Echocardiographic Variables and Left Ventricular Morphology Patterns Associated with Right and Left Bundle Branch Blocks

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Background: Complete right and left bundle branch blocks (RBBB and LBBB) are associated with increased morbidity and mortality; however the mechanisms responsible for these relations are unclear.
Objectives: To determine independent echocardiographic variables associated with RBBB and LBBB.
Methods: We analyzed the data of 10,621 consecutive patients without pacemakers, non-specific intraventricular conduction delay, or significant valvular disease on the electrocardiogram, who were referred to stress echocardiography in our Institute. Left ventricle (LV) morphology patterns were categorized according to the American Society of Echocardiography recommendations. Logistic regression analysis determined independent variables associated with RBBB or LBBB.
Results: There were 479 (4.5%) patients with RBBB, 259 (2.4%) patients with LBBB and 9883 (93.1%) patients with no BBB. After adjustment for clinical and echocardiographic variables, independent variables associated with RBBB compared to no BBB included severely reduced left ventricle ejection fraction (LVEF <30%) and increased LV mass index. The independent variables associated with LBBB included: increased LV diastolic diameter index, any reduction in LVEF (< 50%) and increased LV mass index. A separate analysis revealed that both concentric and eccentric hypertrophy were independently associated with RBBB and LBBB; however for LBBB eccentric hypertrophy was significantly more prevalent than concentric hypertrophy.

	RBBB vs. no BBB		LBBB vs. no BBB	
	Odds ratio	P value	Odds ratio	p value
LV diastolic diameter/BSA > 3.2 cm/m2	1.37	NS	1.58	.016
LVEF 40-49% LVEF 30-39% LVEF<30%	.94 1.01 1.79	NS NS .015	2.70 5.46 15.07	.0001 <.0001 <.0001
Increased LV mass index	1.35	.005	2.21	<.0001
Eccentric hypertrophy Concentric hypertrophy Eccentric vs. concentric hypertrophy	1.46 1.57 .96	.015 .002 NS	4.03 2.27 1.70	<.0001 <.0001 .001

Conclusions: LBBB is strongly associated with increased LV mass index and eccentric hypertrophy. Its association gradually increases with reduced LVEF, whereas RBBB is moderately associated with severe LV dysfunction and increased LV mass index. These data may explain the increased morbidity associated with LBBB and RBBB.

Prediction of Left Atrial Appendage Thrombi in Non-valvular Atrial Fibrillation. The Role of D–dimer.

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Background: There is little knowledge about the prediction of left atrial appendage (LAA) thrombi in non – valvular atrial fibrillation (NVAF).

Aim: To evaluate the role of D–dimer to predict the presence of LAA thrombi in patients with NVAF.

Methods and results: In this prospective blinded study, 71 patients (56 % males, mean age 74.9 years) with NVAF were enrolled. Blood for D-dimer was taken at the time of transesophageal echocardiography (TEE). In 12 (16.9 %) patients, thrombus was found in the LAA. Significant predictors of LAA thrombi were the presence of congestive heart failure (25% vs 15%, p=0.04856), a history of recent embolic event (15.25% vs 8.33%, p=0.0412), severe spontaneous echo contrast (SEC) (66.67% vs 28.81%, p=0.0123), platelet count (248.000/ul vs 208.000/ul, p=0.0381), elevated fibrinogen levels (627.6mg/dl vs 534.3mg/dl, p=0.0480), and D-dimer levels (1445.64ng/ml vs 524.79ng/ml, p= 0.0002).

Receiver operating characteristic analysis detected an optimal cutoff value of ≥ 800ng/ml for D-dimer to detect LAA thrombi.

LAA thrombi were detected in 91% of patients with higher D-dimer values, whereas it was detected in only 9% of patients with lower D-dimer values. D–dimer cutoff level of 800ng/ml had a negative predictive value of 92% for identifying LAA thrombi.

Conclusions: In patients with NVAF, D-dimer may be helpful for predicting the presence of LAA thrombi. D-dimer level may be clinically useful to guide the management of patients with NVAF.

The Yield of BNP in Prediction of Ischemia During Dobutamine Stress Echocardiography

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Objectives: Dobutamine stress echocardiography (DSE) is a valuable tool for the noninvasive evaluation of myocardial ischemia. Recently, B type natriuretic peptide (BNP) has emerged as a biomarker with the potential of risk stratification & ischemia prediction. This study was performed to assess the correlation between BNP levels before and after DSE and myocardial ischemia as demonstrated by DSE.

Patients and methods: 26 patients referred for DSE were recruited for the study after signing informed consent. Before DSE, baseline echocardiography determined LV size, ejection fraction, and pulmonary artery systolic pressure. First NT pro-BNP sample was obtained after venous catheter insertion before dobutamine infusion. IV dobutamine was infused up to 50 mcg/kg/min to reach the target heart rate, IV atropine was used up to 1 mg if needed. Second NT pro-BNP sample was obtained immediately after the end of the exam. SPSS-13 software was used for statistical calculations.

