Predictors of Left Ventricular Systolic Dysfunction in Patients with Left Bundle Breach Block

48

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Type of submitter

Fellow in Training

Abstract

Background: Left bundle branch block (LBBB) is associated with asynchronous left ventricular (LV) activation, which may lead to left ventricular systolic dysfunction (LVSD). However, it is unknown who among patients with LBBB develops LVSD or the time it takes for LVSD to develop. The aim of this study was to identify risk factors of developing LVSD in patients with LBBB.

Methods: Using electronic medical records at Metrohealth Medical Center, we identified all patients (age 18 years and older) between 01/01/2012 and 12/31/2012 who had the following: LBBB and 2 separate left ventricular ejection fraction (LVEF) assessments, with initial LVEF being normal. Using subsequent LVEF assessment (done at least 12 months later) we divided the study cohort into 2 groups (those with LVSD (LVEF< 45%) and those without LVSD (LVEF ≥ 45%). Various clinical variables such as age, sex, smoking, and the presence of key comorbidities were compared between the 2 groups.

Results: Among 450 patients identified as having LBBB between 01/01/2012 and 12/31/2012, 143 patients met the inclusion criteria (mean age 65.9 +/- 13.1), 43.56 % were males. There were 64 patients (44.7%) who developed LVSD on subsequent LVEF assessment. The average drop in LVEF was 21.86% from 56.94% +/- 6.59 to 35.08% +/- 8.97. History of Hypertension was significantly associated with increased risk of developing LVSD (Odds ratio 3.2 (CI 1.12 -9.33; P=0.030), while history of coronary artery disease was significantly associated with reduced risk of developing LVSD (Odds ratio 0.23 (CI 0.13 - 0.52; P=0.0001)).

Conclusion: Our results indicate that a significant proportion of patients with LBBB go on to develop LVSD. We found that hypertension increases the risk of LVSD while coronary artery disease reduces the risk of LVSD in patients with LBBB.

Categories

1st year Fellow: Research

Program/Institution Name

Summa Health System/NEOMED

How much is too much? A Case Series of High Burden of Premature Ventricular Contractions in Children without Congenital Heart Disease

60

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Type of submitter

Fellow in Training

Abstract

Background

Isolated premature ventricular contractions (PVCs) in healthy children are common. It is widely accepted that those with frequent PVCs, defined as >10% PVC burden on 24hr Holter monitor, should receive longitudinal monitoring to assess for the development of ventricular ectopy -induced cardiomyopathy[1]. Whereas for adults there is strong evidence to support the correlation between PVC burden and the development of cardiac dysfunction[2,3], no such data exists within pediatric literature.

Objective

This case series aims to describe outcomes of children with an extremely high PVC burden on Holter monitoring, defined as > 40%, with the hypothesis that a high burden of PVCs in children with structurally normal hearts is not associated with ventricular dysfunction.

Methods

Children with PVC burden >40% on 24hr Holter monitoring over the past 5 years were identified from our institutional database. Retrospective chart review was performed for assessment of PVC burden, imaging data, medical treatment, and non-invasive and invasive electrophysiology testing. Patients with congenital heart disease were excluded. This study was approved by institutional IRB.

Results

Eighteen patients with PVC burden >40% were identified. Ten patients were excluded due to the presence of congenital heart disease, an intra-cardiac tumor, or accelerated ventricular rhythm. Nine patients with high burden of PVCs on Holter monitoring treated in the past 5 years were identified and their treatment courses reviewed (Table 1); one patient was excluded due to loss to follow up. All patients had monomorphic PVCs on serial monitoring. Patient 1 was treated with beta blockade due to intermittent mild biventricular systolic dysfunction on imaging studies. Patients 2-8 all demonstrated normal structure and function on initial and surveillance cardiac imaging. Patients 2-8 received no anti-

arrhythmic medications and underwent no invasive electrophysiology studies. PVC burden decreased in seven patients, on average by 85% over time. One patient had an increase in PVC burden on most recent Holter monitor.

