

## Summaries of Articles

### Differentiating Features of Chordal Rupture Associated with Rheumatic Mitral Valve Disease and Primary Mitral Valve Prolapse

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It has been known that chordal rupture (CR) is the most important complication of primary mitral valve prolapse (MVP). However, CR may also occur in relation to rheumatic mitral valve disease (RMVD). Although the relationship between MVP and CR has been thoroughly investigated, there is still insufficient information about the formation of CR in RMVD. The aim of our study was to evaluate the incidence and the differentiating features of patients with CR in both groups as assessed by transesophageal echocardiography (TEE). One-hundred nineteen patients with RMVD (70 male and 49 female, mean age 45), and 60 with MVP (34 male and 26 female, mean age 46) with MR (>2) were included in the study, and were compared with 20 healthy subjects. Both groups were divided into two subgroups with and without CR, and were compared according to age, gender, anterolateral (AL) and posteromedial (PM) chordal length, and mitral valve leaflet related to CR. The incidence of CR was 13 % in RMVD and 25 % in MVP group ( $p<0.05$ ). There was no significant difference related to age (45 and 43) and gender (male/female: 0.8 and 0.8) between the CR (+) and CR (-) groups of RMVD. Although, male gender was predominant (male/female 4 and 1.9,  $p<0.05$ ), the older age (58 and 41) was not significant in patients with MVP with CR, in contrary to without CR.

On the other hand, there was no significant difference between CR (+) and CR (-) groups with RMVD according to AL ( $1.63 \pm 0.4$  and  $1.31 \pm 0.4$  cm) and PM ( $1.62 \pm 0.4$  and  $1.25 \pm 0.4$  cm) ( $p>0.05$ ). Chordal length in MVP group (AL  $2.69 \pm 0.6$ , PM  $2.78 \pm 0.6$  cm) was significantly longer than RMVD group (AL  $1.53 \pm 0.6$ , PM  $1.51 \pm 0.5$  cm) and control group (AL  $1.81 \pm 0.2$ , PM  $1.80 \pm 0.2$  cm) ( $p<0.05$ ). But chordal length was not significantly different in CR (+) and CR (-) MVP subgroups (AL  $2.75 \pm 0.5$  and  $2.61 \pm 0.5$ , PM  $2.77 \pm 0.5$  and  $2.59 \pm 0.5$  cm) ( $p>0.05$ ). In rheumatic group incidence of CR asso-

ciated with anterior and posterior leaflet were 87 % and 13 % respectively. The incidence of CR associated with posterior and anterior leaflet were 80% and 20%, respectively in MVP group ( $p<0.05$ ).

In conclusion, CR assessed by TEE was seen mostly in males and in older age group, and related with posterior leaflet in patients with MVP. However, rheumatic CR involved mostly the anterior leaflet and was not associated with age and gender.

### Spontaneous Microbubbles Associated With Prosthetic Mitral Valves As Assessed By Transesophageal Echocardiography and Its Clinical Importance

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There is insufficient information about the incidence, mechanism and clinical importance of spontaneous microbubbles (SMB) associated with prosthetic valves observed by echocardiography. The aim of our study was to investigate the incidence of SMBs associated with prosthetic mitral valves and related clinical features and echocardiographic parameters. One-hundred and ninety-eight patients with prosthetic mitral valves (mean age  $37.9 \pm 13.3$  years) evaluated by transesophageal echocardiography (TEE) were included in the study and age, gender, cardiac rhythm, prosthetic valve type, area and gradients, left atrial diameters and flow velocities, incidence of mitral valve thrombosis, paravalvular leakage, left atrial spontaneous echocontrast (LA-SEC), and systemic arterial embolism (SAE) were compared between groups with and without SMB. The incidence of SMB, 50.5 % in the entire group, was 82.7 %, 38.3 % in the bileaflet and monoleaflet mechanical valve subgroups, respectively ( $p<0.05$ ). But no SMB was observed in bioprosthetic valve subgroups. No significant difference existed in the age, rhythm, transvalvular gradients, mitral valve area, left atrial diameter, atrial forward and backward mean velocities, incidence of paravalvular mitral leakage, LA-SEC, and SAE between the groups with and without SMB ( $p>0.05$ ).

