Zagazig University Medical Journal
www.zumj.journals.ekb.eg
https://doi.org/10.21608/zumj.2025.422590.4176 Volume 31, Issue 11 November. 2025
Manuscript ID:ZUMJ-2509-4176
DOI:10.21608/zumj.2025.422590.4176

ORIGINAL ARTICLE

Severity of Coronary Artery Disease in Patients with Left Bundle Branch Block

Asmaa Abd El-karim Kenawy, Hossam Abd El-karim Ismail Mohamed Magar*, Morad Beshay Mina, Ghada Mahmoud Sultan
Cardiology Department, Faculty of Medicine, Menoufia University, Menoufia, Egypt.
***Corresponding author:**
Hossam Abd El-karim Ismail Mohamed Magar
E-mail:
hossammagar562@gmail.com

Submit date:16-9-2025
Revise date:08-10-2025
Accept date:14-10-2025

ABSTRACT

Background: Left bundle branch block (LBBB) is linked to reduced ventricular function and elevated risk of morbidity and death, particularly when related to coronary artery disease (CAD). This research aimed to evaluate the predictive value of the existence of left bundle branch block on surface electrocardiogram (ECG) in determining the severity of coronary artery disease, evaluated through Synergy Between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery (SYNTAX) score.

Methods: This prospective research involved 80 CAD patients undergoing coronary angiography: 40 patients with LBBB and 40 patients with non-LBBB on baseline ECG, echocardiographic and laboratory data were recorded. QRS duration was calculated for all patients. The SYNTAX score has been used to evaluate the severity of CAD.

Results: Patients with LBBB are associated statistically significantly with diabetes and prior CABG. Echocardiography revealed increased LVEDD, LVESD, and reduced ejection fraction in the LBBB group. QRS duration in LBBB patients was positively correlated with SYNTAX score. LDL, RBS, and SYNTAX score were additionally statistically significantly elevated in this group. QRS duration was an independent predictor of severe CAD in LBBB patients (OR = 1.233, p = 0.003), with 87.5% sensitivity and 88% specificity at 145 ms cut-off (AUC = 0.874, $p < 0.001$) for predicting high SYNTAX score (≥32).

Conclusion: In LBBB patients, QRS duration was related to SYNTAX score and independently predicted CAD severity. QRS duration more than 145 ms effectively identified severe CAD. A QRS duration above 145 milliseconds demonstrated moderate to high accuracy in identifying severe CAD, suggesting its promising predictive value as a simple, non-invasive marker for assessing disease severity in patients with LBBB.

Key words: Left bundle branch block; Coronary artery disease; QRS duration; SYNTAX score.

INTRODUCTION

Left bundle branch block is related to a poor prognosis and was associated with detrimental effects on left ventricular diastolic and systolic functions, even in the absence of overt structural cardiac illness. In this context, a significant rise in morbidity and death is observed in comparison with the normal population.[1] Elevated death may be attributed to elevated possibility of atrioventricular block, progressive heart failure, and acute myocardial infarction.[2] The possibility of obstructive CAD is elevated in patients with LBBB.[3] Patients with left bundle branch block had significantly elevated death rates compared to normal individuals in the

Framingham Heart Study. Patients with coronary artery disease exhibit a poorer prognosis when related to left bundle branch block [4]. Recent evidence continues to highlight the clinical importance of LBBB in the context of ischemic heart disease. Studies have shown that the coexistence of LBBB with significant coronary atherosclerosis is associated with higher rates of adverse outcomes, advanced ventricular remodeling, and increased need for revascularization procedures [4].

