08:30 - 10:00 S15 - Clinical Echocardiography Hall E

Chairs: **D. Gilon**
E. Goldhammer

08:30 **Comparison of the Clinical Characteristics of Apical and Non-apical Variants of 'Broken Heart' (Takotsubo) Syndrome in the United States**
R. Jabara [1,2], R. Gadesam [2], L. Pendyala [2], N. Chronos [2], S. King [2], J. Chen [2]
[1] Jerusalem, [2] Atlanta, GA

08:43 **Long-Term Follow-Up of Patients with Mitral Annulus Calcification: an Echocardiographic Study**
D. Weisenberg, S. Mishan, Y. Shapira, M. Vaturi, D. Monakier, A. Battler, A. Sagie
Petach Tikva

08:56 **Functional Mitral Regurgitation as a Predictor of Atrial Fibrillation Following Acute Myocardial Infarction**
F. Bahouth, D. Mutlak, S. Dabbah, J. Lessick, W. Markiewicz, H. Hammerman, Y. Agmon, D. Aronson
Haifa

09:09 **Flow Acceleration Time: A Novel Diagnostic Parameter for Prosthetic Aortic Valve Stenosis.**
S. Ben Zekry, S.H. Little, W.A. Zoghbi
Houston, TX

09:22 **Right Ventricular Pacing Increases Tricuspid Regurgitation Grade Regardless the Mechanical Effect of the Electrode Placement**
M. Vaturi, J. Kuzniec, Y. Shapira, M. Perlmutter-weiser, L. Glaymer, B. Strasberg, A. Sagie
Petah Tikva

09:35 **Diastolic Mitral Regurgitation in High Degree Atrio-Ventricular Block – Hemodynamically and Clinically Significant**
Y. Topilsky [1,2], G. Keren [1], S. Viskin [1], J. Sherez [1], R. Megidish [1]
[1] Tel Aviv, [2] Rochester

09:48 **Results of Anterior Leaflet Compared with Posterior Leaflet, Mitral Valve Prolapse Repair**
D. Spiegelstein, L. Sternik, S. Tager, A. Shinfeld, D. Loberman, M. First, A. Malachy, O. Golan, E. Raanani
Ramat Gan

Comparison of the Clinical Characteristics of Apical and Non-apical Variants of 'Broken Heart' (Takotsubo) Syndrome in the United States

Refat Jabara [1,2], Refat Gadesam [2], Lakshmana Pendyala [2], Nicolas Chronos [2], Spencer King [2], Jack Chen [2]

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Objectives: The present study was designed to delineate and compare the clinical characteristics of patients with apical and non-apical Takotsubo syndrome in a high-volume U.S. hospital.
Background: A comparison between apical and non-apical variants of the 'Broken Heart' or Takotsubo syndrome has not been performed in the United States.
Methods: From 2004 through 2007, patients with Takotsubo syndrome were identified according to the following criteria: acute chest pain with electrocardiographic changes or elevation of cardiac enzymes, absence of significant coronary narrowing, left ventricular (LV) segmental akinesia ("ballooning"), with or without antecedent stressful events. Based upon the location of LV ballooning, the patients were divided into 2 subgroups: apical and non-apical.
Results: Of 38 patients (age 64±12 years) fulfilling inclusion criteria, 84% were women; 79% had documented stressors, 76% had apical and 24% non-apical LV ballooning. When compared to non-apical subjects, apical patients presented predominantly with ST-elevation, had a higher incidence of hypertension, had significantly higher levels of Troponin T (8.5±6.7 ng/ml vs. 3.4±2.1 ng/ml, respectively, P=0.032), and lower ejection fraction (31±9% vs. 43±5%, respectively, P<0.001). Severe complications occurred only in apical subjects: pulmonary edema (10.3%), ventricular tachycardia (6.9%), cardiogenic shock (6.9%), LV apical thrombus (3.4%), transient LV outflow tract obstruction (3.4%), and death (3.4%).
Conclusions: Apical and non-apical ballooning subgroups may represent different manifestations of a single syndrome. When compared with non-apical ballooning, the apical ballooning group may represent a more severe subset, characterized by more heart failure and increased rate of cardiac complications.

Long-Term Follow-Up of Patients with Mitral Annulus Calcification: an Echocardiographic Study

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Background: Mitral Annulus Calcification (MAC) is one of the commonest cardiac pathologies in the elderly . Its etiology is unknown, but it is associated with atherosclerosis. MAC may cause mitral regurgitation (MR) and infrequently causes mitral stenosis (MS). However, the prevalence, severity and natural history of these abnormalities have not been explored. Therefore, we sought to determine these abnormalities in a large cohort of patients with long-term echocardiographic follow-up.

