EC3

Effect of Age on Normal Ranges of Pulmonary Artery Pressure at Peak Treadmill Exercise

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Background: Treadmill stress echocardiography (TSE) is frequently used for the assessment of dyspnea on exertion. This study sought to explore the effect of age on the normal ranges of pulmonary artery pressure at peak treadmill exercise.
Methods: Patients referred for TSE to rule out ischemia or for the evaluation of dyspnea on exertion underwent measurement of the right ventricular:right atrial (RV:RA) gradient pre and post exercise. RA pressure was estimated at 5mmHg. Patients with moderate or greater stenotic or regurgitant valvular disease, baseline wall motion abnormalities or studies positive for inducible ischemia were excluded from the analysis.
Results: 128 patients met criteria and underwent TSE with pre and post measurement of RV:RA gradient. Pre-study RV:RA gradient was not be obtained in 18 patients (14%) and post study RV:RA gradient was not obtained in 23 patients (18%). Estimated PA pressure pre and post exercise according to decade of life is presented in the table below.
Conclusions: Resting and peak pulmonary artery pressure can be measured in the majority of patients referred for TSE. Estimated peak PA pressure >40mmHg in non-trained patients under 70, and >49mmHg in patients 70 and over should be considered abnormal.

Ages	All	<40	40-49	50-59	60-69	70+
N	128	6	30	31	36	25
Males	70	2	17	16	22	13
METS	11+3	12.5+13	12.7+2.4	11.9+3.0	10.3+2.4	8.8+.4
%Peak HR	94+11	91+7	95+7	95+14	95+12	92+13
Peak SBP	156+19	141+10	154+19	156+22	160+21	156+17
Resting PA	27+6	22+4	25+6	26+6	27+4	31+6
Exercise PA	34+12	29+8	30+9	31+10	34+11	44+12
Range at Peak Exercise	14-77	20-42	23-57	14-57	17-58	25-77
increment	8+9	7+8	5+6	6+7	8+9	13+10
95 percentile	57	40	33	35	38	49

Vegetation Size in Patients with Infective Endocarditis

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Objective. Infective endocarditis is a serious disease with diverse clinical manifestations. In this work we analyzed vegetations' size in relation to the clinical presentation, course of the disease, and the type of the microorganism.

Methods: A total of 146 patients with definite diagnosis of infective endocarditis were identified at Assaf Harofeh Medical Center during the years 1998 to 2010. Of them in 102 patients accurate vegetations' size was available. The data of these patients were collected and analyzed.

Results: 23% of patients died, embolic complications occurred in 20.6% of patients, 16% of patients underwent surgery. Large vegetations (≥1cm) occurred in 46 patients. Older patients (>60 years) with large vegetations had significantly increased risk of mortality 38% ($p<0.05$). The strongest independent predictor of mortality was MRSA endocarditis (45%, $p=0.01$), followed by staphylococcal endocarditis associated with large vegetations (43%, $p=0.01$), or with older age (41%, $p=0.01$). The combination of staphylococcal endocarditis with large vegetations in the older patients was associated with mortality risk of 50%, $p=0.02$. Large vegetations were associated with high incidence of abscess formation (17%, $p<0.001$), especially in combination with MRSA (27%, $p=0.01$), diabetes (25%, $p<0.02$) and older age (30%, $p=0.01$).

Conclusion: Our results indicate that in patients with infective endocarditis the strongest predictor of mortality is MRSA infection, followed by staphylococcal infection especially in association with older age or with large vegetations. Older patients with large vegetations are also in significant risk of mortality. In these groups of patients surgery should be considered early.

