LVEF threshold of 40% provided further risk stratification of mild to moderately (WMSI=1.1-1.7) and markedly (WMSI>1.7) abnormal studies [graph]. In a multivariate logistic regression model, LVEF superceded peak WMSI as the best independent predictor of cardiac events ($p=0.0035$).

Conclusions: Stress echo yields incremental prognostic information for risk stratification of pts. A normal stress echo (peak WMSI=1.0) confers a benign prognosis (0.7% event rate). Peak WMSI>1.7 and LVEF<40% are independent markers of poor prognosis.



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Noninvasive Diagnosis of Restenosis by Transthoracic Doppler Echocardiography After Percutaneous Coronary Intervention: Comparison With 201-Tl SPECT

Kumiko Hirata, Hiroyuki Watanabe, Koutaro Tokai, Ryo Otsuka, Takashi Muro, Masakazu Teragaki, Junichi Yoshikawa, *Osaka City University Medical School, Osaka, Japan*.

Background and Purpose: Coronary flow velocity reserve (CFVR) determined by transthoracic Doppler echocardiography (TTDE) is useful for the physiologic assessment of coronary artery stenosis. However, feasibility of this method in diagnosing restenosis has not been evaluated, which plays a crucial role in treatment of the patient after PCI. Therefore, the purpose of this study was to diagnose the restenosis after PCI using CFVR measurement by TTDE. **Methods:** We studied consecutive 53 patients six months after successful PCI for the LAD lesions for relief of stable angina pectoris. The flow velocity in the distal LAD was measured by TTDE both at rest and during intravenous infusion of adenosine. CFVR was calculated as the ratio of hyperemic to basal mean diastolic flow velocities. We defined reversible perfusion defect in exercise TI-201 single-photon emission computed tomography (SPECT) as a physiological diagnostic of restenosis. The CFVR measurements by TTDE were compared with the results of SPECT. **Results:** Complete TTDE data were acquired for 51 of 53 study patients. Contrast agent was used to obtain adequate Doppler signals in 6 patients. There were 9 patients with CFVR<2, 42 patients with CFVR≥2. Of these 51 patients, TI-201 SPECT confirmed reversible perfusion defects in the LAD territories in 10 patients. CFVR<2 predicted restenosis determined by TI-201 SPECT, with a sensitivity and specificity of 100% and 90%, respectively. **Conclusions:** Noninvasive measurement of CFVR by TTDE accurately reflects physiological severity of coronary narrowing due to restenosis after PCI. This method has possibility to decline the number of unnecessary TI-201 SPECT following PCI.

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Segmental Early Relaxation Phenomenon in Stress Echocardiography Incidence, Clinical Features, and Patient Demographics of a Distinct Phenomenon: A Pilot Study

Omar Obsaidat, Karthik Ananthasubramaniam, Mohsin Alam, Muhammed Arida, Mouaz Al-Mallah, *Henry Ford Heart and Vascular Institute, Detroit, Michigan*.

Background: Segmental Early Relaxation Phenomenon (SERP) is a sudden localized outward bulging of a portion of left ventricular (LV) wall occurring in the early phase of isovolumic relaxation period. We conducted a study to address the incidence and clinical features of SERP in stress echocardiography.

Methods: Digitized Echocardiographic images of 244 consecutive patients (pts) undergoing exercise or dobutamine echocardiography were analyzed. Pts with Left bundle branch block, poor endocardial visualization or needing contrast were excluded. SERP was diagnosed by using frame by frame analysis of LV wall motion after peak systole prior to mitral valve opening at rest and post stress.

Results: Stress associated SERP was observed in 71 (29.1%) pts, 25 pts had more than one segment involved. Only 5 pts had resting SERP with 2 persisting with stress. Only 96 of 3658 analyzed segments were positive for SERP. The apical septum was most commonly involved (49%) and mid septum in 18%. Only 5/96 (5.2%) had new hypokinesia and SERP in the same segment. Patients with SERP had a lesser incidence of hypertension than those without.

Conclusions: 1. SERP is a distinct and relatively common stress echocardiographic phenomenon regardless of type of stress, predominantly seen in apical septum. 2. It should not be mistaken for atypical septal motion or ischemic response and seems not related to previous history of coronary disease. 3. Angiographic correlation is needed to delineate its true clinical and prognostic significance.

