Summaries of Articles

Clinical Investigations

Functional Recovery After Revascularization in Patients with Coronary Artery Disease and Left Ventricular Dysfunction

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The present study sought to evaluate the value of gated SPECT imaging, which provides the opportunity to acquire function and perfusion information simultaneously, under infusion of low dose dobutamine in the prediction of functional recovery after revascularization in patients with coronary artery disease and left ventricular dysfunction. Sixteen patients with stable coronary artery disease and segmental ventricular dysfunction scheduled for PTCA underwent resting echocardiogram, rest gated SPECT and gated SPECT under infusion of 5-10 μg/kg/min dobutamine during acquisition on the same day, and rest/stress Tc-99m sestamibi standard perfusion imaging on a separate day before PTCA. The improvement of dyssynergic segments was determined with a rest echocardiogram 2 months after PTCA. A 16-segment model was used for interpretation of the echocardiograms and the SPECT images. Wall motion was scored on a 4-point scale (0=absent, 3=normal) on gated images and perfusion was scored on a 5-point scale (0=normal, 4=absent) on gated and standard perfusion images. On gated images, diagnostic criteria for viable dysfunctional segments were: a) wall motion score ≥2, b) perfusion score ≤2, c) a wall motion score change > 1 grade with dobutamine. On perfusion images, diagnostic criteria were taken as: a) reversible defect, b) fixed defect having >50% uptake of maximal activity. 104 segments demonstrated abnormal wall motion and 72 of them improved after revascularization. Dobutamine gated SPECT had a 86% sensitivity, 72% specificity and 82% diagnostic accuracy for predicting functional improvement. These values were 68%, 75% and 70%, respectively, for rest gated SPECT and 71%, 53% and 65%, for standard SPECT imaging. Gated imaging improved specificity and dobutamine perfusion improved sensitivity. Thus, dobutamine gated SPECT has a higher diagnostic accuracy and this method may have incremental value in the prediction of functional improvement after revascularization in patients with coronary artery disease and left ventricular dysfunction.

Key words: Dobutamine, gated SPECT, coronary artery disease

Paravalvular Mitral Regurgitation Protecting from Thrombus Formation on Prosthetic Mitral Valve

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Protective effect of a significant mitral regurgitation (MR) from thrombus (THR) formation in the left atrium (LA) is well documented. But interaction between paravalvular (PV) MR and THR formation on prosthetic mitral valves (PMV) has not been investigated. The aim of this study was to investigate the clinical and echocardiographic characteristics of patients with PMVTHR, and to assess whether or not PVMR protects PMV againts THR. Study population comprised 265 patients (F 143, M 122, mean age 43.4±24.9) who underwent transthoracic and transesophageal echocardiography (TTE, TEE) for the follow-up of PMV evaluation. Atrial fibrillation (AF) was present in 157 patients (59.%). Prosthetic valve THR, PVMR (≥2), LATHR and spontaneous echo contrast (SEC) were diagnosed in 43 (16.3%), 22 (8.3%), 28 (10.6%) and 98 (37%) patients, respectively. Age, gender, duration between valve replacement and TEE, mechanical valve types, rhythm, diameter of LA, fractional area change of LA appendage (LAA), inward and outward velocities of LAA were not found to be significantly different between patients with and without PMVTHR (group A and B), respectively (p>0.05). However, frequency of bi-

oprosthetic valve (0 vs 15.3%, p<0.001), PVMR (≥2) (0 vs 9.9%, p<0.001), and INR level (1.6±0.6 vs 2.9±0.6, p<0.001) were found to be significantly lower, and frequency of LASEC (69.7% vs 30.6%, p<0.05) and LATHR (20.9% vs 8.6%, p<0.05) were found to be higher in patients with PMTHR than in patients without PMVTHR. Mitral or LA THR was not detected, but LASEC was detected in 1 (4.5%) patient with PVMR, and MVTHR, LASEC and LATHR were observed in 43 (17.7%), 97 (39.9%) and 28 (11.5%) patients without PVMR, respectively. In the suboptimal anticoagulation (INR <2) group (n=112), no LATHR or PMVTHR was documented in patients with PVMR (n=12), but LATHR and PMVTHR were detected in 20% and 35% of patients without PVMR (n=100), respectively (p<0.001, p<0.001). In patients of optimal (INR ≥2) anticoagulation (n=153) LATHR or MVTHR was not detected in patients with PVMR (n=10), but LATHR and MVTHR were detected in 5.5% and 5.5% of patients without PVMR (n=13) (p<0.05, p<0.05). We conclude that (1) presence of PMVTHR seems to be associated with absence of paravalvular MR, presence of LA SEC and LATHR, lower INR level and absence of bioprostheses, but not with other clinical or valve-related parameters, and echocardiographic criteria of LA/LAA functions, (2) significant PMR seems to be protective against THR formation on PMV as well as in LA even in patients with low INR, (3) protective effect of PVMR may be associated with shear effect on surfaces of PMV and LA.