New Method for Assessment of Left Atrial Appendage Dimensions by Transesophageal 3D Echocardiography

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Introduction: left atrial appendage (LAA) is the source of thrombi in more than 90% of patients with non-valvular atrial fibrillation (AF). Percutaneous Closure of the LAA has been proven to be an alternative strategy to chronic warfarin therapy for stroke prophylaxis in patients with non-valvular AF. Measuring the LAA dimensions became a key guiding stage before introducing percutaneous LAA closure device. The aim of the study was to compare the 3 and 2 Dimensional Real Time Transesophageal Echocardiography (RT3DTEE, RT2DTEE) in the measurement of the LAA dimensions.
Patients and Methods: We prospectively studied 49 consecutive patients (23/26 M/F) that underwent TEE in our center between July to October 2011 using IE33 3D Echo machine (BORTHEL Phillips).The following LAA variables were measured: Diameters of the LAA orifice were compared by RT2DTEE: 0o, 45o, 90o and 135o and by rotating RT3DTEE for the maximal LAA diameter and depth.
Results: Using the rotating 360 degrees RT3DTEE method revealed larger LAA diameter comparing to the largest 135o RT2DTEE (1.87 ± 0.6 cm, vs. 1.74 ± 0.3 $p<0.05$). In 23% of the cases the 135o which is the recommended angle for evaluation the maximal LAA orifice diameter was not the angel with maximal orifice diameter. No change was found in between the RT3DTEE and the RT2DTEE in the LAA depth (2.61 ± 0.6 vs. 2.54 ± 0.4 cm, p=NS).
Conclusions: Using the rotating RT3DTEE method significant larger diameter of LAA orifice diameter were provided in 23% of the cases. The rotating RT3DTEE method seems to be a more accurate method to measure the largest LAA diameter orifice and may facilitate the LAA closure procedure by choosing the appropriate closing device size. More studies are needed for evaluating this subject.

Epicardial Fat and Diastolic Filling in Subjects Without Heart Disease

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Introduction: Epicardial fat (EF) is part of the visceral fat, and is correlated to ultrasound measurements of central fat and waist circumference. It also has been found to correlate with coronary artery disease. In diabetics and morbidly obese, EF was associated with diastolic dysfunction.
Aim:to test the association of EF and diastolic filling in subjects without heart disease.
Methods: In volunteers without cardiac disease, EF was measured by Echocardiography, from parasternal long axis (LAX) and short axis (SAX) views, as the echo-free space betwen the myocardium and visceral pericardium located anterior to the right ventricle free wall at end diastole. Diastolic filling was assessed by measuring mitral inflow (E wave, A wave, E/A ratio, A duration), pulmonary vein flow (S wave, D wave, S/D ratio, S wave VTI, D wave VTI, systolic filling fraction, Ar velocity, Ar-A duration), TDI (septal e', lateral e', E/e') and color M-mode flow propagation velocity (Vp).
Results: 44 subjects, age (mean±SD) was 52±11 years, 79% males, BMI 30±6, diabetes 20%. PF thickness was 3.2±1.4 mm in LAX view and 3.2±1.3 mm in SAX view. PF thickness in LAX view was significantly correlated with E/A ratio (r= -0.33, p=0.037) and septal e' (r= -0.31, p=0.045). PF in SAX view significantly correlated with E/A ratio (r= -0.34, p=0.023) and Vp (r= -0.32, p=0.037). These correlations remained significant after adjustements for age and gender. Correlations between PF and other indices of diastolic filling were not significant.
Conclusion: Increased pericardial fat, negatively influences diastolic filling in subjects without heart disease.

Characteristics and Outcomes of Patients with Suspected Vs. Certain Left Ventricular Thrombus