Atherosclerosis is a chronic inflammatory condition marked by the progressive accumulation of plaques inside the vessel walls of medium and large arteries. Plaque consists of cholesterol and additional substances deposited within the artery. Plaque accumulation leads to the gradual narrowing of arterial interiors, potentially obstructing blood flow either partially or completely.[5]

The early identification of myocardial ischemia is crucial for judging the progression of the illness and directing clinical intervention, like interventional treatment.[6]

Severity of coronary artery disease might be evaluated through different scoring systems like SYNTAX score, Jenkins' score,[7] Sullivan Extent score, and Gensini scoring system,[8] and others. The SYNTAX score estimates the severity and degree of coronary artery disease by evaluating the number of angiographically identified coronary lesions, their functional impacts, complexity, and sites. The parameters considered for SYNTAX score calculation include coronary dominance, lesion location at trifurcations, bifurcations, or ostia, calcifications, tortuosity, thrombus content, widespread disease existence, and long lesions. This instrument gives guidance on the suitable revascularization method to utilize.[9]

Despite extensive research linking left bundle branch block (LBBB) with adverse cardiac outcomes, the precise relationship between LBBB and the angiographic severity of coronary artery disease (CAD) remains inadequately defined. Prior studies have largely focused on diagnostic challenges or prognostic implications rather than directly quantifying CAD burden using objective tools such as the SYNTAX score. Moreover, the potential role of QRS duration as a simple, non-invasive predictor of CAD severity in patients with LBBB has not been well established. Therefore, this study aimed to evaluate the predictive value of QRS duration in patients with LBBB for determining the severity of coronary artery disease as assessed by the SYNTAX score, and to explore its correlation with other clinical and laboratory risk factors.

METHODS

This prospective research has been performed on 80 patients with coronary artery disease (CAD) who have been admitted to the Cardiology Department of Menoufia University Hospital and have been divided into 2 groups depending on the existence of LBBB on surface ECG: Group 1 involved forty patients with CAD whose baseline electrocardiogram showed LBBB, and Group 2 involved forty patients with CAD whose baseline ECG showed non-LBBB with a narrow QRS complex.

We included patients more than 40 years old who were diagnosed with CAD and were admitted for coronary angiography. The exclusion criteria were patients with pacemaker rhythm, left bundle branch block pattern on surface electrocardiogram because of recognized etiologies rather than coronary artery disease and patients with dilated cardiomyopathy of non-ischemic cause.

Ethical approval has been attained from the Ethics and research committee of faculty of medicine Menoufia university (approval code 9/2023 CARD 9). Then informed written consent has been taken from all subjects involved in the research prior to enrollment in the research following clarification of the study's aim and procedures.

All patients have been subjected to full clinical assessment, including history taking and clinical examination.

Electrocardiography (ECG) was performed for all patients: QRS period above 120 milliseconds, dominant S wave in V1, broad monophasic R wave in lateral leads (I, aVL, V5-6), Absence of Q waves in lateral leads.[10]

Trans-thoracic two-dimensional (2D) echocardiography was done to assess systolic left ventricular (LV) function according to echocardiography guidelines.[11, 12] Laboratory investigations were performed, including lipid profile, random blood sugar, and serum creatinine.

Coronary angiography (CAG) has been conducted utilizing the Judkins method.[13] The severity and extent of coronary artery disease were assessed utilizing the SYNTAX score,[9], which has been estimated from the coronary angiographic information. a narrowing of ≥fifty percent in a coronary vessel with a diameter above 1.5 millimeters has been deemed significant. Based on the SYNTAX score, patients have been categorized into two groups: low risk (score zero to thirty-two) and high risk (score ≥ thirty-two).[14, 15]

Statistical analysis

The distribution of information has been evaluated utilizing the Kolmogorov-Smirnov and Shapiro-Wilk tests. Categorical information has been compared utilizing the chi-square test or Fisher's exact test. Continuous parameters have been compared utilizing an unpaired Student's t-test or Mann-Whitney U-test. Information has been represented as mean ± standard deviation. Association among severity of CAD and QRS duration was calculated. Discrimination of severe CAD in patients with LBBB was done using different univariable and multivariable logistic Regression then the receiver operating characteristic curve (ROC) has been generated to define the cut-off value. All tests were two-sided, and a $p < 0.05$ showed statistically significant variances. All analyses have been conducted utilizing SPSS v26 (IBM Inc., Chicago, IL, United States of America).

To minimize the possibility of overfitting, only variables that were clinically relevant and statistically significant in univariate analysis ($p < 0.1$) were included in the multivariate regression model. Although formal multicollinearity testing was not performed, the included variables did not show strong correlations in the preliminary analysis. SYNTAX scoring was performed by a single experienced interventional cardiologist blinded to clinical and ECG data, with re-evaluation of uncertain patients to maintain internal consistency.