Table 1

Discussion

Our case series describes children with a very large burden of PVCs and suggests that they do not require anti-arrhythmic therapy or invasive intervention and may be followed with non-invasive monitoring. Despite the high burden of PVCs present within this patient population described, the development of ventricular dysfunction was not demonstrated. These results are consistent with prior studies which have described the typically benign course of isolated PVCs of lower burden in children with structurally normal hearts. Further, we observed a spontaneous and dramatic decline in the burden of ventricular ectopy over time in 7/8 (88%) patients.

Conclusion

Children with very high PVC burden and structurally normal hearts with normal function may be monitored without medical or invasive intervention. Larger studies of high burden PVC in children are necessary to determine risk factors for development of cardiomyopathy.

Categories

1st year Fellow: Research

Program/Institution Name

Nationwide Children's Hospital/Ohio State University

Men, Women and Matters of the Heart: Explaining Sex Differences in Response to Cardiac Resynchronization Therapy

50

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Type of submitter

Fellow in Training

Abstract

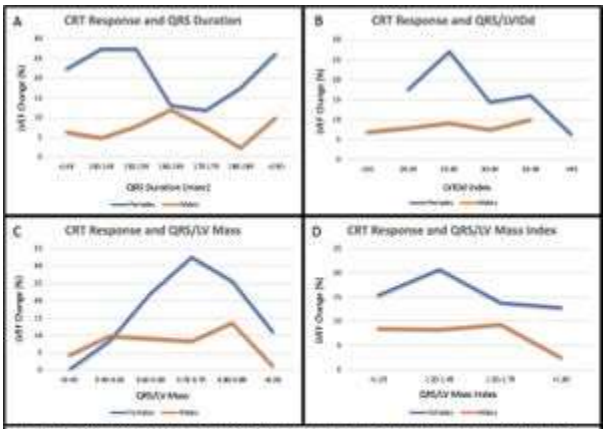

Figure. Sex differences in absolute change in LVEF after CRT relative to (A) QRS duration, (B) QRS duration indexed to LV diameter, (C) QRS duration indexed to LV mass, and (D) QRS duration indexed to LV mass index. LVEF = left ventricular ejection fraction; CRT = cardiac resynchronization therapy.

Sex	QRSd/LVIDd	QRSd/BSA	QRSd/LV mass	QRSd/LV mass index
Females (N=26)	29.8 ± 6.3	85.3 ± 13.1	0.8 ± 0.3	1.5 ± 0.5
Males (N=40)	24.8 ± 4.9	74.8 ± 12.1	0.6 ± 0.2	1.2 ± 0.5
P-Value	< 0.001	0.002	< 0.001	0.019

Background. Wide QRS duration, non-ischemic cardiomyopathy (NICM), and female sex portend favorable response to cardiac resynchronization therapy (CRT). Among patients with NICM and left bundle branch block (LBBB), outcome differences between males and females remain poorly understood.

Objective: We examined sex differences among patients with NICM and LBBB to determine if the indexed QRS duration could explain the reponse discrepancy.

Methods. Patients who underwent CRT due to NICM and LBBB were retrospectively reviewed. Only patients with *de novo* CRT implants and complete EKG and echo data were included. Patients were grouped by sex and matched according to QRS and indexed QRS duration.

Results. Of patients meeting inclusion criteria, 40 (61%) were males and 26 (39%) were females. Compared with males, females had smaller LV diameter (5.5 cm vs. 6.3 cm; p<0.001), LV mass (218 g vs.

300 g; *p*=0.002), and LV mass index (114 g/m^2 vs. 141 g/m^2; *p*=0.013). Females experienced greater absolute LVEF change (17.1% vs. 7.8%; *p*=0.001) and larger LVEF change relative to baseline (75% vs 40%; *p*=0.022). Although QRS duration was similar between males and females (162.8 + 19.0 ms vs. 157.8 + 20.7 ms; *p*=NS), indexed QRS duration was not (*p*<0.001) (Figure).

Conclusions. In patients with NICM and LBBB who undergo CRT, females respond favorably compared to males. Overall, sex differences may be attributed to longer QRS duration relative to patient and/or LV size. When matched to males with similar indexed QRS durations, women still outperformed the men. Additional studies are needed to identify other possible factors to explain sex difference in CRT response. Given the significant differences between repsonse to CRT between men and women for a given QRS duration, future guidelines surrounding CRT device placement may need to take patient sex in to considertion.