Patients Characteristics

Variables	SERP(71)	No SERP (173)	P-value
Exercise Echocardiography	61(86%)	133(77%)	NS
Dobutamine Echocardiography	10(14%)	40(23%)	NS
AGE (mean years)	54	58	0.32
SEX (males %)	56%	50%	0.48
Hypertension	45%	58%	0.015*
Diabetes	17%	17%	NS
Hyperlipidemia	38%	51%	NS
History of coronary artery disease	13%	20%	0.20
Smoking	27%	28%	NS
Ejection Fraction %(mean)	52%	52%	NS
EKG changes with stress	18%	12%	0.16

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The Effect of Dobutamine Stress on Ejection and Filling Hemodynamics in Dilated Cardiomyopathy

Allison Duncan, Christine O'Sullivan, Michael Henein, Derek Gibson, *The Royal Brompton Hospital, London, United Kingdom*.

Aim: To study the effect of pharmacological stress on ejection and filling times in patients with dilated cardiomyopathy (DCM) and impaired activation.

Methods: 59 DCM patients were studied during dobutamine stress: 34 ischemic DCM (20 normal activation, IsDCM-NA, and 14 left bundle branch block, IsDCM-LBBB) and 25 idiopathic DCM (15 IdDCM-NA and 10 IdDCM-LBBB). LV ejection and filling times were assessed using Doppler echocardiography (expressed in s/min).

Results: In IdDCM-NA, ejection and filling times increased with stress (19 ± 2 to 22 ± 4 , and 29 ± 4 to 31 ± 5 s/min respectively, both $p<0.005$), so that total isovolumic period (TIP) fell (13 to 6 s/min, $p<0.001$). In IdDCM-LBBB, filling time, and thus TIP, were 7 s/min shorter than IdDCM-NA at rest ($p<0.001$). With stress, ejection and filling times increased (18 ± 3 to 22 ± 2 , and 22 ± 4 to 27 ± 4 s/min respectively, both $p<0.005$), so that TIP fell (20 to 11 s/min, $p<0.001$). The fall in TIP correlated with QRS shortening (IdDCM-NA: 99 ± 8 to 95 ± 14 ms, $p<0.001$, $r=0.87$; IdDCM-LBBB: 164 ± 14 to 156 ± 14 ms, $p<0.01$, $r=0.91$). Ejection and filling times were similar in IsDCM-NA compared to IdDCM-NA at rest. Filling time did not change with stress, and although ejection time increased (20 ± 2 to 22 ± 2 s/min, $p<0.005$), TIP (11 s/min at rest) failed to fall. In IsDCM-LBBB, ejection and filling times were shorter at rest than IsDCM-NA (18 ± 3 s/min, $p<0.01$, and 22 ± 4 s/min, both $p<0.001$) and neither increased with stress. At peak stress TIP was 20 s/min (9 s/min longer than IdDCM-LBBB and 11 s/min longer than IsDCM-NA, both $p<0.001$). QRS duration broadened in IsDCM-NA (96 ± 12 to 102 ± 12 ms, $p<0.01$), but did not change in IsDCM-LBBB. There was no correlation between QRS and TIP in either ischemic group. **Conclusion:** In DCM, LBBB reduces the time available for ejection and filling at rest. In IdDCM, QRS shortening is associated with a fall in the isovolumic period at peak stress, irrespective of resting activation. By contrast, in IsDCM, the isovolumic period is unaltered during stress. When coronary disease and LBBB are combined, one-third of the cardiac cycle at peak stress is neither ejecting nor filling, which may explain the impaired cardiac output response to tachycardia in these patients.

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Histological Dedifferentiation Associated With Functional Dedifferentiation Identified With Dobutamine Stress in a Pig Model of Chronic Ischemia

Monika Szilard, Xiaoshun Liu, Yanming Huang, Eric Verbeken, Frans Van De Werf, Ivan De Scheerder, *University Hospital Gasthuisberg KU Leuven, Leuven, Belgium*.

Dobutamine stress (DSE) is a standard method used to detect myocardial viability in patients with chronic LV dysfunction. The aim was to quantify the histologic changes in DSE induced responses in "at-risk" chronic dysfunctional myocardium (CDM).