Short Communication

Prevalence of Coronary Artery Disease in Patients with Left Bundle Branch Block and Its Association with Risk Factors Hypertension and Diabetes Mellitus

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Abstract

Background: Left bundle branch block (LBBB) is a common finding in electrocardiography, there are many causes of LBBB. **Objectives:** The aim of this study is to discuss the true prevalence of coronary artery disease (CAD) in patients with LBBB and associated risk factors in the form of hypertension and diabetes mellitus. **Materials and Methods:** Patients with LBBB were admitted to the Iraqi heart center for cardiac disease in December 2017 to the end of April 2021; all patients underwent coronary angiography and they are classified into three groups: group 1: patients with proximal left anterior descending artery (LAD) or mid-LAD and either left circumflex artery (LCX) or right coronary artery (RCA) with lesion consider significant if more than 70% stenosis of the artery, group 2: patients with either isolated LCX or RCA with lesion if more than 70% stenosis of the artery, group 3: patients with normal coronary artery. **Results:** The most important finding in this study is that the percentage of LAD artery lesions or two vessels disease was only 24.5%. Patients in group 1 showed a high prevalence of hypertension (77.6%), whereas in group 3, the prevalence of hypertension was 47.95%. In this study, the prevalence of diabetes mellitus in group 1 was high (62.2%), whereas in group 3, it was 32%. **Conclusion:** High prevalence of men with LBBB than women, and the prevalence of LBBB increases with age. Patients who had hypertension and diabetes mellitus with LBBB most likely had an ischemic cause of LBBB, but patients with LBBB had low ejection fraction (EF) 369 out of 400 patients (90%) had low EF.

Keywords: Coronary artery disease, diabetes mellitus, hypertension, left bundle branch block

Introduction

The cardiac depolarization initiates at the Sinoatrial node, followed by the conduction of the impulse to the atrioventricular (AV) node. Subsequently, the electrical impulses are transmitted from the AV node to the Bundle of His, which further divides into the right and left bundle branches.[1] When a bundle branch is affected by a disease, it leads to significant reorganization of the left ventricle's activation and recovery patterns, resulting in alterations in the QRS complex (QRS complex includes the Q wave, R wave, and S wave).[2] Left anterior descending artery (LAD) artery gives blood supply for the left bundle branch, particularly for the proximal portion. Lesion in LAD artery can cause ischemic Left bundle branch block (LBBB).[3-6] LBBB affects patient's management, in patients with acute clinical conditions, such acute coronary syndrome, and give additional insights into the prognosis of patients with chronic cardiovascular diseases.[7] In many studies, multiple factors found to be associated with the development of LBBB included hypertension, ischemic heart disease, cardiomyopathies, valvular heart disease, as well as various electrocardiographic abnormalities, such as left ventricular (LV) hypertrophy. In many people, LBBB can be observed in electrocardiography (ECG) in the absence of any of

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these risk factors.[8,9] In patients with LBBB, the condition is often accompanied by LV dilatation, with reduced LV ejection fraction (EF). LBBB is an independent risk factor for mortality in patients with heart failure.[10-13] The mechanism of reduced (EF) in patient with LBBB is in coordinated ventricular contractions, where contractions in different parts of the left ventricle are disorganized. In LBBB, the early activated septum contracts when the LV lateral wall is fully relaxed, and septal contraction displaces blood towards the lateral wall that is, stretched to abnormally high preload. When the lateral wall is activated, it contracts vigorously according to the Starling mechanism, and displaces blood back toward the septum that is stretched and displaced toward the right ventricle. When the septum is stretched and displaced, it absorbs energy from work per formed by the LV lateral wall, which can be assessed as wasted work in the septum.[14-19]

This study aims to find the prevalence of CAD in patient with LBBB, and to find association between the presence of hypertension and diabetes mellitus in patient with LBBB and presence of CAD and to determine the relation between LV EF in patient with LBBB and presence of CAD.

Materials and Methods

Study design

This study is a retrospective study that has been done in Iraqi Heart Center from December 2017 to May 2021. The researchers collected data of patients from the review of patients files. All patients had LBBB in ECG and underwent coronary angiography, the diagnosis of left bundle done by ECG criteria, and all patients diagnosed with hypertension and diabetes mellitus from review of patients files, and all patients had echocardiography study, left ventricular systolic dysfunction was considered if the EF was less than 50%.