RESULTS

The demographic data of the study population, as illustrated in Table 1, revealed statistically insignificant variances among the two groups (CAD with LBBB vs. CAD without LBBB) for most demographic and clinical variables. The two groups were comparable concerning gender distribution, with 65% of males in Group 1 and 55% in Group 2 (P =to 0.36), and the mean age of the patients was statistically significant elevated in Group 1 (62.72 ± 10.1 years) compared to Group 2 (57.4 ± 8.6 years) (P = 0.013). The two groups also showed comparable mean values for weight, BMI, height, and the occurrence of risk factors like dyslipidemia, smoking, hypertension, and family history of CAD, all of which didn't vary statistically significant among groups (P > 0.05 for all). However, diabetes mellitus was more prevalent in Group 1 (65%) compared to Group 2 (40%) (P = 0.025), another difference was observed in the history of coronary artery bypass grafting (CABG), with ten percent of patients in Group 1 having a history of CABG, whereas none of the patients in Group 2 had undergone this procedure (P = 0.04).

There were statistically significant variances in several ECG, and laboratory variables among CAD patients with LBBB (Group 1) and those without LBBB (Group 2). The QRS duration was statistically significantly extended in Group 1 (142.9 ± 12.3 ms) compared to Group 2 (94 ± 10.8 ms), (p <0.001).

Echocardiographic findings also revealed more impaired cardiac function in the LBBB group, with statistically significantly larger left ventricular end-diastolic (LVEDD) and end-systolic (LVESD) diameters (P = 0.002 and <0.001, correspondingly), and a significantly reduced ejection fraction (EF) (46.2% vs. 54.3%, P <0.001). Regarding laboratory data, Group 1 had statistically significantly higher median LDL levels (110 vs. 90.5 milligrams per deciliter, P = 0.016). Notably, the SYNTAX score was statistically significantly greater in Group 1 (median: 28) compared to Group 2 (median: 13), P < 0.001 (table 2).

A significant positive correlation has been found among QRS duration and SYNTAX score when considering all CAD patients both with and without LBBB (r = 0.514, P < 0.001). When analyzing the groups separately, this correlation remains strong and statistically significantly in the CAD patients with LBBB (Group 1) (r = 0.601, P < 0.001). However, statistically insignificant association has been observed in the CAD patients without LBBB (Group 2) (r = -0.138, P =to 0.396) (table 3).

Univariate logistic regression analysis identified several significant predictors of severe CAD in patients with LBBB. Significant variables included male gender (OR=0.143, p=0.024), diabetes mellitus (OR=7.000, p = 0.024), smoking (OR=4.200, p = 0.043) and QRS duration (OR=1.169, p =to 0.001). In the multivariate logistic regression analysis, QRS duration was the only statistically significant predictor of severe CAD in patients with LBBB (OR = 1.233, p = 0.003) (table 4).

In ROC analysis, QRS period in patients with LBBB demonstrated a specificity of 88% and sensitivity of 87.5% at a cut-off value of 145 msec, showing significant accuracy for predicting high SYNTAX score (> 32) (AUC = 0.874, p < 0.001) (table 5; figure 1).

Table (1): Comparison of Clinical Characteristics and Risk Factors between the studied groups.

	Group 1 (CAD with LBBB) n=40	Group 2 (CAD without (LBBB) n=40	Test	P value
Age (years) Mean± SD	**62.72±10.1**	**57.4±8.6**	**t=2.5364**	**0.013***
Sex				
Male	**26 (65%)**	**22 (55%)**	**X^2=0.833**	**0.36**
Female	**14 (35%)**	**18 (45%)**		
Weight (kg) Mean± SD	**87.9±15.01**	**84.05±13.8**	**t=1.1942**	**0.23**
Height (cm) Mean± SD	**175±8.4**	**172.3±9.1**	**t=1.3789**	**0.17**
BMI (kg/m²) Mean± SD	**28.02±4.3**	**27.3±4.6**	**t=0.7232**	**0.47**
Diabetes Mellitus	**26 (65%)**	**16 (40%)**	**5.013**	**0.025***
Hypertension	**26 (65%)**	**26 (65%)**	**0.000**	**1.000**
Smoking	**22 (55%)**	**17 (42.5%)**	**1.251**	**0.26**
Dyslipidemia	**27 (67.5%)**	**29 (72.5%)**	**0.238**	**0.63**
Family history for CAD	**23 (57.5%)**	**23 (57.5%)**	**0.000**	**1.000**
History of CABG	**4 (10%)**	**0 (0.00%)**	**4.211**	**0.04***