Categories

1st year Fellow: Research

Program/Institution Name

Ohio State University Hospital

Effect of periodontal therapy on mediators of vascular inflammation; A meta-analysis.

28

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Type of submitter

Fellow in Training

Abstract

Aims

Periodontitis is chronic inflammation of the supporting structures of teeth. Periodontal therapy is known to improve endothelial function, vascular inflammation and prevent atherosclerosis and cardiovascular adverse events. The mechanism of such benefit is a matter of active investigation. We studied if such benefit is due to a reduction in the levels of adhesion molecules. Adhesion molecules are important mediators of atherosclerosis.

Methods

We searched PubMed, clinical trials.gov, Scopus and Embase for studies done on the effect of periodontal therapy on cell adhesion molecules. The outcomes studied were decrease in the levels of s-ICAM-1(soluble intercellular adhesion molecule-1), s-VCAM-1 (soluble vascular cell adhesion molecule-1) and s-E-selectin (soluble endothelial selectin) levels after periodontal therapy in patients who had moderate to severe periodontitis. Standardized mean difference (SDM) was used for effect size measurement. An effect size of 0.2-0.5 is considered small, 0.5-0.8 is medium and more than 0.8 is large. Publication bias was studied too.

Results

Eight studies (797 patients) met inclusion criteria in the meta-analysis. Periodontal therapy showed a positive and medium effect size (SDM 0.52, 95% CI 0.10-0.94) on decreasing s-E-selectin values (Figure

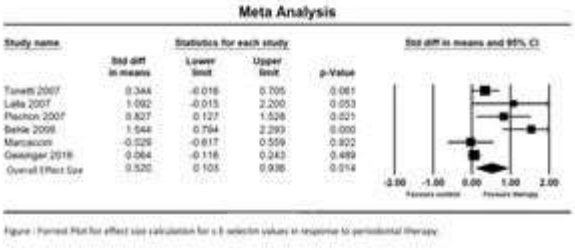

Figure : Forrest Plot for effect size calculation for s-E selectin values in response to periodontal therapy

1) . There was no significant effect of periodontal therapy on s-ICAM-1 (SDM 0.41, 95% CI -0.002 to 0.827) or s-VCAM-1 levels (SDM -0.047, 95% CI -0.27 to 0.18).

Conclusion

Periodontal therapy lowers s-E-selectin levels but has no effect on s-ICAM-1 or s-VCAM-1 levels. Lowering of s-E-selectin levels may thus be one of the mechanisms periodontal therapy works by to reduce the risk of developing and progression of vascular inflammation and atherosclerosis.

Categories

1st year Fellow: Research

Program/Institution Name

University of Toledo

The use of Speckle-tracking Echocardiography to Evaluate Cardiac Function in Adult Patients with Fontan Physiology.

70

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Type of submitter

Fellow in Training

Abstract

Background: Conventional echocardiographic parameters of assessing myocardial function utilize visual estimations and calculations derived from velocities and myocardial displacement and are known to have high interobserver and intraobserver variability. However, strain analysis utilizes the concept of wall deformation or myocardial stretch in order to distinguish between active and passive segmental movements. Abnormal atrial and ventricular strain have been associated with increased hospitalizations, arrhythmias and morbidity in patients with heart failure, atrial fibrillation and ischemic heart disease.

Objective: We evaluated atrial and ventricular global longitudinal strain (GLS) as a marker of cardiac dysfunction in adult Fontan patients alongside traditional echocardiography parameters mainly ejection fraction (EF) and E/e'.

Methods: We retrospectively analyzed echocardiograms in adult Fontan patients, who followed at the Emory Adult Congential Clinic, with systemic left ventricles (LV) for ejection fraction, E/e' and myocardial strain. Strain was calculated via speckle-tracking echocardiography using images with a frame rate greater than 60. Atrial strain was measured in a 4-chamber (CH) view and quantified at the QRS complex with the mitral valve closed prior to the onset of systole. The Fontan graft was excluded. LV strain was measured in apical long-axis, 4-CH and 2-CH views. LV end-systolic frame was defined by aortic valve doppler at the closure of the aortic valve. Myocardial motion was analyzed using Automated Functional Imaging software to determine GLS. Normal atrial strain was defined as greater than 35%, normal LV strain greater than -18%, normal LV function as EF greater than 55% and diastolic dysfunction as E/'e greater than 8.