Key words: Mitral regurgitation, prosthetic valve, thrombus

Relation of the Isolated Myocardial Muscle Bridge with Left Ventricular Hypertrophy and Left Ventricular Diastolic Dysfunction

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Data concerning myocardial muscle bridge (MB) which causes significant coronary constriction is limited and relationship between MB and left ventricular diastolic function has not been investigated. The purpose of our study was to investigate the relationship between angiographically significant MB and left ventricular hypertrophy (LVH) and left ventricular diastolic function (LVDF). Study population comprised 38 pts (36 M, 2 F, mean age 53 ± 9.2) with MB associated with left anterior descending artery constriction (≥60%) and without fixed atherosclerotic coronary lesion, and 40 age- and sex-matched control cases (30 M, 10 F, mean age 52 ± 10.1) with normal coronary arteriogram. Study group was evaluated by digital coronary arteriography, and LVH (interventricular septum (IVS) and posterior wall (PW) thickness, left ventricular mass index (LVMI) and LVDF (mitral peak velocities of E and A waves, A/E>1, isovolumetric relaxation time (IVRT) and E deceleration time (EDT) were determined by M-mode, 2D and Doppler echocardiography. In pts with MB mean coronary constriction was 72±12%, and frequency of LVH was significantly higher in pts with MB (n=16, 42%) than CG (n=6, 15 %) (p<0.01). Thickness of the IVS (1.1±0.32 vs 1.0±0.11 cm, p<0.01) and PW (1.1±0.15 vs 1.0±0.09 cm, p<0.05), and LVMI (138±39.0 vs 104±26.8, p<0.001) were significantly higher in pts with MB than CG.

In Doppler echocardiographic evaluation, left ventricular diastolic dysfunction (LVDD) was detected in 34 pts (89%) with MB, and in 13 cases of CG (32.5%) (p<0.001). As compared to CG, E velocity was found to be lower (0.85±0.13 vs 0.82±0.18 my/sec, p<0.001), A velocity (0.95±0.32 vs 1.53±0.42, p<0.001) and A/E ratio (1.53±0.42 vs 0.95±0.32, p<0.001) higher, IVRT (120±15.2 and 221±19.3 m/sec, p<0.001) and EDT (93±15.3 and 189±21.2 m/sec, p<0.001) longer in pts with MB. Frequency of LVDD were higher in pts with MB with and without LVH (100% and 81%) than CG (32%) (p<0.001); moreover, LVDD was more frequent in pts with LVH than without LVH (p<0.001).

We conclude that isolated myocardial MB is closely associated with LVH, and with left ventricular diastolic dysfunction whether or not LVH is present. Our results are compatible with the concept that MB is independently associated with LVDD.

Subclinical Valvular Involvement in Rheumatic Fever: Comparison of Patients with Isolated Polyarthrits and Chorea Minor

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We aimed to investigate subclinical valvular involvement in patients with isolated polyarthritis and pure chorea minor by colored Doppler echocardiography (CDE). CDE was performed in 39 children with rheumatic fever (RF) without evident cardiac inovolvement. 20 of 39 patients had isolated polyarthritis, 15 had pure chorea and 4 had chorea associated with previous arthritis. 20 of them were female, 19 male, and mean age was 11.2±2.6. Eleven of the 39 patients had innocent murmurs. CDE disclosed silent mitral and/or aortic regurgitation (MR and/or AR) in 30 of 39 (77%) patients with RF without evident cardiac involvement; i.e. 15 with isolated MR, 11 combined MR and AR, and 4 isolated AR. The frequency of silent valvular regurgitation was not significantly different in patients between with and without innocent murmurs while silent valvular regurgitations were demonstrated in 14 of 15 patients with pure chorea minor and 13 of 20 patients with polyarthritis. Silent valvular regurgitation was encountered in most patients with Sydenham's chorea and with isolated polyarthritis though significantly higher in patients with chorea.