P value >0.05: Not significant, P value <0.05 is statistically significant, p<0.001 is highly significant., SD: standard deviation, LBBB: left bundle branch block, CAD: coronary artery disease, BMI: body mass index, CABG: coronary artery bypass grafting

Table (2): Comparison of ECG, Echocardiographic data, Laboratory Findings and angiographic data between the studied groups.

	Group 1 (CAD with LBBB) n=40	Group 2 (CAD without (LBBB) n=40	Test(t)	P value
ECG and echocardiographic data				
QRS duration (msec) Mean± SD	**142.9±12.3**	**94±10.8**	**18.8942**	**< 0.001***
LVEDD Mean± SD	**58.8±9.1**	**53.1±6.9**	**3.1567**	**0.002***
LVESD Mean± SD	**43.9±10.2**	**36.4±7.6**	**3.7291**	**< 0.001***
EF(M-mode) % Mean± SD	**46.2±10.8**	**54.3±9.5**	**3.5616**	**< 0.001***
Laboratory data				
LDL (mg/dl) Median (Range)	**110 (55 – 423)**	**90.5 (32 – 236)**	**2.38638**	**0.016***
RBS (mg/dl) Median (Range)	**255.5 (85 – 454)**	**123 (56 – 321)**	**2.9348**	**0.003***
Creatinine (mg/dl) Median (Range)	**1.1 (0.5 – 3.0)**	**0.9 (0.5 – 1.5)**	**1.89563**	**0.057**
Coronary angiography data				
Syntax score Median (Range)	**28 (0.0 – 50.0)**	**13 (3.0 – 39.0)**	**3.70948**	**< 0.001***

P value >0.05: Not significant, P value <0.05 is statistically significant, p<0.001 is highly significant., LVEDD: Left Ventricular End-Diastolic Diameter, LVESD: Left Ventricular End-Systolic Diameter, EF, Ejection Fraction. LDL: Low-Density Lipoprotein, RBS: Random Blood Sugar.

Table (3): Correlation Between QRS Duration and SYNTAX Score in CAD Patients with and without LBBB

		Syntax score	
		r	**P value**
QRS Duration in CAD with and without LBBB		**0.514****	**< 0.001***
QRS duration	**Group 1**	**0.601****	**< 0.001***
	Group 2	**-.138**	0.396

P value <0.05 is statistically significant, r: Pearson correlation, CAD: coronary artery disease, LBBB: left bundle branch block.

Table (4): Univariate and Multivariate Logistic regression analysis identifying Risk Factors for Severe Coronary Artery Disease (high syntax score> 32) in Patients with Left Bundle Branch Block.

Variables	Univariate Logistic regression analysis			Multivariate Logistic regression analysis		
	Exp(B) (Odds ratio)	95% C.I. for EXP(B)	Sig.	Exp(B) (Odds ratio)	95% C.I. for EXP(B)	Sig.
Age (years)	1.015	(0.953 – 1.081)	0.645			
Gender (male)	0.143	(0.027 – 0.769)	0.024*	0.054	(0.001 – 2.459)	0.134
Diabetes Mellitus	7.000	(1.300 – 37.704)	0.024*	9.883	(0.271 – 360.787)	0.212
Hypertension	1.320	(0.345 – 5.050)	0.685			
Smoking	4.200	(1.044 – 16.904)	0.043*	3.643	(0.137 – 96.872)	0.440
Dyslipidemia	1.800	(0.443 – 7.308)	0.411			
LVEDD	1.072	(0.992 – 1.159)	0.080			
LVESD	1.041	(0.976 – 1.110)	0.223			
EF(M-mode)	0.996	(0.939- 1.057)	0.894			
LDL	.999	(0.991 – 1.008)	0.869			
RBS	1.003	(0.997 – 1.010)	0.266			
QRS duration	1.169	(1.067 – 1.281)	0.001*	1.233	(1.072 – 1.418)	0.003*

P value >0.05: Not significant, P value <0.05 is statistically significant, p<0.001 is highly significant, LVEDD: Left Ventricular End-Diastolic Diameter, LVESD: Left Ventricular End-Systolic Diameter, EF, Ejection Fraction. LDL: Low-Density Lipoprotein, RBS: Random Blood Sugar.