Results: Mean age was 69 (47-83) years, 58% were females, 13 had established CAD, 9 had previous MI. Average LVEF was 58 (30-70)%, 80% of patients had EF $\geq$ 50%;: 5 patients had chest pain during DSE, 7 had ECG changes. 6 had wall motion abnormalities at baseline study. LV function did not improve or deteriorated in 3,
6 had evidence of inducible ischemia. Mean NT pro-BNP first sample value was 408 (17-2381) pg/ml, second sample was 401 (16-2292) pg/ ml, mean difference between the 2 samples was -7.67 (-89 to 82) pg/ml. There was a significant statistical correlation between 2 NT pro-BNP samples and baseline EF (p=0.031 & 0.027), when EF was divided into normal (>50%) and abnormal group, the correlation was even higher (p=0.001). There was no correlation between any of 2 NT pro-BNP value, their average, their relative change (and ratio between the change and the average) and the presence of inducible ischemia.

Conclusion: In this pilot study, NT pro-BNP levels before and after DSE and the difference between them did not correlate with the presence of inducible myocardial ischemia on DSE. Our study did not show any added value of NT pro-BNP levels during dobutamine stress echocardiography.

Nitrous Oxide Inhalation for Transoesophageal Echocardiography- An Alternative to Benzodiazepine Sedation?

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Background: Transoesophageal echocardiography (TEE) is usually performed using benzodiazepine sedation, which is a limiting factor for elderly patients or those with respiratory insufficiency. Kalinox®, an equimolar mixture of nitrous oxide and oxygen, with no depressive respiratory action and fast reversible effects, seems ideally suited for performing TEE but has never been evaluated. The aim of the present study was to evaluate TEE feasibility and efficiency using Kalinox compared to standard care using benzodiazepine.

Methods: We prospectively enrolled 80 consecutive patients referred for TEE. In the 35 first patients, TEE was performed using intravenous benzodiazepine (Midazolam) and in the 45 last patients using Kalinox (nasal delivery). Pain and tolerance induced by the examination were evaluated on a 0-10 scale. Remembrance of the examination by the patient and quality of the TEE by the operator were also evaluated.

Results: All TEEs were performed by the same experienced operator. TEE duration was not different (6±3 vs. 7±4 min respectively, p=0.57). Patients in the Kalinox group felt TEE to be more difficult (p=0.005) and remembered the procedure more clearly (p<0.0001) but pain experience was not different (7% vs. 9% had a pain score ≥5 respectively, p=0.75). Percentage of patients who agreed to have a second TEE if necessary was slightly lower (77% vs. 94% respectively, p=0.04). The operator judged TEE quality satisfactory in similar proportions (76% vs. 68% respectively, p=0.44).

Conclusion: These preliminary results show that TEE using Kalinox is feasible, provides similar pain relief despite more discomfort for the patient, and acceptable conditions for the operator. Thus, Kalinox use could be considered as an alternative to benzodiazepine sedation for patients intolerant to benzodiazepines such as elderly or respiratory-insufficient patients.

Accuracy and Reproducibility of Left Ventricular Outflow Tract Diameter Measurement Using Transthoracic as Compared to Transesophageal Echocardiography

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Background: Accurate measurement of left ventricular outflow tract diameter (LVOTd) is essential for reliable estimation of aortic valve area (AVA) using the continuity equation. Transesophageal echocardiography (TEE) can accurately delineate the LVOT. The purpose of this study was to assess the accuracy and reproducibility of LVOTd measurement using transthoracic echocardiography (TTE) with harmonic imaging as compared to TEE.

Methods: We prospectively studied 50 pts (mean age 69±14y, 20 with aortic stenosis (AS) and 30 without AS). LVOTd was measured offline in a blinded fashion in both systole and diastole by 2 experienced observers using TTE in the parasternal long axis view and TEE in the midesophageal aortic view (~130°).

Results: There was good correlation between TTE and TEE (r=0.91). LVOTd was significantly smaller by TTE as compared to TEE (2.11±0.21 cm vs. 2.16±0.22 cm, mean difference -0.05±0.09 cm, p=0.0003). Bland-Altman analysis showed 95% confidence interval of +0.14 and -0.24 cm for LVOTd measurement by TTE vs. TEE. Inter and intra-observer variability for LVOTd was 4.8±4.1% and 2.8±1.9% for TTE and 4.2±3.1% and 2.5±1.6% for TEE (p=NS). In patients with AS, estimated AVA was 0.93±0.22 cm^2 using TTE and 0.96±0.24 cm^2 using TEE, p=0.08. Diastolic LVOTd by TTE was smaller compared to systolic LVOTd by TEE (-0.07±0.08 cm, p<0.0001), especially when LVOTd was large, but there was excellent correlation between the two (r=0.95).