Results: 59 patients with systemic LV Fontan circulation (mean age 27.1 ± 6.8, 59% male, mean Fontan duration 22.5 yrs ± 4.7 (unknown for 7 patients)) were analyzed for atrial and ventricular GLS, EF and E/e' (Table 1). Of the 59 patients, 37 (63%) had a normal EF (60% ± 4%) and 41 (69%) had a normal E/e' (5.3 ± 1.2). However, 50 (85%) had a decreased LV GLS (-14.7% ± 2.1) and 58 (98%) had a decreased atrial GLS (14.5% ± 6.0). Of the 50 patients with a decreased LV GLS, only 21 (42%) had a decreased EF (45% ±9%) and of the 58 patients with decreased atrial strain, only 40 (69%) had a normal E/e' (5.4 ± 1.3). Mean atrial GLS for classic Fontan was (10% ± 2.2), lateral tunnel Fontan was (15.6% ± 6.7) and extra-cardiac Fontan was (17.1% ± 8.9).

Conclusions: Atrial and ventricular GLS are abnormal in majority of Fontan patients even when LV EF and E/e' are normal. Further studies are needed to determine whether abnormal GLS can serve as a precursor to decreased systolic and diastolic cardiac function.

Table 1: EF, E/e', and GLS in Fontan Patients

	EF >55% = 37 (60% ± 4%)		EF<55% = 22 (45% ± 8%)	
E/e'<8 = 41 (5.3 ± 1.2)	Atrial GLS(N)=1 (36±0)	LV GLS(N)=8 (19.8±2.1)	Atrial GLS(N)=0	LV GLS(N)=1 (18.1)
	Atrial GLS(AB)=26 (14.8±6.6)	LV GLS(AB)=19 (15.9±3.7)	Atrial GLS(AB)=14 (12.9±4.6)	LV GLS(AB)=13 (-13.3±2.2)
E/e'>8 = 18 (8.9 ± 2.5)	Atrial GLS(N)=0	LV GLS(N)=0	Atrial GLS(N)=0	LV GLS(N)=0
	Atrial GLS(AB)=10 (13.3±7.0)	LV GLS(AB)=10 (=14.9±2.0)	Atrial GLS(AB)=8 (14.5±4.7)	LV GLS(AB)=8 (-13.6±2.3)

(N= Normal, AB=Abnormal)

Categories

1st year Fellow: Research

Program/Institution Name

Ohio State University Hospital

Ventricular Arrhythmia Prevalence and Characteristics for HIV+ Persons and Matched Uninfected Controls

7

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Type of submitter

Fellow in Training

Abstract

Introduction:

Sudden cardiac death and myocardial fibrosis are common in HIV. No studies to our knowledge have examined the prevalence and morphology of ventricular ectopy or arrhythmia (VEA) for HIV+ versus uninfected persons.

Methods:

We screened 5,041 HIV+ persons and 10,121 uninfected controls (matched 1:2 on demographics and location) at an urban medical center between 2000 and 2016 for VEA using administrative codes. We then reviewed electrocardiographic data to determine (1) whether VEA were present, and (2) VEA morphology (left or right bundle and inferior or superior axis). Prevalence and morphology of VEA were compared by HIV status and markers of HIV severity.

Results:

Of 5041 HIV+ persons, 139 (2.8%) had VEA vs. 165 out of 10121 (1.6%) for controls ($p<0.001$). This association persisted after adjustment for demographics (Odds Ratio [OR] 1.53, 95% Confidence Interval [CI] 1.21-1.94) but was attenuated to non-significance after adjustment for diabetes and hypertension. Compared with HIV+ persons with nadir CD4≥200 cells/mm^3, those with nadir CD4<200 cells/mm^3 had significantly elevated odds of VEA after adjustment for demographics, diabetes, and hypertension (OR 1.65, 95% CI 1.12-2.31). Likewise, each $\log_{10}$ higher peak HIV viral load was associated with a significantly elevated odds of VEA (OR 1.24, 95% CI = 1.07-1.44) after adjustment for demographics, hypertension, and diabetes. Right bundle, superior axis morphology was somewhat more common among HIV+ versus uninfected persons, but this did not reach statistical significance ($p = 0.092$).