We conclude that SMB is significantly associated with the type of the prosthetic valve (bileaflet over monoleaflet and bioprosthetic valves) and is considered to be a clinically innocent echocardiographic finding.

### Relation Between the Ratio of Recovery to Peak Exercise Systolic Blood Pressure and the Presence and Extent of Myocardial Perfusion Abnormalities During Stress Reinjection Tl-201 Scintigraphy

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A delay in the decline of systolic blood pressure response after exercise is considered as an abnormal response. We studied the relation between the ratio of recovery systolic blood pressure to peak exercise systolic blood pressure (SBPR) and the presence and extent of myocardial perfusion abnormalities in 265 consecutive patients using stress-redistribution-reinjection Tl-201 scintigraphy. SBPR was measured as the systolic blood pressure 3 minutes after exercise divided by peak exercise blood pressure. According to Tl-201 results, cases were divided into 4 groups: Group I consisted of normal scans (n=98), group II of patients with only reversible defects (n=90), group III of patients with only nonviable fixed defects (n=32), group IV of reversible and viable or nonviable fixed defects (mixed group, n=45). The mean SBPR was found as  $0.84 \pm 0.13$ ,  $0.92 \pm 0.12$ ,  $0.91 \pm 0.12$  and  $0.93 \pm 0.17$  in groups I-IV, respectively. There was a significant difference between normal subjects and patient groups, whereas the 3 patient groups did not show a significant difference among them. Using a cut-off value of  $\geq 0.90$  identified from the receiver operating characteristic curve as the SBPR value which indicated an increased risk of perfusion abnormalities, SBPR had a sensitivity of 59%, specificity of 63% and accuracy of 61% whereas exercise-induced ST depression had a sensitivity of 64%, specificity of 73% and accuracy of 68% (p=NS; p<0.05). The mean SBPR was  $0.95 \pm 0.13$  in patients with  $\geq 5$  abnormal scan segments compared to  $0.90 \pm 0.14$  in patients with 1-4 abnormal scan segments (p=0.007). However, a mild-moderate correlation was found between the number of

segments and SBPR values with linear regression analysis (r=0.34). In conclusion, abnormal SBPR may be related to either myocardial necrosis or ischemia and has a limited diagnostic accuracy for detecting the presence and extent of perfusion abnormalities.

### Effects of Preinfarction Angina on Infarct Size, Postinfarct Left Ventricular Systolic Function and Early Prognosis

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There are some inconsistencies between the results of the studies which were carried out to investigate the role of preinfarction angina (PA) on infarct size and early prognosis of acute myocardial infarction (AMI). For that reason, we investigated the effects of PA that occurred in the last 72 hours before the index AMI on early prognosis in postinfarction period. We evaluated 55 patients with AMI that was admitted to our hospital with chest pain of less than 6 hours of duration and received thrombolytic therapy. There were 32 patients in PA group (Group A) and 23 patients in the control group (Group B). There were no statistically significant difference between the groups in terms of age, sex, atherosclerotic risk factors, duration of chest pain, infarct location, multivessel disease, collateral circulation, infarct complications both in hospital and 3 months' period and revascularisation procedures (PTCA and CABG). Determinants of left ventricular function; QRS score ( $7.58 \pm 2.67$  vs  $6.95 \pm 3.58$ ), left ventricular ejection fraction (% EF) ( $44.2 \pm 8.57$  vs  $44.1 \pm 9.16$ ) and wall motion score index ( $1.36 \pm 0.29$  vs  $1.36 \pm 0.29$ ) were not different between the groups. But still, in group A patients had smaller infarct size (peak hydroxybutyrate dehydrogenase:  $554 \pm 252$  U/L vs  $782 \pm 402$  U/L, p=0.01) and less patients had EF $\leq 45\%$  (46% vs 78%, p=0.02). These differences between the groups were more prominent in the patients with anterior infarction; in group A, peak hydroxybutyrate dehydrogenase level ( $528 \pm 158$  U/L) and QRS score ( $7.8 \pm 1.7$ ) were significantly less than group B ( $932 \pm 453$  U/L and  $9.6 \pm 1.8$ ) (p=0.005 and p=0.03). The salutary effects of PA may be due to the acquired myocardial resistance to the ischemia is possibly via ischemic preconditioning and stress proteins.

