

Summaries of Articles

Clinical Investigations

Does Exercise-Induced Severe Ischemia Result in Elevation of Plasma Troponin T Level in Patients with Coronary Artery Disease?

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It has been reported that a loss of cell-membrane integrity during severe ischemia results in elevation of plasma troponin T (TnT) in unstable angina. We investigated whether TnT is released into circulation during severe ischemia (e.g. on treadmill exercise testing) in patients with chronic coronary artery disease (CAD). The study comprised 54 patients who had angiographically documented CAD (22 patients had prior myocardial infarction) and 18 normal subjects. All cases underwent exercise TI-201 SPECT myocardial perfusion imaging. Blood samples were obtained before, immediately after and 6 hours after exercise for TnT measurements. SPECT images were divided into 20 segments. Patients with ≥ 5 redistribution defects were considered to have severe ischemia. 16 patients had severe ischemia on SPECT images. The mean TnT were 0.009 ± 0.010 , 0.012 ± 0.009 , 0.010 ± 0.010 ng/ml in patients with severe ischemia and 0.014 ± 0.009 , 0.010 ± 0.009 , 0.010 ± 0.009 , 0.010 ± 0.010 ng/ml in normal subjects before, immediately after and 6 hours after exercise, respectively. There was no significant difference between the 2 groups and also in pre-, post-exercise TnTs in each group. All TnTs were normal (< 0.1 ng/ml). Additionally, when the patients were grouped according to other SPECT variables (patients with reversible defects vs. patients with fixed defects; patients with increased lung TI-201 uptake vs. patients without those; patients with transient ischemic dilatation vs. without those) and angiographic findings (patients with multivessel disease vs. normal subjects), there was no significant difference in pre- and post-exercise TnTs. In conclusion, severe ischemia does not result in elevation of plasma TnT level in patients with CAD.

Key words: Coronary artery disease, exercise TI-201 myocardial perfusion scintigraphy, troponin T

Anticardiolipin Antibodies in Acute Myocardial Infarction

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A high anticardiolipin antibody (ACA) presence has been reported to be related to lupus anticoagulant positivity, venous and arterial thrombosis, thrombocytopenia and cerebrovascular events. This study was undertaken to determine whether there is any relation between ACA and thrombus formation in acute myocardial infarction (AMI) patients. Patients with anterior or anteroseptal AMI were grouped according to 2-dimensional transthoracic echocardiography (TTE). Group I consisted to 22 patients (3 women, 19 men) with a mean age of 60.4 ± 12.1 , who had left ventricular thrombus (LVT) in TTE. Group II included 11 patients (2 women, 9 men) with a mean age of 57.1 ± 8.6 , without LVT in TTE. A third group consisting of healthy individuals (1 woman, 9 men), with a mean age of 47.7 ± 4.4 were included in the study as controls. In all patients and healthy individuals routine blood biochemistry, activated partial thromboplastin time (APTT), ACA IgG, ACA IgM were determined after the TTE examination.

Results: ACA IgG levels were 10.4 ± 11.5 , 2.0 ± 3.3 and 2.3 ± 1.4 GPLU for groups, I, II and III, respectively, and were significantly higher in Group I compared with group II and III ($p < 0.02$, $p < 0.01$, respectively). There was no difference between Group II and III. Other biochemical parameters apart from ACA IgG did not differ between groups. In conclusion, patients with AMI who have high ACA IgG levels seem to be in a higher risk for thrombus formation.

Key words: Anticardiolipin, acute myocardial infarction, left ventricular thrombus

Analysis of Left Ventricular Regional Functions by Pulsed-wave Tissue-Doppler in Apparently Healthy Subjects and in Patients with Coronary Artery Disease

