Original Article

Accuracy of Dobutamine Stress Echocardiography in detecting Coronary Artery disease in LBBB

Sara Hosseini[1], Afsoon Fazlinejad[2], Leila Hosseini[3], Majid Jalalyazdi[4*], Maryam Abbasi[5]

[1]Resident of Cardiology, Mashhad University of Medical Sciences, Mashhad, Iran, [2]Professer of Cardiology, echocardiography fellowship, Mashhad University of Medical Sciences, Mashhad, Iran,[3] Assistant Professor of Cardiology, North Khorasan university of Medical sciences, Bojnurd, Iran, [4]Assistant Professor of Cardiology, Mashhad University of Medical Sciences, Mashhad, Iran, [5]Medical Student, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

Correspondence: Majid Jalalyazdi, Assistant Professor of Cardiology, Mashhad University of Medical Sciences, Mashhad, Iran. Email: jalalyazdim@mums.ac.ir.

ABSTRACT

Introduction: Patients with left bundle branch block (LBBB) and concomitant Coronary Artery Disease (CAD) have a worse prognosis than those with LBBB without CAD. Exercise-induced electrocardiographic changes do not facilitate detection of CAD in patients with complete LBBB. Stress echocardiography also has reduced accuracy for detecting CAD in patients with LBBB. In this study we aimed to evaluate the sensitivity, specificity and diagnostic accuracy of DSE for diagnosis of CAD in patients with LBBB. Method: This case control study includes 20 patients in case group with ischemic symptoms and LBBB in ECG and 20 patients in control group with ischemic symptoms but without LBBB in ECG. This patient evaluated with DSE and coronary angiography. Result: There is similar sensitivity and accuracy of DSE in detecting CAD in LBBB and normal ECG patients. Conclusion: we can suggest that DSE is a very sensitive, specific and accurate non-invasive test for identification of CAD, both in the LBBB and non LBBB patients.

Keywords: Dobutamine Stress Echocardiography, Coronary Artery, disease, LBBB.

Introduction

In patients with isolated Left bundle branch block, delayed left ventricular activation, contraction, and relaxation produced interventricular asynchrony and resulted in alteration in heart sounds, diastolic filling time, interventricular septal motion, and septal contribution to left ventricular ejection fraction [1-5].

Patients with LBBB and concomitant Coronary Artery Disease (CAD) have a worse prognosis than those with LBBB without CAD. Exercise-induced electrocardiographic changes do not facilitate detection of CAD in patients with complete LBBB. Stress echocardiography also has reduced accuracy for detecting CAD in patients with LBBB. In patients with mobility problems or LBBB, drug myocardial scintigraphy with adenosine and dobutamine stress echocardiography (DSE) provide a good alternative [6-11].

In this study we aimed to evaluate the sensitivity, specificity and diagnostic accuracy of DSE for diagnosis of CAD in patients with LBBB.

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Method

This study is design to evaluate the sensitivity and specificity of DSE in LBBB patients. This case control study include 20 patients in case group with ischemic symptoms and LBBB in ECG and 20 patients in control group with ischemic symptoms but without LBBB in ECG. These patients evaluated with DSE and coronary angiography within a year. Patients with history of myocardial infarction and another changes in ECG for ischemia except LBBB, were excluded .

Use of B-blockers, calcium antagonist and Nitrate drugs stopped 24 h before echocardiography. Right and left coronary angiography and left ventriculography be performed within 2-3 weeks of DSE. Angiograms were reviewed by an experienced observer without awareness of DSE results. Significant CAD was considered as>70% luminal diameter stenosis of a major coronary artery.

Two-dimensional Trans-thoracic echocardiographic, M-mode and Doppler imaging were performed using cardiac ultrasound equipment Philips Envisor C, USA 2008 and a 3 MHz probe that obtained in parasternal long-axis and short-axis and apical four-chamber and two-chamber views according to ASE/AHA guide line and left lateral decubitus position. These views were recorded on tape and digitized.

Dobutamine IV was infused in 3 min dose increment of 5, 10, 20 and 30 up to a maximum of 40 μg/kg per minute to achieve 85% of age-related maximum exercise heart rate. 1 mg atropine administered to the patients who did not reach the target heart rate during infusion of dobutamine. Blood pressure, heart rate and ECG were monitored throughout the test. End point were the achievement of target heart rate, impairment of wall thickening, severe angina and dyspnea, significant increase and decrease of blood pressure, ventricular and supraventricular tachyarrhythmia.