Methods: Between 1995 and 2006 , all patients with MAC and long (≥5 years) transthoracic echocardiographic follow-up were included. Patients with rheumatic heart disease or after mitral valve replacement/ repair were excluded. MAC severity, degree of MR/MS and pulmonary pressure were all evaluated over time. Severe MAC was defined as calcification involving more than one third of the posterior mitral annulus.

Results: One hundred and eighty-nine consecutive patients (110 female-58%, mean age 71±9 years, range 25 to 97) were followed for 84±20 months (range 60 to 144). Co-morbidities were frequent: hypertension-162(85%) ,diabetes-85(44%), coronary artery diasease-144(76%), history of stroke-49(25%) and atrial fibrillation-90(47%). At baseline, MAC was mild in 89 patients(47%) and severe in 100(53%), MR was none or mild in 150 patients (79%) and moderate to severe in 39(21%), MS was none or mild in 186(98%) and moderate in 3(2%), pulmonary pressure was normal or mildly elevated in 177(94%) and moderately elevated in 12 patients(6%), and left ventricular function was normal in 157 patients(83%). Progression from mild to severe MAC occurred in 47 out of 89 patients (53%). Mitral valve function worsened over the years: 38 out of 150 patients with initially none or mild MR developed moderate MR (3.6%/year) and 9 patients severe MR (0.7%/year). Moreover, 10 patients developed moderate MS (0.7%/year) and one patient severe MS. Moderate pulmonary hypertension developed in 36 patients (19%) .

Conclusions: Mac is a progressive disease. A limited but not negligible number of patients with MAC develop significant MR, whilst MS is rare, during long-term follow-up.

Functional Mitral Regurgitation as a Predictor of Atrial Fibrillation Following Acute Myocardial Infarction

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Background: The role of factors that increase left atrial pressure or cause an acute left atrial dilatation is frequently emphasized in the pathogenesis of atrial fibrillation (AF) in patients with acute myocardial infarction (AMI). Functional (ischemic) mitral regurgitation (FMR) occurring after AMI may promote AF. However, there is no information concerning the role of FMR in the development of new-onset AF in patients with AMI.
Methods: We performed a post hoc analysis of 1529 patients admitted with AMI and enrolled in a prospective study on the clinical outcomes of FMR. Patients with previous AF were excluded. Echocardiography was performed within 7 ± 3 days from admission. FMR was classified into 3 groups: 1) none, 2) mild or mild-moderate, 3) moderate to severe. The relationship between FMR and new-onset AF occurring at any time during hospital course was examined using multivariable logistic regression.
Results: Mild FMR was present in 587 (38.4%) and moderate/severe FMR in 118 (7.7%) of patients. AF developed in 33 (4.0%), 63 (10.7%), and 19 (16.1%) of patients with no/trivial FMR, mild or mild-moderate FMR, and moderate to severe FMR, respectively (P trend < 0.0001). After adjustments for age, gender, hypertension, diabetes, anterior infarction, ST-elevation infarction, Killip class, coronary revascularization, ejection fraction, and FMR grade, both mild or mild-moderate and moderate to severe FMR were strong independent predictors of AF (Table).
Conclusions: There is a graded independent association between the severity of FMR and development of AF in pts with AMI. Concomitant FMR may be an important determinant of new-onset AF in patients with acute MI.

Independent predictors of new-onset atrial fibrillation		
Variable	**Odds Ratio (95% CI)**	***P* value**
Age > 60	3. (1.8-4.8)	<0.0001
Ejection fraction < 45%	1.7 (1.1-2.5)	0.01
No/trivial FMR	1.0 (Referent)	-
Mild or mild-moderate FMR	2.2 (1.4-3.4)	0.0008
Moderate to Severe FMR	3.0 (1.6-5.6)	0.007

Flow Acceleration Time: A Novel Diagnostic Parameter for Prosthetic Aortic Valve Stenosis.

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Objective: Diagnosing prosthetic aortic valve (PAV) stenosis, especially in mechanical valves, is challenging. We postulated that ejection dynamics, particularly acceleration time (AT) and the ratio of AT to ejection time (ET) can differentiate PAV stenosis from normals and those with patient-prosthesis mismatch.