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Regional left ventricular (LV) dysfunction is an early finding of coronary artery disease (CAD). It is possible to obtain systolic and diastolic myocardial velocities in different myocardial segments through sample volume placement by pulsed-wave tissue-Doppler technique (PWTD). Aim of this study was to compare the myocardial velocities obtained by PWTD in healthy subjects with the patients with CAD. For this purpose we performed dipyridamole stress echocardiography to 22 patients with CAD and 12 subjects with a low likelihood of CAD. PW Doppler settings were changed to acquire optimal recordings of low velocity and high frequency signals. Systolic (S), early diastolic (E) and late diastolic (A) waves were recorded from septal, anterior, lateral and posterior segments at basal, mid and distal levels by using apical 4- and 2-chamber views. The period between the end of the S wave and the beginning of the E wave was defined as regional isovolumetric relaxation time (PIVRT). Generally myocardial velocities obtained from septum and distal segments were found lower than the other segments. S and E velocities and E/A ratio of ischemic segments were lower (S: 7.5 ± 2.1 - 10.4 ± 2.9 $p < 0.01$, E: 10.8 ± 2.7 - 17.6 ± 3.2 $p < 0.0001$, E/A: 0.80 ± 0.23 - 1.69 ± 0.73 $p < 0.0001$) and, PIVRT was longer ($106,5 \pm 21,5$ - $69,1 \pm 13,9$ $p < 0,001$) in comparison to the normal segments both at rest and during the test. It was concluded that pulsed-wave tissue Doppler technique may contribute to the diagnosis of CAD.

Comparison of Exercise and Dipyridamole Tc-99m Tetrofosmin Scintigraphy for the Diagnosis of Coronary Artery Disease in Patients with Left Bundle-Branch Block

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It is well known that the specificity of myocardial perfusion scintigraphy (MPS) for the diagnosis of coronary artery disease (CAD) is low in patients with left bundle branch block (LBBB). It has been suggested that the use of IV dipyridamole (Dp)

instead of exercise as a stress modality increases the diagnostic accuracy of the test. Accordingly, symptom-limited treadmill exercise and IV Dp (0.56 mg/kg) Tc-99m tetrofosmin scintigraphies were performed in 29 consecutive patients presented with chest pain and LBBB. MPS were analysed qualitatively with previous knowledge of patients' gender and LBBB status and myocardial segments were defined as normal, with reversible defect, mild persistent defect and severe persistent defect. All patients underwent coronary angiography. Patients having stenoses more than 50% in one or more major coronary arteries or their major branches were considered to have CAD. In 15 patients with CAD, significant perfusion defects (2 reversible, 6 mild persistent and 3 severe persistent) were detected after exercise in 11 (73%) and after IV Dp in 10 (67%) (2 reversible, 5 mild persistent and 3 severe persistent). Of 14 patients with normal angiographies 2 (14%) displayed significant perfusion defects (2 mild persistent) after exercise and 1 (7%) (1 mild persistent) defect after IV Dp.

In conclusion, no difference was found between the diagnostic values of exercise and Dp Tc-99m tetrofosmin MPS when analysed with previous knowledge of patients' gender and LBBB status for the CAD in the patients with LBBB.

Key words: Myocardial perfusion scintigraphy, left bundle branch block, tetrofosmin

Effects on Cardiopulmonary Parameters of Stepper Exercise in Patients After Myocardial Infarction

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The purpose of the present study is to investigate stepper's effect on cardiopulmonary parameters and to determine whether or not there is a difference in the metabolic responses between the cardiac patients and healthy adults.

Method: 25 healthy subjects (control group) and 30 patients with myocardial infarction (MI) underwent "stepper" exercise after second month of infarction. The following parameters were measured before, at

peak exercise and at the end of recovery period; heart rates, blood pressures minute ventilation (VE), ventilatory frequency (FR), tidal volume (TV), oxygen consumption per kg (VO_2/kg), ventilatory equivalent (VE-eq) and MET. Double product and oxygen-pulse were calculated.

Results: Before exercise VO_2/kg and MET values were significantly higher in the MI group ($p<0.01$, $p<0.02$, respectively). Other rest parameters were similar in both groups. Respiratory parameters and VO_2/kg values of patients reached to peak before the control group. Mean exercise time was 20 minutes for healthy subjects, and 13 minutes for MI patients. All subjects reached at least 70% of their maximal heart rates during exercise. Total exercise time of subjects were variable in both groups. At the end of recovery period, VO_2/kg value was significantly higher in the MI group than the control group ($p<0.01$), however, other values were similar in both groups as at the beginning of exercise.

In conclusion, since exercise time in the patients was shorter than in healthy subjects, stepper exercise could be used as an alternative mode for training in clinically stable and moderately fit patients.

Key words: Stepper exercise, myocardial infarction.

Assessment of Coronary Blood Flow with Transesophageal Echocardiography in Aortic Regurgitation

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Aortic regurgitation (AR) is a valvular heart disease resulting from defective diastolic closure of aortic valve. In this study, we tried to assess the coronary blood changes by transesophageal echocardiography in patients with AR.