Conclusions:

VEA is more common among HIV+ persons but this was attenuated after adjustment for CVD risk factors. Greater HIV viremia and immunosuppression are associated with greater odds of VEA. Compared with uninfected persons, HIV+ persons may more commonly have VEA originating from the left ventricular myocardium, suggesting abnormal myocardial substrate rather than idiopathic outflow tract arrhythmia.

Categories

1st year Fellow: Research

Program/Institution Name

Ohio State University Hospital

In Hospital Clinical Outcomes of patients with or without Acute Coronary Syndrome following Transcatheter Aortic Valve Replacement

27

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Type of submitter

Fellow in Training

Abstract

BACKGROUND: About one-half of the patients undergoing Transcatheter aortic valve replacement (TAVR) have concurrent coronary artery disease (CAD). However, the incidence and clinical outcomes of acute coronary events following TAVR remain unknown.

OBJECTIVES: This study sought to assess the incidence, clinical characteristics and outcomes of acute coronary syndrome (ACS) following TAVR.

METHODS: This observational study used the National Inpatient Sample database and National Readmission database to identify patients who underwent TAVR from January 2012 to September 2015. Using propensity score matching, clinical outcomes were compared between post TAVR ACS and post TAVR non-ACS patients during the index hospitalization. The primary outcome was in-hospital all-cause mortality. Secondary outcomes included length and cost of the hospital stay and 30-day readmission rate.

RESULTS: A total of 28,312 patients, 806 (2.9%) with ACS were included. Propensity score matched 804 patients in each arm. Patients with post TAVR ACS compared to those without ACS had significantly higher in-hospital mortality (10% vs 3.9%, p=<0.01). Cardiovascular complications including cardiac arrest (6.3 % vs 3 %, p=0.003), cardiogenic shock (10.6 % vs 3.4 %, p=<0.01) & stroke (4.5 % VS 2.4 %, p= 0.02) (Table 1) were significantly higher in Post TAVR ACS patients. Patients with Post TAVR ACS had longer length of stay (13.28 days vs 8.33 days, p=<0.01) and higher cost of hospitalization (median $26,000 vs $19,000, p=<0.01).

CONCLUSION: In this nationwide observational study, acute coronary syndrome after TAVR was associated with adverse clinical outcomes and increased healthcare resource utilization.

Table 1: Clinical Characteristics and outcomes of patients with and without ACS after TAVR

Baseline Characteristics	Un-Matched			Matched(1:1)		
Overall TAVR cohort	Non-ACS N=27599	ACS N=808	P value	Non-ACS N=804	ACS N=804	P value
Age (mean ± SD)	81.6±7.90	81.29±8.10	0.25	81.5±7.75	81.32±8.16	0.668
Female (N & percentage)	13081(47.4)	368(45.7)	0.199	369(47.9)	368(45.8)	0.459
Hypertension	23106(83.4)	637(79.2)	0.346	621(77.5)	636(79.1)	0.466
Diabetes mellitus Uncomplicated	7869(28.5)	247(30.6)	0.206	255(31.7)	246(30.6)	0.667
Diabetes Mellitus Complicated	1827(6.6)	77(9.6)	0.002	76(9.7)	76(9.5)	0.93
Hyperlipidemia	14471(52.6)	414(51.4)		397(49.4)	413(51.2)	0.489
History of smoking	7149(25.9)	174(21.6)	0.005	158(19.7)	175(21.6)	0.355
Obesity (BMI>30)	8125(29.5)	238(29.6)	0.83	257(31.9)	237(29.5)	0.299
Family history of coronary artery disease	649(2.5)	19(2.4)	0.98	18(2.4)	19(2.4)	0.99
History of CABG	3094(11.2)	130(16.1)	0.139	123(15.3)	130(16.2)	0.68
History of PCI	4713(17.1)	160(19.9)	0.045	161(20.0)	160(19.9)	0.99
History of CHF	2200(8.0)	81(10.0)	0.038	79(9.7)	79(9.8)	0.99
Peripheral vascular disease	8108(29.5)	259(32.1)		275(34.2)	258(32.1)	0.39
History of Atrial Fibrillation	11727(42.6)	404(47.6)	0.004	428(48.8)	401(47.4)	0.588
History of Chronic Lung Disease	7162(26.1)	288(35.1)	0.28	277(34.5)	283(35.0)	0.87
Chronic Kidney Disease	9774(34.8)	335(41.6)	<0.01	334(39.5)	335(41.4)	0.36
History of Cerebrovascular accident	2586(9.4)	58(7.2)	0.044	62(8.3)	58(7.2)	0.456