Methods: Doppler echocardiographic studies were reviewed and quantitated in 58 patients with PAV (22 mechanical and 36 bioprosthetic; age 66.9±14.5 years; valve size range 19-27 mm). Three groups of patients were identified: 1) patients with normal prostheses (n=34) evaluated within 3 months of surgery 2) patients with patient-prosthesis mismatch (n=10) and 3) documented PAV stenosis (n=14) with surgical confirmation. Quantitative Doppler parameters included ejection dynamics (AT, ET and AT/ET) and conventional PAV parameters of effective orifice area (EOA) and gradient.

Results: Summary of the Doppler parameters is presented in Table 1. Patient with PAV stenosis had significantly lower EOA and higher gradients compared to normals and mismatch. Flow ejection parameters (ET, AT and AT/ET) were significantly longer in the stenotic valves. Patients with prosthetic mismatch, while having a normal absolute EOA, had gradients and ejection dynamics intermediate, between normal and stenotic valves. Receiver-Operating characteristic curve analysis showed that AT discriminated best PAV stenosis from normals and patients with mismatch (area under ROC= 0.97). A cut off of AT = 100 msec had a sensitivity of 93% and specificity of 90% for PAV stenosis.

Conclusion: In prosthetic aortic valves, ejection dynamics, particular acceleration time, are reliable, angle independent diagnostic parameters for identifying prosthetic valve stenosis.

Table 1: Doppler Echocardiographic parameters in normal PAV, stenotic valves and patients with mismatch.

Echo Parameters	Normal PAV	Patient-prosthesis mismatch	PAV Stenosis
EOA (cm^2)	**1.66 ± 0.7**	**1.4 ± 0.4**	**0.6 ± 0.1†‡**
Mean pressure Gradient (mm Hg)	**13 ± 7**	**36 ± 8†**	**52 ± 15†‡**
ET (msec)	**240 ± 39**	**263 ± 35**	**313 ± 42†‡**
AT (msec)	**68 ± 18**	**87 ± 20†**	**129 ± 18†‡**
AT/ET	**0.28 ± 0.06**	**0.33 ± 0.06†**	**0.41 ± 0.03†‡**

†P<0.05 vs. normal valves.
‡P<0.05 vs. patient-prosthetic mismatch valves.

Right Ventricular Pacing Increases Tricuspid Regurgitation Grade Regardless the Mechanical Effect of the Electrode Placement

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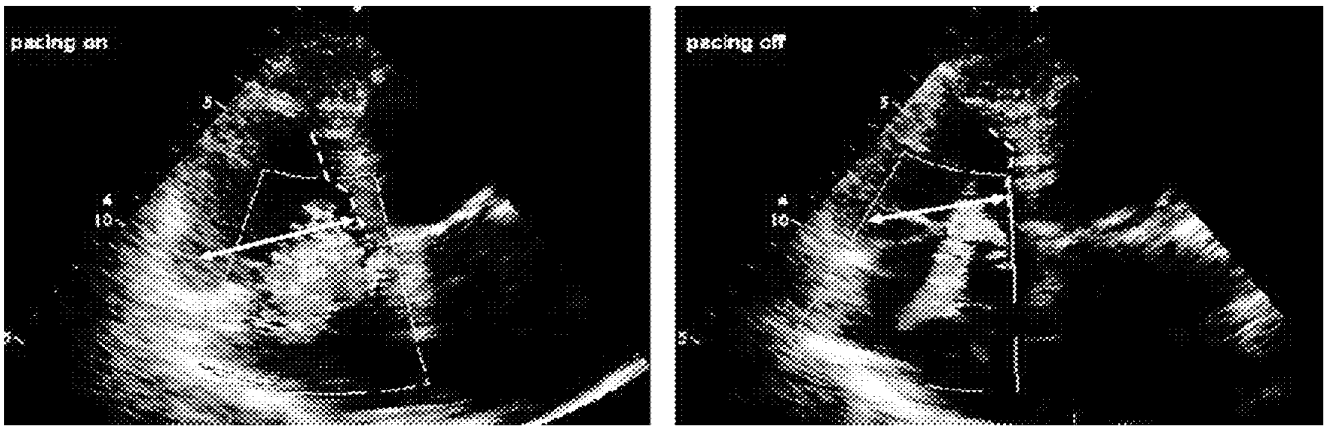
Background: The effect of RV pacing on tricuspid regurgitation (TR) is still debatable and is related to interference in valve closure by the electrode. The study aimed to determine the pacing impact on TR grade.