Table (5): ROC Analysis of QRS Duration in Patients with Left Bundle Branch Block for Predicting High SYNTAX Score (> 32).

	AUC	Cut off value	Sensitivity	Specificity	Std. Error	Asymptotic Sig.	Asymptotic 95% Confidence Interval	
							Lower Bound	Upper Bound
QRS Duration	0.874	145.00	87.5%	88%	0.060	< 0.001*	0.756	0.992

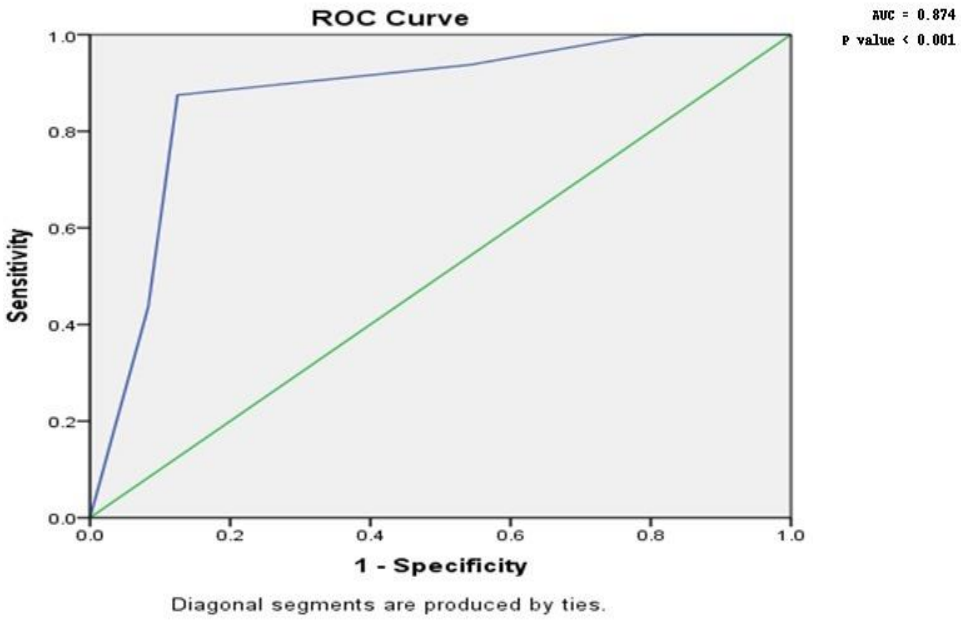

Figure (1): Receiver operating characteristic (ROC) curve showing the predictive value of QRS duration for identifying patients with high SYNTAX score (≥32). The optimal cut-off point was 145 ms (AUC = 0.874, Sensitivity = 87.5%, Specificity = 88%).

DISCUSSION

In this research, QRS duration in patients with LBBB was significantly correlated with coronary artery disease severity evaluated through SYNTAX score, furthermore, QRS duration was an independent predictor of severe coronary artery disease in LBBB patients (OR = 1.233, p = 0.003), with 87.5% sensitivity and 88% specificity at a 145 ms cut-off (AUC = 0.874, p < 0.001) for predicting high SYNTAX score (≥32).

The possibility of developing coronary artery disease is greater in patients with left bundle branch block, nevertheless, detecting coronary artery disease in these patients has been extensively studied and remains a clinical difficulty.[16]

The co-existence of left bundle branch block with coronary artery disease is related to a poorer prognosis compared to LBBB without CAD. Patients with LBBB and coronary artery disease have a greater possibility of mortality, especially from ventricular arrhythmias and myocardial infarction. Consequently, the detection of CAD in patients with LBBB is essential to stratify the safety and manage the therapeutic choices. LBBB has a significant influence by masking or imitating other electrocardiographic patterns.