Outcomes	Non-ACS (N=804)	ACS (N=804)	Odds Ratio (CI)	P Value
In-hospital all-cause mortality	5.9 %	10.0 %	2.75 (1.79-4.22)	<0.01
Cardiac Arrest	3.0 %	8.3 %	2.91 (1.91-4.54)	0.000
Cardiogenic Shock	3.4 %	10.6 %	3.403 (2.18-5.30)	<0.01
Stroke	1.6 %	4.5%	2.917 (1.35-6.40)	0.028
Acute Kidney Injury	16.2 %	27.2%	1.941 (1.52-2.47)	<0.01
Vascular Complications	5.0 %	9.8 %	1.4045 (0.922-2.13)	0.138
Blood transfusions	20.0 %	37.7 %	1.141 (1.1-1.99)	<0.01
Need for PPM	9.6 %	10.1 %	1.059 (0.762-1.46)	0.802
Length of stay(mean days)	8.33	13.28	4.951(3.98-5.92)	<0.01
Cost Of Hospitalization x $ 10,000	1.9 (1.3-2.8)	2.6 (1.7-3.8)		<0.01
30 day readmission rate	16.9 %	18.0 %	1.0805 (0.81-1.39)	0.586

Categories

1st year Fellow: Research

Program/Institution Name

University of Toledo

Point of Care Use of an Appropriate Use Criteria Smartphone App for Echocardiography

14

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Kettering Health Network

Type of submitter

Fellow in Training

Abstract

Background: Appropriate use criteria have been purported to possibly reduce cost burden to patients and improve quality of care. How best to implement these criteria remain to be determined.

Study objective: Assess the feasibility of making appropriate transthoracic echocardiogram ordering decisions using a smartphone app based on the 2011 appropriate use criteria guideline protocol published by the American College of Cardiology.

Methods: Evaluated transthoracic echocardiogram imaging orders over a 2-month period using a smartphone app to determine whether the orders were appropriate, inappropriate or uncertain per the 2011 appropriate use criteria. The time needed to use the app to assess the level of appropriateness was also measured.

Results: N = 390, mean age 69.8, 194 (49.7%) females and 196 (50.3 %) males. Of the 390 transthoracic echocardiogram ordered, 80.3% were appropriate, 14.4% were inappropriate, 5.3% were uncertain. The average time needed to assess appropriateness using the smartphone app was 19.1 seconds. Teaching service residents had a 16.1% inappropriate ordering rate while non-teaching services had a 57.1% inappropriate ordering rate. Inappropriate orders among cardiologists was 27.8 %. Among the top indications for ordering the trans-thoracic echocardiograms were for Stroke/TIA (14.4%), Chest pain (10.3%), heart failure evaluation (10.2%), Dyspnea (9.3%), Perioperative Clearance (7.5%), Afib/Aflutter (7%), Endocarditis (6%). The top 2 inappropriate indications were perioperative management (25.1%) and presyncope/syncope (21.4%).

Conclusion: Smartphones has become a part and parcel of our daily living and has increasingly become a useful tool for quick access to medical information at the point of care. The incorporation of a free and convenient smartphone app could enhance the appropriate ordering of transthoracic echocardiograms and provide a cost-effective benefit in a time-effective manner in comparison to building it into existing electronical medical record systems.

Keywords: smartphone, appropriate use criteria

Categories

1st year Fellow: Research

Program/Institution Name

Kettering Health Network