Methods: Patients with permanent pacemaker (PM) (electrode at the RV apex) were studied. Exclusion criteria: PM dependence, atrial fibrillation and LV dysfunction. Each patient had a baseline echocardiography study followed by PM programming: if in sinus rhythm, the PM was set on a pacing mode (≤ 5 heartbeats of baseline rate) and vice versa. Echo study was repeated immediately thereafter. The TR was graded by vena contracta (TRvc). RV and LV areas (end-diastolic and systolic in the apical view) and the RV base systolic diameter (septum to free wall) were measured (arrow in Figure).

Results: Twenty-one patients (12 males, 79±12 years, 81% with DDD pacing) were included. RV pacing was associated with increase in TRvc (from 0.2±0.2 to 0.4±0.2 cm, $p<0.0001$) and in the average TR grade (from mild to mild-moderate, $p<0.0001$). RV and LV areas and RV systolic pressure were not changed by the acute change in the pacing mode. However, RV base systolic diameter increased with pacing (3.3±0.7 vs. 2.9±0.5 cm, $p=0.001$) and was accompanied by visually leftward deviation of the basal septum (Figure).

Discussion: RV pacing is associated with a small (but significant) increase in TR grade, independently of the electrode's presence. It is suggested that pacing increases TR via induction of dyssynchrony in RV contraction.

Figure



Diastolic Mitral Regurgitation in High Degree Atrio-Ventricular Block – Hemodynamically and Clinically Significant

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Background: Loss of atrio-ventricular (AV) synchrony due to high degree AV block is commonly presented with dyspnea. Diastolic mitral regurgitation (MR) which has been described in this setting, was assumed to be small in volume and insignificant clinically, although never quantified. The purpose of this study was to evaluate diastolic MR quantitatively, in these patients, and to study it's clinical significance.

Methods: 25 consecutive subjects with advanced AV block, were divided into 2 groups according to the presence (n= 12) or absence (n=13) of dyspnea. All patients underwent echocardiographic evaluation , including quantitative calculation of diastolic MR volume, using modified methods ,before and after permanent pacemaker implantation.

Results: There was no difference between the groups in terms of age, gender, drug therapy, ventricular or atrial rate. 20/25 (80%) of patients had diastolic MR. The volume of diastolic MR , estimated with the proximal isovelocity surface area method ,reached up to 52cc per atrial relaxation (mean 15.0±14.8cc). The best single discriminator, between the "Symptomatic" and "Asymptomatic" groups was a volume of diastolic MR of 14.5 cc. A vigorous atrial relaxation was the only significant predictor of diastolic MR volume. All patients had no residual diastolic MR after pacemaker implantation.

Conclusions: Diastolic MR, in patients with high degree AV block, is common, and contributes significantly to symptoms of left heart failure.

Results of Anterior Leaflet Compared with Posterior Leaflet, Mitral Valve Prolapse Repair

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Background

The short and long term results of mitral valve repair for anterior leaflet prolapse (ALP) is considered less favorable than those reported for posterior leaflet prolapse (PLP). We compared mid term results of PLP repair versus ALP or bileaflet prolapse (BLP) repair.

Methods

From 1/2004, 377 patients underwent mitral valve repair. Valve pathology was degenerative in 263 (70%) patients. 184(70%) had PLP, and 79(30%) had ALP/BLP. Mean age was 60±12 and 58±13, in PLP and ALP/BLP groups, respectively (p=0.22). Valve repair techniques included leaflet resection (76% and 28%), annuloplasty (97% and 98%), artificial chordea (26% and 67%), in PLP and ALP/BLP groups, respectively. Minimal invasive approach was used in 54/184 (29%) patients in PLP group and in 5/79 (6.3%) patients in ALP/BLP group.

Results

There were 2 (1.1%) in hospital death in PLP group, and none in ALP/BLP group. Mean follow up was 15±16 month. Freedom from reoperation was 97.8% (180/184) and 98.7% (78/79), in PLP and ALP/BLP groups, respectively. There were no late deaths in both groups. NYHA improved from 2.1±0.9 to 1.5±0.6 in PLP group versus 2.1±0.8 to 1.5±0.7 in ALP/BLP group. Echocardiography follow-up revealed 90% (166/184) and 87% (69/79) of patients (PLP and ALP/BLP groups, respectively) were free from moderate or severe mitral regurgitation (p=0.63).

Conclusions

Mid term results of anterior or bileaflet mitral valve prolapse repair are comparable to the standard posterior leaflet prolapse repair.