Exclusion criteria

Exclusion criteria included patients with left ventricular outflow obstruction, aortic stenosis and hypertrophic cardiomyopathy, history of coronary artery bypass graft and patient on pacemaker, as well as left main stem and distal LAD lesion were excluded from the study.

The patients were categorized according to angiographic finding into three groups:

1. group 1: patients had proximal LAD lesion or two vessels (mid LAD and either LCX or RCA).
2. group 2: patients had either RCA or LCX lesion.
3. group 3: patients who had normal coronary angiography.

lesion equal or more than 70% stenosis regarded as significant.

Ethical approval

The study approved by the Internal Medicine Department Ethical Committee, College of Medicine, University of Babylon. Patients informed about enrollment in the study and verbal consent obtained. According to document number 398, a local ethics commission reviewed and gave its approval to the study protocol, subject information, and permission form on February 22, 2022.

Statistical analysis

Statistical analysis was done by using SPSS version 23 (SPSS, IBM Company, Chicago, Illinois). Categorical variables were presented as frequencies and percentages. Continuous variables were presented as means ± standard deviation. Pearson chi-square test was used to find the association between categorical variables. A *P* value of ≤0.05 was considered significant.

Results

The distribution of patients according to socio-demographic characteristics

Table 1 shows distribution of patients according age, gender.

The distribution of patients according to history of chronic diseases

Table 2 shows distribution of patients according to history of chronic diseases including (hypertension and diabetes mellitus).

The distribution of patients according to angiography finding

Table 3 shows distribution of patients according to angiography finding including group 1 had proximal LAD or two vessels (mid LAD and either LCX OR RCA), group 2 had single RCA OR LCX and group 3 had

Table 1: The distribution of patients according to socio-demographic characteristics (*N* = 400)

Age year	Below 60 years	Above 60 years
	156 (39%)	244 (61%)
Gender		
Female	137	34.3%
Male	263	65.7%
Total	400	100.0%

Table 2: The distribution of patients according to history of chronic diseases (*N* = 400)

Study variables	*N*	%
Hypertension		
Yes	246	61.50%
No	154	38.50%
Total	400	100.00%
DM		
Yes	128	32.00%
No	272	68.00%
Total	400	100.00%

normal coronary angiography). Majority (n = 234, 58.5%) of patients presented with normal angiography.

The distribution of patients according to EF

Table 4 shows distribution of patients according to EF including (>50%, 35%-50%, and <35%). Majority (n = 202, 50.5%) of patients presented with poor EF (<35%).

The association between coronary angiographic findings and study variables

Table 5 shows the association between angiographic findings and study variables including (hypertension, diabetes millets and EF). There was significant association between angiographic findings and history of hypertension and diabetes millets.

Discussion

In this study, the number of patients who had >70% stenosis in proximal LAD or stenosis >70% in two vessels (mid LAD and either LCX or RCA) in group 1 is 24.5%. The researchers consider the cause of LBBB in this group is due to CAD. This can be explained by the fact that the septal branches of LAD is thought to be main blood supplier to left conductive tissues, so the stenosis of >70% in LAD can cause ischemia in left bundle branch. In the study of Al Atbee *et al*.[20] they found the percentage of ischemic LBBB is 54% because they consider any lesion in any coronary artery is a cause of ischemia in left bundle branch. In another study done by Shehata *et al.*[21] found the cause of ischemic LBBB is 70% because they consider the lesion in any part of LAD, LCX, and RCA can cause ischemia in left bundle branch. Lashari *et al*.[22] revealed that the prevalence of ischemic LBBB was 84% which also consider lesion more than 70% lesion in any coronary artery is a cause of ischemic LBBB. However, Framingham found that 45% of patients with LBBB were reported to have CAD.[23]

In this study, LBBB was common among old age groups. The researchers found 61.0% above 60 years old age, and the result is similar to other study done by Al Atbee *et al*.[20] who found the mean age of LBBB is 58 years.[20] Other study done by Shehata *et al*.[21] found 60% of patients with LBBB were above 60 years.[21] Eriksson *et al*.[24] also found that the prevalence of LBBB increases with age. Regarding gender, LBBB was more common in men than women, and the result of this study is similar to the study done by Shehata *et al.*[21] which found male predominance of 65%.

In the study by Al Atbee *et al*.,[20] the frequency of LBBB was more among male patients 63.4%. Regarding risk factor, this study found LBBB patients had high prevalence of hypertension 61.5%, and also found patients in group 1 had high prevalence of hypertension 77.6% than other patients in group 3 who had LBBB with normal coronary angiography 47.9%, which all indicate significant association between hypertension as risk factor for ischemic LBBB.