Conclusions: LVOTd is slightly underestimated by TTE as compared to TEE, but using harmonic imaging is accurate and reproducible. LVOTd measurements at end diastole can be used to predict systolic LVOTd when systolic images are suboptimal.

Comparison of Conventional and High-Frequency ECG Analysis in Detecting Ischemic Heart Disease During Dobutamine Echocardiography

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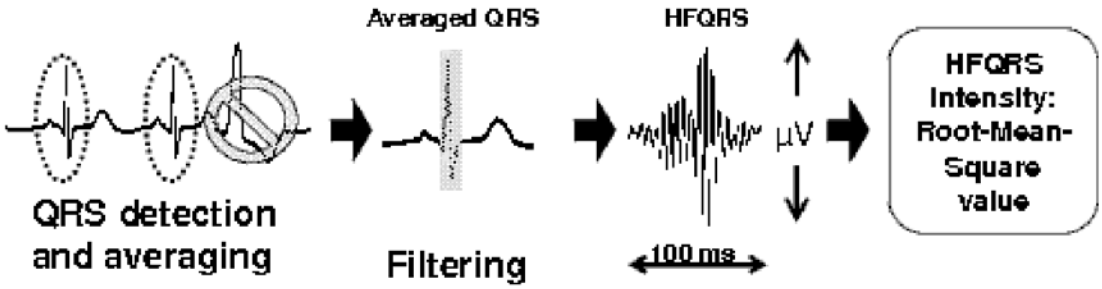
A novel technique for electrophysiological detection of stress induced ischemia, based on analysis of the high frequency mid-QRS potentials (HFQRS), has recently been reported to outperform conventional exercise ECG interpretation. Our aim was to test the performance of this technique in patients undergoing dobutamine echocardiographic imaging.

Methods: The study included 71 pts (67±14 y, 39 men) referred to clinical dobutamine echocardiography, which served as the comparative diagnostic test for ischemia. Conventional ECG was combined with high resolution ECG acquisition that was digitized and analyzed offline using the HyperQ™ System (BSP, Tel Aviv, Israel). HFQRS signals were extracted and time-intensity curves calculated (figure). Relative intensity change in HFQRS during the test was used as an index of ischemia.

Results: The dobutamine echocardiographic test was positive in ten patients, negative in 55 patients, while six patients had inconclusive results. HFQRS analysis was possible in 45 patients and conventional ECG interpretation was available in 33 patients. HFQRS analysis showed better specificity than conventional ECG interpretation (85% vs 55%, $p<0.01$), and overall accuracy was significantly improved (82% vs. 55%, $p<0.01$) when HFQRS was employed.

Conclusions: HFQRS analysis presents a significant improvement over conventional ECG interpretation in detecting ischemia during dobutamine stress and may thus aid in enhancing the non-invasive diagnosis of ischemic heart disease. Further testing in a larger patient population is required to accurately assess the diagnostic performance of this technique.



Correlates of Echocardiographic Left Atrium and Ventricular Parameters and GFR in Hospitalized Patients

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Introduction: Chronic kidney disease is associated with increased cardiovascular (CV) risk. Left ventricular hypertrophy (LVH) together with coronary artery disease has been considered the main target of intervention in these patients. LVH is highly prevalent in CKD even in early stages. The aim of the study was to investigate the relationship between Glomerular filtration rate (GFR) and LV, left atria (LA) echocardiographic parameters in hospitalized patients.

Methods: Retrospective chort analyses of all patients hospitalized in Internal Medicine A during the study period was performed. GFR was estimated by means of the serum creatinine level using the MDRD Equation formula. LVH, LA volume, area and diameter were determined according to echocardiographic criteria.

Results:

Data analysis was performed on 1000 consecutive patient's laboratory and echo files during 16 months (1/ 2006 -4/ 2007). In 397 pts (M/F 147/250) all data existed and thus were included. Mean Age was 76.5±8 (38-94y).The Correlation of GFR with LVH (posterior wall and septum) and LA Volume was good (r^2=0.68 and 0.62 respectively $p<0.05$). The Correlation of GFR with LA Area was Borderline (r^2 = 0.45, p=0.058) and no correlation was found with LA diameter (r^2=0.35, p=0.64).Creatinine clearance was inversely related to LVH (r=-0.132, $P<0.0001$).

Conclusions: GFR is associated with altered LV dimensions. These data may help explain the high cardiovascular mortality observed in patients with renal dysfunction. The incidence of LV diseases progressively increases as GFR deteriorates. This observation is more accurate when volumes are used and less when area and diameter are used.