Electrocardiographic, echocardiographic or scintigraphic techniques make it difficult to detect CAD in presence of LBBB, thus coronary angiography is typically needed to provide a conclusive diagnosis.[17, 18]

Our study showed that Group 1 had significantly larger left ventricular end-diastolic diameter and end-systolic diameter, in addition to significantly lower ejection fraction as determined via both M-mode and Simpson's technique.

In agreement with Jeevanantham et al.,[19] documented that the mean ejection fraction was significantly reduced in the left bundle branch block group in comparison with the non-left bundle branch block group (51.8 ± 13.2 versus 58.4 ± 9.3, p < 0.01). As well Ghanem et al.,[18] found the mean LVEF was significantly reduced in the CAD patients with left bundle branch block group than the CAD patients without LBBB group. In contrast Zhu et al.,[20] documented a statistically insignificant variance was found between examined groups concerning LVEDD and LVEF.

Our results demonstrated that a statistically insignificant variance was found between

examined groups regarding creatinine, whereas there was statistically significant elevation in Group 1 (CAD patients with LBBB) in comparison with Group 2 (CAD patients without LBBB) regarding LDL, RBS and Syntax score.

In contrast Zhu et al.,[20] reported that Syntax score was significantly greater among patients with RBBB compared to patients with LBBB. Also, a statistically significant modification has been observed between the examined groups concerning creatinine and no significance regarding LDL.

Our results demonstrated that there was significant positive association among Syntax score and QRS duration in the studied groups. There was significant positive association among Syntax score and QRS duration in Group 1 (CAD patients with LBBB), whereas there was no significant association among Syntax score and QRS duration in Group 2 (CAD patients without LBBB).

In line with Nassir et al.,[21] aimed to examine the association among the existence of fragmented wide QRS complex (fw-QRS) and significant obstructive CAD in patients with LBBB, reported that In LBBB patients, a significant association was observed among the fragmented wide QRS complex with the existence and severity of CAD.

As well Bekler et al.,[22] aimed to examine the association among fQRS complexes and SYNTAX and Gensini scores in patients with acute coronary syndrome (ACS), reported that QRS duration and greater frequency of (f-QRS) were related to the degree and severity of coronary lesions according to SYNTAX score.

In the multivariate logistic regression analysis, QRS duration was the only statistically significant predictor of severe CAD in patients with LBBB (OR = 1.233, $p = 0.003$).

In line with Jeevanantham et al.,[19] reported that gender (OR 2.37, ninety-five percent CI 1.46–3.84, $p < 0.01$), and left bundle branch block (OR 4.05, ninety-five percent CI 2.41–6.79, $p < 0.01$) have been observed to be the most significant predictors of coronary artery disease in LBBB patients.

Our results showed that QRS duration in patients with LBBB demonstrated a specificity of 88% and sensitivity of 87.5% at a cut-off value of 145 ms, indicating moderate to high accuracy and promising predictive ability for identifying patients with a high SYNTAX score (>32) (AUC = 0.874, $p < 0.001$).

In line with Al-Daydamony & Mustafa,[16] aimed to examine the correlation among fQRS and the existence and severity of coronary artery disease in patients with LBBB, reported that sensitivity of f-wQRS in expecting obstructive CAD in patients with left bundle branch block was 80.1 percent, specificity was 73.3 percent, negative predictive value was 81.5 percent, positive predictive value was 72.4 percent, and total accuracy was 76.8 percent, p =to 0.0022.