DSE Images were reviewed by an experienced observer who was not aware of clinical data and angiography results. Enhancement of wall thickening defined as a normal response with stress and Heterogeneity of septal contraction was not considered as a marker of CAD. Stress-induced impairment of wall thickening was interpreted in 17 myocardial segments (anterior, septal, apex, lateral, inferior and posterior).

Coronary angiography was performed by femoral access and result were reviewed an experienced observer who was not aware of clinical data and DSE results.

Statistical analysis

Our results were expressed as percentages and mean ±SD. Statistical analysis was performed by using a t test and chi square. Sensitivity, specificity, diagnostic accuracy and positive and negative predictive values of DSE for identification of CAD in LBBB and Non LBBB group were calculated separately.

Result

Base line and clinical data of case and control group are listed in table 1. There is no statistically difference between two group in this parameters. In LBBB group 4 patients had normal coronary angiogram and 5 patients in normal ECG group. Sensitivity, specificity, accuracy, positive predictive value and negative predictive value of two group are listed in table 2. There is similar sensitivity and accuracy of DSE in detecting CAD in LBBB and normal ECG patients.

Table 1: baseline and clinical data of patients

	Normal (20 patient)	LBBB (20 patient)	P value
Age	51.1 ± 9	55.5 ± 10	0.35
Gender (male)	12 (60 %)	7 (35%)	0.10
Ischemia in DSE	18 (90%)	16 (80%)	0.33
Hypertension	5 (25%)	7 (35%)	0.36
hyperlipidemia	5 (25%)	6 (30%)	0.50
Diabetes	5 (25%)	5 (25%)	0.64
smoking	7 (35%)	6 (30%)	0.50
Family history	5 (25%)	6 (30%)	0.50
Significant stenosis in angiography	15 (75%)	16 (80%)	0.50

Table 2: The sensitivity, specificity, diagnostic accuracy and positive and negative predictive values of dobutamine-stress echocardiography for diagnosis of coronary artery disease in LBBB and normal ECG patients

ECG	sensitivity	specificity	accuracy	Positive predictive values	negative predictive value
LBBB	100%	75%	95%	94%	100%
Normal	100%	80%	95%	93%	100%

Discussion

Septal wall motion abnormalities with ventricular asynchronization and greater than normal heterogenous contraction of interventricular septum are well known to occur in patients with LBBB. however, thickening of myocardium remains nearly normal in the absence of CAD. Therefore, an ischemic response cannot be identified by analysis of wall motion, but can be identified by detecting stress-induced impairment of wall thickening, including failure to improve wall thickening relative to the hyperkinetic response to maximal stress [12-15].

In our study we accepted the impairment of myocardial wall thickening during DSE as a predictor of CAD. The patients who had previously suffered myocardial infarction were excluded from our study in order to prevent the results of false sensitivity, specificity and diagnostic accuracy. Scar tissue that would show up as impairment of wall thickening would cause a decrease in specificity of DSE and an increase in sensitivity of DSE. There were significant increases in double product during DSE [16-20]. Two patients had paradoxical sinus deceleration and hypotension. It has been reported that these paradoxicals response are not predictors of left ventricular dysfunction or CAD and are due to Bezold-Jarish reflex [21-24].

Dobutamine-induced chest pain experienced by some patients has no valuable sensitivity and accuracy for diagnosis of CAD. When impairment of wall thickening was accepted as a criterion for CAD, DSE had high sensitivity, specificity and accuracy for identifying CAD in all coronary territories of patients with LBBB. Scandura et al. showed that DSE has a high diagnostic value as a provocative non-invasive test for CAD in patients with LBBB [20]. Mairesse et al. has reported that the diagnostic accuracy of DSE is superior to that of conventional dobutamine scintigraphy. They gave the sensitivity of 80% for detection of CAD but the specificity of 75% was only moderate [25, 26]. In our study we have obtained high values of sensitivity, specificity and accuracy by increasing the number of patients and excluding the patients who had previously suffered myocardial infarction. Additionally, we found high positive and negative predictive value of DSE for diagnosis of CAD even in the presence of LBBB.

In conclusion, we can suggest that DSE is a very sensitive, specific and accurate non-invasive test for identification of CAD, both in the LBBB and non LBBB patients. In our study, because of the inclusion criteria, we had high sensitivity, specificity and diagnostic accuracy. However, these results are not applicable to everyday practice, for which possibilities of previous infarction, myocardial hibernation and latent cardiomyopathy cannot be excluded.

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