Classification of Left Heart Functional Dimensions by Clustering Cardiac Echo-Doppler Measurements. A Mathematical Data Mining Technique Can be Used to Find Pathological Patterns

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Introduction: Cardiac Echo-Doppler (Echo) data may contain hidden information that cannot be revealed and identified by an experienced cardiologist. Thus, important relations between Cardiac dimensions (CD) may be misinterpreted. Clustering is commonly used in Data Mining (DM) and aimed to partition data into clusters.

Aim and methods: The aim was to find if mathematical tool such as clustering algorithms can find possible correlations between CD in order to upgrade and improve echo diagnostic abilities. Therefore clustering algorithms including K-means (KM), Kohonen (Koh) and TwoStep (TS) were applied on 24,400 data objects of Cardiac Echo measurements.

Results: The commercial DM tool Clementine (Clem) was used. Each algorithm generated different clusters. Despite this, between left atrial Area (LAad) and ascending aortic Diameter (AsAod), pathological positive correlations were identified and both negatively correlated with EF (table 1).

Conclusions: This work is an example from a series of works which shows that mathematical Data Mining technique can be apply on Echo measurements, find correlations between CD and thus may be used to look for hidden pathological patterns.

Cardiac Dimension vs. clustering algorithm	K-means	Kohonen	TwoStep
AsAod (mm)	29.2±4.8	*31.9±3.5	*33.8±4.2
Lad (mm)	*32.3±4.1	*36.6±5.2	*44.7±8.8
LAa (cm2)	*15.5±3.2	*19.4±3.8	*28.1±7.0
LVEDD (mm)	*46.5±4.1	*50.7±4.7	*55.7±8.5
LVESD (mm)	*28.9±3.2	*38.3±5.5	*42.4±10.8
EF %	*63.2±3.7	*41.4±11.1	*44.8±14.8
STH (mm)	*8.7±1.3	*10.2±1.4	*11.2±2.4
PWT (mm)	8.5±1.2	9.7±1.2	10.5±1.8

Table 1: LAd and left atrial area (LAa), LV end diastolic and systolic diameter (LVEDD)-LVESD), Ejection fraction (EF), Septal&Posterior wall thickness (STH-PWT).*= P<0.01 (in column only).

Routine Coronary Angiography pre Valve Surgery is it Time to Change the Paradigma ?

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Aim: To assess the usefulness for routine coronary angiography in patients referred for valve surgery.

Methods: Patients diagnosed with valve disease on clinical and echocardiographic findings and who underwent routine coronary angiography in the absence of clinical ischemia, were analyzed as to the presence and severity of coronary artery disease. Data was collected from the catheterization reports.

Results: 99 patients from private and public hospitals were catheterized . 40% were females. Average female age was 69years and males 63years. 67% of the patients had normal or non obstructive disease and 13% only 1 vessel disease. However in the patients under 60 years 88% were normal and 8% had only one vessel disease. In this subgroup no female had coronary artery disease. Only 13% underwent concomitant cabg.

Conclusions.High rate of normal and non obstructive disease especially in females under the age of sixty.

Recommendations..No need for routine coronary angiography prior to valve surgery in patients under 60. coronary CT scan can serve as an alternative.

Characteristics and Management of Hospitalized Old Patients with Severe Aortic Stenosis

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Introduction: Severe aortic stenosis (sev-AS) is common in old patients but there are no guidelines for its management at this age. We studied characteristics and management of these patients compared to younger sev-AS patients and to old patients without sev-AS.

Methods: Patients with sev-AS over age 70 (group 1 = 37 patients, age 84.6±4.2) were retrospectively compared to old patients with mild AS (group 2 = 20 patients, age 84.8±2.5) and to younger patients with sev-AS (group 3 = 17 patients, age 68±7.9, $p<0.001$ vs. other groups).

Results: Majority of patients were female (73, 50 and 67% in groups 1-3, respectively). Severity of AS was similar in groups 1 and 3 (mean gradient 56±24 vs. 54±17mmHg; valve area 0.61±0.18 vs. 0.69±0.14cm^2). Surprisingly, other echo parameters were similar in all groups as was the prevalence of hypertension (72-79%), atrial fibrillation (21-54%), diabetes (25-50%) and IHD (27-54%). Hyperlipidemia and smoking were more common in group 3 (67 and 22% vs. 29-35% and 0-4%, respectively). Common reasons for admission were heart failure (54-57%) and vertigo/syncope (19-33%). Blood pressures, heart rates, laboratory results on admission were similar but creatinine was higher in groups 1-2 vs. group 3. A cardiological consult was requested in 22% of group 1 but in 94% of group 3 patients. Accordingly, valve replacement was recommended in only 11% of group 1 vs. 72% of group 3 patients.

Conclusions: Old patients with sev-AS patients have similar characteristics to younger patients with sev-AS but are treated like old patients with mild AS.