Key words: Rheumatic fever, silent valvular regurgitation, isolated polyarthritis, chorea minor, colored Doppler echocardiography

A Quantitative Assessment of Relation Between Left-to-Right Shunt and Defect Diameter Determined by 2D-Echocardiography in Isolated Secundum Atrial Septal Defect

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We aimed to determine whether the diameter of the atrial septal defect, evaluated in detail by two-dimensional echocardiography in recent years by means of transcatheter occlusion procedures, could be used as a criterion to estimate the pulmonary-to-systemic shunt ratio quantitatively.

The pulmonary-to-systemic shunt ratios were measured by Doppler echocardiography (velocity time interval and peak velocity) and radionuclide angiography in 38 patients with isolated secundum type ASD. The diameter of the defect was measured in apical and subcostal four-chamber and subcostal short axis views, and the average diameter was divided to body surface area in order to find the "ASD index". The shunt ratio was also measured hemodynamically in 19 patients of the study group.

Catheterization results were accepted as gold standard in our study. We found strong significant correlation between catheterization and velocity-time integral results ($r= 0.93$, $p < 0.001$), and significant correlation between catheterization and peak velocity and ASD index ($r=0.71$, $p<0.001$) in the subgroup including 19 patients. Radionuclide angiographic correlation was insignificant ($r= 0.24$, $p<0.35$). In all cases with paradoxical ventricular septal motion, the shunt ratio was found > 1.9 in this subgroup.

Velocity-time integral measurements, the parameter found to have the strongest correlation with catheterization results, were compared with the ASD index in the rest of the study and the correlation was significant between them in whole study group ($r= 0.74$, $p<0.001$). The regression analysis showed equation is expressed as "velocity time integral = ASD index x 0.05 + 1.27" between them. We conclude that ASD index can be used as another noninvasive parameter for calculating pulmonary-to-systemic blood flow ratio in secundum type ASD.

Key words: Atrial septal defect, left-to-right shunt, echocardiography

The Effects of Hemodynamic Changes in Left Atrial and Left Ventricular Diameters After Physiological Pacing

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The aim of this study is to show the alterations in left atrial (LAD) and left ventricular (LVDd) diameters and to examine the relationship between hemodynamic changes and the change in cardiac chambers in 16 patients (67,4±15,4 years old) who received physiological pacemakers; all of them with AV block. All patients required temporary right ventricular pacing. LAD and LVDd, cardiac output (CO) and pulmonary capillary wedge pressure (PCWP) were measured before and after permanent pacemaker implantation. LAD and LVDd obtained by echocardiography was divided by body surface area to obtain left atrial diameter index (LADI) and left ventricular diameter index (LVDdI). After physiological pacing, CO increased in all patients (3,6±0,3 L/min to 4,1±0,3 L/min, p<0,001). PCWP decreased from 14±6,8 mmHg to 8,7±6,9 mmHg (p<0,001). However, LVDdI did not show significant change. There was a positive correlation between the changes in LADI and those in PCWP after physiologic pacemaker implantation (r=0,82). All patients were followed for approximately 62 days (45-92 days). There were no significant changes in LADI measured 24 hours after pacemaker implantation and those measured at the end of follow-up period (r=0,2). As a conclusion, LAD decreased after physiologic pacemaker and this change accompanied to positive hemodynamic change. But at the end of follow-up period, change in LAD was not significant. Also there was no significant change in LVDd after physiologic pacemaker.

Key words: physiological pacing, left atrial diameter, left ventricular diameter

Value of Exercise Treadmill Score as an Indicator of High-risk Coronary Artery Disease