## Balloon Angioplasty for Coarctation of Aorta: Initial Experience

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Balloon angioplasty has been used to treat patients with coarctation of aorta as an effective and alternative method to surgical correction. We presented results of 12 balloon coarctation angioplasty in 11 patients. They ranged in age 13 days to 13 years (median 7 months). Eight patients had associated cardiac defects. Eight procedure in native coarctation, four in recoarctation were done. Balloon angioplasty produced a reduction in the peak to peak coarctation gradient from  $38.4 \pm 22.6$  (0-70) to  $10.6 \pm 9.8$  mmHg ( $p < 0.001$ ). The systolic peak to peak gradient decreased to 33 mmHg in only one patient with isthmic hypoplasia, the other's gradients were less than 20 mmHg. Mean aortic diameter in coarctation region increased  $4.2 \pm 3.3$  (1.7-13.8) to  $8.8 \pm 4.8$  (3.3-18.4) mm. The gradient decreased  $36.6 \pm 7.6$  to  $21 \pm 11.5$  mmHg in four patients whose increase of aortic diameter in coarctation region was less than two times, but it decreased  $43.9 \pm 23.2$  to  $8.1 \pm 6.5$  mmHg in others. There was no difference in ratio of balloon diameter/diaphragmatic aorta, but diaphragmatic aorta/coarctation ( $2.5 \pm 0.73$  vs  $1.76 \pm 0.6$ ), balloon/coarctation ratio ( $1.0 \pm 0.17$  vs  $0.97 \pm 0.24$ ) and isthmus/diaphragmatic aorta ( $0.82 \pm 0.13$  vs  $0.71 \pm 0.02$ ) were statistically different. There was not early aneurysm in patients and any immediate surgery did not required. Femoral artery complication occurred in 4 patients (33%) who were less than 6 months. We observed a case of paradoxical hypertension after balloon angioplasty. Recoarctation developed in one of 11 patients in mean  $7 \pm 16.2$  months follow-up and was successfully treated by repeat balloon angioplasty. In conclusion; balloon coarctation angioplasty for coarctation of aorta provides safe and effective alternative to surgical repair in newborn and patients with high surgical risks and decreased coarctation gradient.

## Transatrial Repair of Tetralogy of Fallot

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Despite satisfactory hemodynamic results with the classical correction of tetralogy of Fallot by right

ventriculotomy approach, the undesired effects of ventriculotomy incision such as sudden death due to ventricular arrhythmias and right ventricular dysfunction may appear in the late postoperative period. In cases without infundibular hypoplasia, a correction with limited or no ventriculotomy by transatrial approach might preclude these late occurring complications.

Between January 1987 and July 1996, a total of 92 patients with tetralogy of Fallot without annular and infundibular hypoplasia were totally corrected with transatrial approach in our Institute. Ventricular septal defect closure and infundibular resection were achieved through tricuspid valve in all patients with a mean age of  $5.6 \pm 3.22$  years. Valvotomy was done with the same approach in 57 patients with pulmonary valve stenosis. After weaning from cardiopulmonary bypass, a right ventricular to left ventricular pressure ratio below 0.8 was accepted as a sufficient enlargement for right ventricular outflow tract reconstruction. In 56 patients the pressure ratio was found under 0.8 (mean  $0.58 \pm 0.21$ ). In 36 patients with pressure ratio ranging among 0.8 and 1.14, cardiopulmonary bypass was reconstituted and a limited ventriculotomy followed by an enlargement of right ventricular outflow tract with a pericardial patch was applied. The pressure ratios were measured between 0.45-0.76 (mean  $0.62 \pm 0.16$ ) after patch application. Two patients from low cardiac output, one patient with sepsis and one patient from bleeding were lost in the early postoperative period (4.4 %). There was no mortality in 72 (82 %) patients who were followed for a mean of  $59.2 \pm 33.9$  months. One patient was reoperated because of recurrent VSD on the 6th postoperative month. In echocardiographic examinations, flow rate through the pulmonary valve that was measured 1.29 - 2.24 m/sec, the gradient of right ventricular outflow tract varied between 5 and 22 mmHg. All these patients were asymptomatic and receiving no medication.