The study was performed in the Gülhane Military Medical Academy Cardiology Clinic. It involved 30 patients of whom 7 were female and 23 male (mean age: 24 ± 8 years). The patients were divided into mild and severe AR groups. Ten free of cardiovascular disease according to history,

physical, electrocardiographical and echocardiographical examination were selected as the control group. The subjects underwent transthoracic (TTE) and subsequently transesophageal echocardiography (TEE) after appropriate history and physical examination. Left ventricular mass index was estimated by dividing transthoracic echocardiographically estimated left ventricular mass by boyd surface area. During TEE, pulsed Doppler flow video recordings were obtained from LAD just distally to the bifurcation. measurements were then obtained from these video recordings. Following parameters were obtained: mean and peak systolic flow velocities, mean and peak diastolic flow velocities, diastolic and systolic flow velocity integrals. Severity of AR was assessed by TTE from parasternal long axis view; when regurgitation jet was beyond the edge of anterior mitral leaflet, it was considered as severe, otherwise as mild. For statistical comparisons, Mann-Whitney U test was used, $p<0.05$ being considered as significant.

While there were no differences between the control group and the mild AR group with respect to any of the parameters, there were statistically significant differences between the severe AR group and both the mild AR group and the control group with respect to peak systolic flow velocity, peak diastolic flow velocity, mean systolic flow velocity, mean diastolic flow velocity, systolic velocity time integral, diastolic velocity time integral, LAD artery diameter. In severe AR group, flow/mass index ratio was significantly lower.

In conclusion, in mild AR, coronary flow patterns are similar to normal subjects; but in severe AR coronary flow increases though this increase though this increase is not sufficient to compensate eccentrically hypertrophied myocardial mass.

Key words: Aortic regurgitation, transesophageal echocardiography, coronary blood flow.

Frequency and Predictors of Systemic Arterial Embolization in Rheumatic Mitral Valve Disease and Its Subgroups: Transesophageal Echocardiographic study

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The aim of the study was to investigate the frequency and predictors of systemic arterial embolization (SAE) in patients (pts) with rheumatic mitral valve disease (RMVD) and in its subgroups (moderate to severe mitral stenosis- MS, severe mitral regurgitation-MR and mixed mitral valve disease). 136 pts with predominant moderate to severe MS (mean age: 43±11, 88 F, 75 with atrial fibrillation-AF and 88 pts with severe MR (mean age: 45±12, 61 F, 42 with AF) and 83 pts with mixed mitral (mean age: 42±14, 55 F, 56 with AF) were included in the study. Transthoracic and transesophageal (TEE) echocardiography was performed in all pts. Left atrial (LA) diameter, mitral valve area, maximal and mean mitral gradients were measured and LA and LA appendage spontaneous echo contrast (SEC) - thrombus (THR) and MR were evaluated in all pts. Left atrial SEC was graded as mild, moderate and severe. Also history of all pts were evaluated in regard to SAE: it was classified as recent embolization when they occurred in the preceding ≤ 1 week and as remote embolization if they occurred > 1 week before TEE. Multiple logistic regression analysis was used to determine independent predictors of SAE in all patients. Systemic arterial embolization was found in 11.7 % (36/307, 10 recent, 26 remote) of pts with RMVD. In the moderate to severe MS group (21.3 %, 29/136) frequency of SAE was significantly higher than that of the severe MR (3.4 % 3/88) and mixed mitral (4.8 %, 4/83) group (p<0.01). Also there was a higher frequency of LA SEC and THR in the moderate to severe MS group than the other groups (p<0.01). When all pts were taken into consideration, the incidences of AF, SEC and THR were higher in pts with SAE than those with no history SAE (p<0.01, p<0.00001, p<0.0001 AF, SEC, THR, respectively). There was no significant difference between the two groups in regard to the degree of SEC and localization of THR. Left atrial SEC (p<0.001) and THR (p<0.01) were found to be independent markers of SAE in multiple regression analysis, with a higher significance for SEC. When only pts with moderate to severe MS group were taken into account, AF (p<0.05) was more frequent in pts with SAE and

there was no significant difference in regard to other parameters.

We concluded that the higher frequency of SAE in the moderate to severe MS group is due to the higher frequency of LA SEC and THR in this group. In order to determine the risk of SAE, TEE should be performed in all pts with RMVD except those with AF and moderate to severe MS. However, in pts with moderate to severe MS with AF, oral anticoagulation may be administered without performing TEE because of a high frequency of SAE.