Table 3: Distribution of patients according to angiography finding

Angiography finding	Number	%
Group 1	98	24.5%
Group 2	68	17.0%
Group 3	234	58.5%
Total	400	100.0%

Table 4: Distribution of patients according to ejection fraction

EF	Number	%
>50%	40	10.0%
35-50%	158	39.5%
<35%	202	50.5%
Total	400	100.0%

Table 5: Association between angiographic findings and study variables

Study variables	Angiography findings			Total	X^2	P-value
	Proximal LAD or two vessels	Single RCA	Normal			
Hypertension						
Yes	76 (77.6)	58 (85.3)	112 (47.9)	246 (61.5)	*45.3*	<0.001*
No	22 (22.4)	10 (14.7)	122 (52.1)	154 (38.5)		
Total	98 (100.0)	68 (100.0)	234 (100.0)	400 (100.0)		
DM						
Yes	61 (62.2)	38 (55.9)	29 (12.4)	128 (32.0)	100.36	<0.001*
No	37 (37.8)	30 (44.1)	205 (87.6)	272 (68.0)		
Total	98 (100.0)	68 (100.0)	234 (100.0)	400 (100.0)		
EF						
>50%	8 (8.2)	10 (14.7)	22 (9.4)	40 (10.0)	2.134	0.344
≤50%	90 (91.8)	58 (85.3)	212 (90.6)	360 (90.0)		
Total	98 (100.0)	68 (100.0)	234 (100.0)	400 (100.0)		

The result of this study is similar to the result of Shehata *et al.*[21] who found that the prevalence of hypertension among patients with coronary artery disease and LBBB 86.8%. Also in other study done by Al Atbee *et al*.[20] it was shown that the prevalence of hypertension is more in patients with LBBB and CAD 54%. Regarding diabetes mellitus as a risk factor for ischemic LBBB, this study found in group 1 the patients with LBBB and LAD or two vessels disease had more diabetic (62.2%) than patients in group 3 with LBBB and normal coronary artery (12.4%), and the result of this study is similar to the study done by Shehata *et al*.[21] which found the prevalence of diabetes mellitus in patients who LBBB and CAD (87.1%). The above results of risk factor hypertension and DM and its associated with LBBB and help the cardiologist when facing patient with LBBB and unknown etiology presence of hypertension and diabetes make him think about CAD, especially in men and increasing age. In this study, the researchers found that most of patients with LBBB had low EF (360 out of 400 patients), and most of them had EF below 35% (202 patients).

The result of this study was compatible with Shehata *et al.*[21] who found that the percentage of patients with LBBB of low EF is 67.8%. But in this study, the researchers found that there is no association between LBBB with low EF and CAD, and this study found in group 1 had low EF (91.8%) and in group 3 (90.6%) had low EF; the *P* valve was not significant.

Conclusion

The prevalence of LBBB is more in men and with increase age. The prevalence of CAD in patients with LBBB is 24.5%. There is a strong association between presence of hypertension and diabetes mellitus in patients with LBBB with CAD, and there is no association between low EF in patient with LBBB and presence of CAD.

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Conflicts of interest

There are no conflicts of interest.