Hence, in patients with tetralogy of Fallot without annular and infundibular hypoplasia, hemodynamic results from transatrial correction are effective and reliable, in addition to avoiding serious complications seen with the extensive ventriculotomy incision in the late postoperative period.

## Isolated Coronary Artery Bypass Grafting in Patients 70 Years of Age and Older: Comparative Results in a 40-60 Years' Age Group

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Coronary artery bypass grafting has been performed for elderly ( $\geq 70$  years) with increasing frequency. From May 1985 through October 1996, 223 elderly patients (Group I) underwent isolated coronary bypass grafting at Koşuyolu Heart and Research Hospital. The risk factors, morbidity and mortality results of Group I were compared to 200 CABG patients who had similar clinical features and were 40-60 years of age (Group II). Group I consisted of 180 males, 43 females, mean age 73,8 years and Group II had 184 males, 36 females, mean age 55,5 years. The preoperative myocardial infarction (MI) rate was 62%, severe left ventricular dysfunction (LVD) rate 33,6% (75 cases) in group I and 48% preoperative MI, 25% (55 cases) severe LVD in group II ( $p < 0,05$ ). The mean number of bypass grafts was 2,66 per patient in group I and 2,83 in group II. The internal mammary artery was used in 77,1% (172 cases) in group I versus 85,4% (188 cases) in group II ( $p < 0,05$ ). The rate of perioperative MI (7,6%; 5,9%), the usage of inotropic agents (21%; 19%), the insertion of intraaortic balloon pumping (IABP) (7,6%; 3,6%), the extracorporeal assist device (3,3%; 1,36%) were higher in group I than in group II. In addition noncardiac complications were found higher in group I. The hospital mortality was 8,9% and late mortality during a mean follow-up of 4 years was 6,7%, total mortality was 15,6% in group I and 4,5%, 3,1% and 7,6%, respectively in group II ( $p < 0,05$ ). The follow-up time ranged from 6 months to ten years (mean 4 years).

In conclusion, inspite of high mortality and morbidity risks, the necessity of CABG operations in the elder age group may be accepted for relief of ischemic symptoms and providing quality of life.

### Review

#### Molecular Genetics of Hypertrophic Cardiomyopathy

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Hypertrophic cardiomyopathy (HC) is an autosomal dominant heart disease that is characterized by hypertrophy, often of the left ventricle, with predo-

minant involvement of the interventricular septum in the absence of other causes of hipertrophy. The degree of hypertrophy, its distribution, patient age at onset, type and severity of clinical manifestations vary markedly. The natural course in certain families is ceased with sudden cardiac death, whereas in others sudden cardiac death is absent. The predominant cardiac pathology is myocyte hypertrophy and sarcomere disarray.

The recent evolution of molecular genetics has facilitated the identification of the underlying genetic defects of HCM. Three genes and a fourth locus responsible for this disease have been identified, and structure-function analysis has shed significant light on the molecular basis of the disease. The  $\beta$  myosin heavy chain gene is identified as the most responsible gene, and 36 mutations in this gene have been shown to be responsible for HCM. Mutations in the cardiac troponin T and  $\alpha$ -tropomyosin genes have also been identified as related with inheritance of the disease.

Identification of the underlying genetic defects provides the opportunity to relate phenotype to specific genotypes. Thus, genetic identification of the mutation will identify the individuals at risk of developing the disease before the presence of symptoms or the development of hypertrophy. If gene transfer therapy becomes available in the future, genotyping will certainly be a crucial examination in the patients with HCM.

### Case Report

#### Therapy of the Patient With Triple Accessory Pathways in a Single Session of Radiofrequency Catheter Ablation

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It is very rare that three accessory pathways exist in a patient with Wolff-Parkinson-White (WPW) syndrome. In the reported case three overt accessory pathways, all left-sided (left anterolateral, left posterolateral and posteroseptal) existed in association with WPW syndrome. All three accessory pathways were successfully eliminated in the same session by radiofrequency catheter ablation. This is to our knowledge the first reported case that ablation in a single session of overt three accessory pathways localized on the same side of heart, was accomplished.