Key words: Rheumatic mitral valve disease, systemic arterial embolization, transesophageal echocardiography

Diagnostic Value of Transthoracic and Transesophageal Echocardiography in the Assessment of Primary Mitral Valve Prolapse Associated with Severe Mitral Regurgitation

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In the diagnosis and follow-up of the patients with mitral valve prolapse (MVP), criteria for transthoracic echocardiography (TTE) has been established. However, studies investigating the potential value of multiplane transesophageal echocardiography (TEE) over TTE in the assessment of the valvular and chordal structures, and valvular regurgitations in pts with MVP are limited. The purpose of this study is to compare TTE and multiplane TEE in the assessment of the morphology of mitral and tricuspid valve leaflets, and chordal structures, grades of valve prolapse and regurgitations in pts with primary classical MVP, and to investigate optimal TEE planes in which prolapsed leaflets, insertion of chordae to leaflets, and regurgitant jets were best visualised. Study population comprised 77 patients (M 50, F 27, mean age 45.8±16.8) with primary classical MVP and mitral regurgitation (MR≥3) who were subjected to TTE and TEE, and also includes a subgroup pts who had undergone a mitral valve surgery (MVS).

Transthoracic echocardiography and TEE findings were concordant in detecting prolapsed leaflet(s). Anterior, posterior, anteroposterior and posteroanterior MVP were found in 1 (1.3%), 30 (38.9 %), 22 (28.5 %) and 24 (31.1%) pts, respectively. Length and thickness of the mitral leaflets that were measured by TTE and TEE were not significantly different. Chordal rupture was detected in 26 pts (33.7%), and 17 (65.4%), 6 (23%) and 3 (11.5%) of them were associated with posterior, anterior and both mitral leaflets, respectively. In comparison to intraoperative (IO) findings, sensitivity, specificity, positive and negative predictive value (PV+, PV-), diagnostic accuracy (DA) of TEE were 100, 100, 100, 100% and for TTE were 63.6, 100, 100, 55.5, 75%, respectively. Although small number of pts had undergone MVS, good correlation was found between TEE and IO assessment. If TEE is taken as a gold standard for diagnosis of CR, including all pts who have not undergone surgery, sensitivity, specificity, PV (+), PV (-), and DA of TTE for CR was 69.2, 86.2, 72, 84.6, and 80.5 %, respectively. In multiplane TEE assessment, best planes for anterior mitral leaflet prolapse and associated MR were found to be between 0 and 10, for posterior leaflet and MR were between 70° and 90° and for TV prolapse and tricuspid regurgitation (TR) between 20° and 60°. In 39 out of 77 pts (50.6%) degree of MR was found to be one degree greater with TEE than that with TTE, and conversely, 31 out of 52 pts (59.6%) TR degree was one degree smaller than that of TEE.

We conclude that, both TTE and TEE are suitable to diagnose prolapsed mitral and tricuspid leaflet(s) similarly, but TEE is superior to TTE in the precise assessment of the leaflet and chordal morphology,

grade of an eccentric MR and when chordal rupture of mitral leaflets are associated.

Key words: mitral valve prolapse, chordal rupture, transthoracic echocardiography, transesophageal echocardiography

History of Cardiology and Philately Corner:

Corneille Heymans (1892-1968): Sinus caroticus reflexes and the control mechanisms of the circulatory and respiratory systems

T. Onat

Two cancellations and a Red Cross stamp issued by Belgium in 1987 was presented in whom Corneille Heymans, the Nobel Laureate of 1938 was honored.

Corneille Heymans was born on March 28, 1892 in Ghent and received his MD degree in 1921. He received the Nobel Prize in physiology and medicine in 1938 for his contributions to the basic control mechanisms of the cardiovascular and respiratory systems via sinus caroticus. He developed an isolated head technique in which one dog served as a donor and another dog as recipient. This method allowed the cerebral circulation to be maintained in the recipient dog. Heymans found that the carotid vein is sensitive to changes in blood pressure and transmits a signal to the respiratory center in the brain. He also found that the carotid body is sensitive to changes in the level of oxygen and carbon dioxide. For example, if arterial oxygen is lowered, the carotid body sends a signal to the respiratory center, and the rate of respiration increases, so that uptake and transport of oxygen to the tissues are also increased.