References

1. Josephson ME. Clinical Cardiac Electrophysiology: Techniques and Interpretations. 2nd ed. Philadelphia: Lea & Febiger; 2020.
2. Francia P, Balla C, Paneni F, Volpe M. Left bundle-branch block—Pathophysiology, prognosis and clinical management. Clin Cardiol 2007;30:110-5.
3. Shen MJ, Zipes DP. Role of the autonomic nervous system in modulating cardiac arrhythmias. Circ Res 2014;114:1004-21.
4. Alventosa-Zaidin M, Guix Font L, Benitez Camps M, Roca Saumell C, Pera G, Alzamora Sas MT, *et al*. Right bundle branch block: Prevalence, incidence, and cardiovascular morbidity and mortality in the general population. Eur J Gen Pract 2019;25:109-15.
5. Surawicz B, Childers R, Deal BJ, Gettes LS, Bailey JJ, Gorgels A, *et al*. AHA/ACCF/HRS recommendations for the standardization and interpretation of the electrocardiogram: Part III: Intraventricular conduction disturbances: A scientific statement from the American Heart Association Electrocardiography and Arrhythmias Committee. J Am Coll Cardiol 2009;53:976-81.
6. Strauss DG, Selvester RH, Wagner GS. Defining left bundle branch block in the era of cardiac resynchronization therapy. Am J Cardiol 2011;107:927-34.
7. Shahab H, Faheem O, Khandwala K, Khan AH. A curious case of intermittent left bundle branch block associated with cough. Cureus 2018;10:e3520.
8. Kumar V, Venkataraman R, Aljaroudi W, Osorio J, Heo J, Iskandrian AE, *et al*. Implications of left bundle branch block in patient treatment. Am J Cardiol 2013;111:291-300.
9. Wilson MG, Chatard JC, Carre F, Hamilton B, Whyte GP, Sharma S, *et al*. Prevalence of electrocardiographic abnormalities in West-Asian and African male athletes. Br J Sports Med 2012;46:341-7.
10. Ladenvall P, Andersson B, Dellborg M, Hansson P-O, Eriksson H, Thelle D, *et al*. Genetic variation at the human connexin 43 locus but not at the connexin 40 locus is associated with left bundle branch block. Open Heart 2015;2:e000187.
11. Fontes MSC, van Veen TAB, de Bakker JMT, van Rijen HVM. Functional consequences of abnormal Cx43 expression in the heart. Biochim Biophys Acta 2012;1818:2020-9.
12. Nyholm BC, Ghouse J, Lee CJ, Rasmussen PV, Pietersen A, Hansen SM, *et al*. Fascicular heart blocks and risk of adverse cardiovascular outcomes: Results from a large primary care population. Heart Rhythm 2022;19:252-9.
13. Baldasseroni S, Opasich C, Gorini M. Left bundle-branch block is associated with increased 1-year sudden and total mortality rate in 5517 outpatients with congestive heart failure: A report from the Italian network on congestive heart failure. Am Heart J 2002;143:39.
14. Houthuizen P, Van Garsse LA, Poels TT, de Jaegere P, van der Boon RM, Swinkels BM, *et al*. Left bundle-branch block induced by transcatheter aortic valve implantation increases risk of death. Circulation 2012;126:720-8.
15. Nazif TM, Williams MR, Hahn RT, Kapadia S, Babaliaros V, Rodes-Cabau J, *et al*. Clinical implications of new-onset left bundle branch block after transcatheter aortic valve replacement: Analysis of the PARTNER experience. Eur Heart J 2014;35:1599-607.
16. Aalen J, Storsten P, Remme EW, Sirnes PA, Gjesdal O, Larsen CK, *et al*. Afterload hypersensitivity in patients with left bundle branch block. JACC Cardiovasc Imag 2019;12:967-77.
17. Revah G, Wu V, Huntjens PR, Piekarski E, Chyou JY, Axel L. Cardiovascular magnetic resonance features of mechanical dyssynchrony in patients with left bundle branch block. Int J Cardiovasc Imag 2016;32:1427-38.
18. Auricchio A, Fantoni C, Regoli F, Carbucicchio C, Goette A, Geller C, *et al*. Characterization of left ventricular activation in patients with heart failure and left bundle-branch block. Circulation 2004;109:1133-9.
19. Vecera J, Penicka M, Eriksen M, Russell K, Bartunek J, Vanderheyden M, *et al*. Wasted septal work in left ventricular dyssynchrony: A novel principle to predict response to cardiac resynchronization therapy. Eur Heart J Cardiovasc Imag 2016;17:624-32.
20. Al Atbee M, Abdulbari A, Al Rubaie H, *et al*. Coronary angiographic and echocardiographic findings in patients with left bundle branch block. Med J Basrah Univ 2015;33:70-7.
21. Shehata I, Mohamed A, Naguib T, Ateya AA-M, Eldamanhory AS. Angiographic pattern of patients with left bundle branch block: A comparative cross-sectional study. J Indian Coll Cardiol 2020;10:128-33.
22. Lashari MN, Kundi A, Samad A. Coronary angiographic findings in stable angina pectoris patients. PJC 2002;13:31-4.
23. Schneider JF, Thomas HE, Jr, McNamara PM, Kannel WB. Clinical electrocardiographic correlates of newly acquired left bundle branch block: The Framingham Study. Am J Cardiol 1985;55:1332-8.
24. Eriksson P, Hansson PO, Eriksson H, Dellborg M. Bundle-branch block in a general male population: The study of men born 1913. Circulation 1998;98:2494-500.