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In order to evaluate the diagnostic value of exercise treadmill score (TS), which is a prognostic index calculated by using ST segment depression, angina and exercise duration, for identification of high-risk coronary artery disease, 284 patients who underwent exercise TI-201 SPECT and coronary angiography were studied. Patients with TS>5 were defined as the low-risk group (group 1, n=94, mean age 51.2±9.2yrs), those with - 11<TS<5 as the moderate-risk (group 2, n=156, mean age 55.4±7.1 yrs) and patients with TS<-11 as the high-risk group (group 3, n=34, mean age 57.8±5.3 yrs). High-risk patients were more often older (p<0.01, p<0.01) and male (p<0.01, p<0.01), with a greater frequency of prior myocardial infarction (p<0.01, p<0.01), hypertension (p<0.05, p<0.05) and hyperlipidemia (p<0.05, p<0.05). The number of total perfusion defects were 2.6±2.2, 5.4 ± 2.5 and 7.2±1.9 in groups 1,2 and 3, respectively. The high-risk group had a significantly higher perfusion score compared to the other two groups (p<0.001, p<0.001). The number of reversible defects were 2.1 ± 1.9, 4.9 ± 2.3 and 6.2 ± 1.5 in groups 1,2 and 3, respectively, with the high-risk group having a significantly higher score compared to groups 1 and 2 (p<0.001, p<0.001). Fixed defects were comparable between the three groups. In addition, the occurrence of multivessel pattern and increased lung uptake were more frequent in the high-risk TS group compared to the low risk group (p<0.001, p<0.001). The extent of angiographic coronary artery disease was 0.7±0.9 in group 1, 1.6±0.8 in group in group 2 and 2.8±0.5 in group 3. For low-risk patients, 55% had normal coronary angiograms and 16% had single-vessel disease, while 85% of high-risk patients had 3-vessel coronary disease. The positive and negative predictive values and the predictive accuracy of a high-risk TS for 3-vessel disease were 85%, and 92%, respectively. High-risk TS which was observed in 12% of our study population was found

to be associated with 3-vessel disease and increased ischemic burden and thus can be used as a reliable index for identifying high-risk coronary artery disease.

Key words: Coronary disease, exercise tests, risk stratification

Case Reports

Vegetation Due to Streptococcus Viridans in Pulmonary Artery in a Child With Patent Ductus Arteriosus

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The authors describe a case of patent ductus arteriosus (PDA) complicated by infective endarteritis due to a vegetation in pulmonary artery in a 14-year-old child. Only few cases of vegetation in the pulmonary artery shown by echocardiography have thus far been reported. All patients with PDA have infective endarteritis risk, regardless of the ductus size.

Key words: infective endarteritis, patent ductus arteriosus

Isolated Anomalous Right Coronary Artery Leading to Coronary Steal Syndrome

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Most of the congenital anomalous coronary arteries are asymptomatic and diagnosed incidentally. But sometimes these may lead to angina pectoris, myocardial infarction or sudden cardiac death. It is not a usual finding that a coronary artery supplying an organ other than the heart. Coronary collateral to the lung can rarely be observed in Takayasu's arteritis or in some congenital heart diseases. In this patient who had no atherosclerotic lesion, the sinus node branch of the right coronary artery was supplying the middle lobe of the left lung causing symptoms and ischemia in the inferior wall on the myocardial perfusion scintigraphy, thus leading to coronary steal syndrome.

Key words: Coronary artery anomaly, steal syndrome.

A Case of Dilated Cardiomyopathy Secondary to Anomalous Left Coronary Artery Originating from the Pulmonary Artery

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Anomalous origin of the left coronary artery from pulmonary artery (ALCAPA) commonly presents in infancy with clinical features of congestive heart failure, dilated cardiomyopathy or cardiogenic shock.

A 24-day-old female infant presented to the hospital with symptoms of respiratory distress, sweating and irritability. She had severe congestive heart failure. Further investigations revealed that she had severe dilated cardiomyopathy due to anomalous left coronary artery arising from main pulmonary artery. We present this case because of its rarity and difficulty in distinguishing clinically from dilated cardiomyopathy. ALCAPA must be thought in an infant with signs of heart failure and dilated cardiomyopathy when there is echocardiographical evidence of left ventricular hypertrophy in addition to ventricular dilatation, fibrosis of the papillary muscles, and aneurysm formation in the apex.

Key words: Anomalous left coronary artery, dilated cardiomyopathy, echocardiography

A Case of Myotonic Muscular Dystrophy With Atrial Flutter

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Myotonic muscular dystrophy (MMD) is a relatively common muscular dystrophy in adults. In the patients with MMD, cardiac involvement may occur in the clinical course. In this case report, we presented a case of MMD with atrial flutter, which is a rare cardiac manifestation of MMD.

Key words: myotonic muscular dystrophy, atrial flutter