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Background: Left ventricular thrombus (LVT) and anticoagulation treatment for LVT are hazardous conditions that are associated with potential embolic or hemorrhagic complications, respectively. Due to the limited diagnostic performance of transthoracic echocardiography (TTE) for the detection of LVT, a diagnosis of suspected LVT (SLVT) is often used. Since the rate of true LVT is lower in this group and presumably unnecessary anticoagulation is associated with potential complications, we sought to compare the clinical characteristics and outcomes of patients with certain LVT (CLVT) vs. patients with SLVT.
Methods: Using the Heart Institute computerized database we retrospectively identified 136 patients who were diagnosed with SLVT (N=109) or CLVT (N=27) between the years 2007 to 2010. Demographic, clinical, including anticoagulation treatment and echocardiographic data were collected. Follow-up events were defined as: embolic event, hemorrhagic event, CHF, MI or combined endpoint of any event.
Results: There was no difference in baseline, clinical and echocardiographic findings between SLVT and CLVT patients. The rate of the combined endpoint was 16.1% and 48.1% for the SLVT group vs. CLVT group, respectively ($p<0.05$). Among patients treated with anticoagulation the rate of either hemorrhagic or ischemic events was 13% and 37 % for the SLVT vs. the CLVT, respectively ($p=0.03$). Among patients not treated with anticoagulation the rate of either hemorrhagic or ischemic events was 5.7% and 6.25 % for the SLVT vs. the CLVT, respectively (p=NS). In a multivariate model, CLVT vs. SLVT predicted combined event with OR of 4.6 (95%CI=2.2-9.8).
Conclusion: The diagnosis of SLVT is more frequent than CLVT. Patients with SLVT have fewer complications than patients with CLVT suggesting that sweeping anticoagulation therapy for this group maybe be unjust. The findings imply for the use of contrast echo agent to enhance the diagnostic performance of TTE.

Does Chronic Atrial Fibrillation Induce Cardiac Remodeling?

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The aim of this study was to compare cardiac structure and function in patients with chronic atrial fibrillation (CAF), as opposed to patients with paroxysmal atrial fibrillation (PAF), and normal control subjects.

There is a strong correlation between heart failure and atrial fibrillation (AF). On one hand, patients who develop AF have an increased risk of developing heart failure; on the other hand, patients with heart failure are more likely to develop AF.

Methods: The study cohort included 83 patients, divided into 3 groups: Group A: 31 patients with CAF for at least 6 months, group B: 30 patients in sinus rhythm with a documented history of PAF, and group C: 22 patients without any history of AF. Patients with CAF were older (71 vs 64 & 64 respectively). Apart from age, groups were clinically similar. After careful clinical evaluation, comprehensive echocardiography studies were performed including cardiac chambers' size, systolic and diastolic LV function.

Results: LA diameter and area were significantly larger in CAF than PAF and control patients: 46.9±5.9 vs. 41.8±8 vs. 36.5±4.8 mm and 29.0±5.8 vs. 23.9±5.2 vs. 18.6±3.8 mm2 respectively ($p<0.001$). LVEF (Simpson) was lower in CAF: 53.6±7.1 vs. 61.0±7.1 vs. 58.2± 4.6 %,($p<0.001$). Isovolumic relaxation time was shorter in CAF, 65.6±16.3 vs. 88.5±20.7 vs. 80.4± 12.9 ms ($p<0.001$), E/e' septal was larger in CAF 12.2±4.5 vs. 10.2±3.5 vs. 9.9±3.4 ($p<0.033$). E/Vp was also significantly different in CAF 2.7±0.8 vs. 1.6±0.4 vs. 1.7±0.5 ($p<0.001$). Additional diastolic parameters were also significantly different.

Conclusions: These findings correlate with the symptoms experienced by patients in AF and demonstrate that in patients with CAF both structural and functional cardiac changes occur. Patients with CAF as opposed to both normal subjects and patients with PAF have larger LA and reduced systolic and diastolic LV function.

The Estimation of Aortic Atheromas by TEE: Do 3D Images Better Estimate Atheromas' Size?

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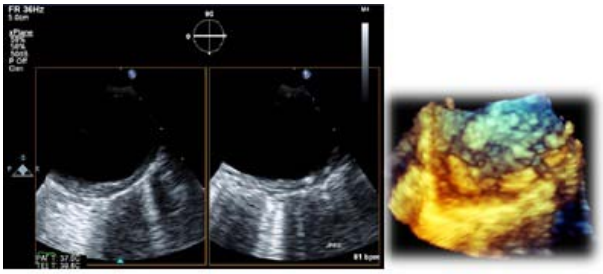
Background: Aortic atherosclerotic plaques (AAP) with complex configuration (i.e. thick, protruding, mobile and\or ulcerated), bear significant risk of embolism. With the increasing popularity of percutaneous cardiac interventions using bulky devices (e.g., TAVI), an accurate pre-procedure evaluation of the AAP burden may predict complications and affect the selection of vascular access. TEE can detect AAP of the thoracic aorta. We hypothesized that 2D TEE images underestimate AAPs' size compared to 3D images.
Methods: The study included 15 patients (age 76±12 years, 9 females), who had routine TEE studies, using the Phillips IE33 3D-imaging platform, at our institute during 2011. The thoracic aorta was studied from arch to distal descending part, using the x-plane mode (simultaneous short and long axis views). If focal intimal thickening (suggestive of AAP) detected, the 3D zoom algorithm was exercised on the specific site with further post processing on a Q-lab workstation to measure its thickness and length in the X,Y and Z planes. The AAPs contour was defined qualitatively as regular or irregular (i.e. anything but flat) in each mode.
Results: A total of 22 AAPs were investigated. The AAP thickness estimation was significantly greater in the 3D mode than in 2D (Table1). No difference in AAP length was found between the two modes. The rate of irregular AAPs was significantly greater when evaluated in the 3D mode (77.3% in 3D vs. 14% in 2D, $p<0.001$) (Figure 1). The difference in AAP thickness between x- and y-planes (Table 1) supports the qualitative estimation of AAP irregularity.



	2D measurements	3D planes	3D measurements	p value (2D vs. 3D)
APP thickness, median (mm) (IQR 25th;75th percentile)	0.2 (0.2;0.3)	x-plane	0.24 (0.18;0.33)	0.005
APP thickness, median (mm) (IQR 25th;75th percentile)	0.2 (0.2;0.3)	y-plane	0.28 (0.22;0.4)	0.01
p value (x- vs.y-plane)			0.02	

Severe Dyspnea During Pregnancy: Characteristics and Possible Cardiac Involvement

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	LVEDd	LVESd	IVS	PAP	E decelT
Control mean	54.8	32.1	8.8	17.3	205.9
STD	19.6	4.0	0.9	4.7	38.9
Dyspnea mean	45.4	28.1	9.9	30.8	139.6
STD	4.4	5.4	1.1	7.7	41.6
P	0.060	0.041	0.010	0.003	0.000

Background: Dyspnea is often associated with pregnancy, but when no extracardiac etiology is found, the possibility of a cardiac source must be entertained.
Aim: To characterize pregnancies associated with severe dyspnea and rule out a possible cardiac etiology.
Method: Twenty five pregnant women with no confounding diseases who were admitted for investigation of severe dyspnea were recruited for this study if no reason was found for their dypsnea. We performed ECGs, echocardiograms (including analysis of longitudinal and circumferential strain), Holter, exercise testing (including, respiration and O2 saturation), chest X-ray and CT when indicated clinically. Demographic and obstetric data were collected. We compared 19 patients with dyspnea to paired pregnant women with no excessive dyspnea.
Results: Patients with severe dyspnea were 32±5 years old, presented in the 39.6±1.7 week of gestation, 3 (16%) had twins, 6 (32%) were primiparas, HR and BP were normal and hemoglobin was 11.4±1.2 g%. ECG and echocardiogram were within normal limits. Tachycardia >120/min was found on Holters in 60% and 2 patients had SVTs. On dyspnea-limited exercise tests HR increased from 100 to 128 bpm and BP from 110/67 to 129/70 mmHg. Exercise time was 294 sec and only 4.6 METs were achieved (30% could complete only 1 stage of Bruce). SO2 decreased during exercise from 98.2 to 97.7% (in one to 94%). On echo, patients with dyspnea had smaller and thicker hearts, elevated pulmonary pressures and a decreased E deceleration time (Table). No significant differences were found in 2D strain and tissue Doppler velocities.
Conclusions: Dyspnea during pregnancy is probably multi-factorial. In this pilot study we found much individual variability in symptoms and findings on multiple tests. However, echocardiography findings raise the possibility that a decreased LV compliance in the face of a physiologically elevated preload may play an etiologic role and further investigation is underway.