Our results add to a limited but growing body of evidence linking ECG features with coronary lesion complexity. For example, Hatamnejad et al. [23] reported that in patients with unstable angina, ECG parameters (like ST-depression and P-wave prolongation) showed modest predictive value for intermediate and high SYNTAX scores. On the other hand, Zhu et al. [24] found no significant association between LBBB (new or old) and coronary lesion severity by SYNTAX score in their cohort. Our findings differ, as we show a significant correlation in the LBBB subgroup—suggesting that within LBBB patients, QRS duration may serve as a more sensitive marker of anatomical disease burden

The present findings suggest that QRS duration may serve as a readily available, non-invasive marker for identifying LBBB patients at greater risk of severe coronary artery disease. In clinical practice, the presence of markedly prolonged QRS duration (>145 ms) in a patient with

LBBB could justify closer surveillance, earlier referral for coronary angiography, or more aggressive risk factor modification. Although QRS prolongation alone cannot replace established diagnostic pathways, its incorporation into clinical assessment may enhance early detection of significant CAD, particularly in settings where noninvasive imaging is inconclusive due to conduction abnormalities. Larger studies are warranted to determine whether integrating QRS duration into risk stratification models could improve patient outcomes through earlier intervention.

Limitations

Our study was conducted in a single center with a relatively small sample size, which may limit the generalizability of the findings. The recruitment process could also introduce potential selection bias, as participants were drawn from a tertiary referral hospital population. Additionally, data on medication use and other comorbidities were not incorporated into the regression model, which may have influenced CAD severity or QRS duration. SYNTAX scoring was performed by a single observer without formal inter-observer reliability testing, which may introduce minor subjective variability despite efforts to ensure consistency. Finally, the absence of longitudinal follow-up precluded the assessment of long-term outcomes such as mortality or major adverse cardiac events.

CONCLUSION

In LBBB patients, QRS duration showed a strong correlation with SYNTAX score and was an independent predictor of CAD severity. A QRS duration above 145 milliseconds demonstrated moderate to high accuracy in identifying severe CAD, suggesting its promising predictive value as a simple, non-invasive marker for assessing disease severity in patients with LBBB.

Financial Disclosures: None

Conflict of Interest: None

Availability of data and materials: The datasets generated and/or analyzed during the current study are not publicly available due to privacy and ethical restrictions but are available from the corresponding author on reasonable request.

Authors' Contributions: AAK contributed to the study conception, design, data interpretation, and critical revision of the manuscript. HAEIMM was responsible for data collection, analysis, drafting the initial manuscript, and coordinating the submission process as the corresponding author. MBM assisted with echocardiographic assessments, statistical analysis, and manuscript revision. GMS provided oversight on the study methodology, ethical approvals, and final manuscript review. All authors read and approved the final version of the manuscript.

REFERENCES

1. Aleksova A, Carriere C, Zecchin M, Barbati G, Vitrella G, Di Lenarda A, et al. New-onset left bundle branch block independently predicts long-term mortality in patients with idiopathic dilated cardiomyopathy: data from the Trieste Heart Muscle Disease Registry. Europace. 2014; 16(10):1450-9.
2. van Hemel NM. Left is worse than right: the outcome of bundle branch block in middle-aged men. Eur Heart J. 2005; 26(21):2222-3.
3. Rotman M, Triebwasser JH. A clinical and follow-up study of right and left bundle branch block. Circulation. 1975; 51(3):477-84.
4. Khanal S, Thakur J, Kumar B, Dahiya N. The clinical and angiographic profile and outcomes of patients with left bundle branch block (LBBB): an observational study from a tertiary care center in North India. Cureus 2025;17(7):e87953.
5. Lin L, Zhang MX, Zhang L, Zhang D, Li C, Li YL. Autophagy, Pyroptosis, and Ferroptosis: New Regulatory Mechanisms for Atherosclerosis. Front Cell Dev Biol. 2021; 9:809955.
6. Pagliaro BR, Cannata F, Stefanini GG, Bolognese L. Myocardial ischemia and coronary disease in heart failure. Heart Fail Rev. 2020; 25(1):53-65.
7. Tolunay H, Kurmus O. Comparison of coronary risk scoring systems to predict the severity of coronary artery disease using the SYNTAX score. Cardiol J. 2016; 23(1):51-6.
8. Neeland IJ, Patel RS, Eshtehardi P, Dhawan S, McDaniel MC, Rab ST, et al. Coronary angiographic scoring systems: an evaluation of their

equivalence and validity. Am Heart J. 2012; 164(4):547-52.e1.
9. Sianos G, Morel MA, Kappetein AP, Morice MC, Colombo A, Dawkins K, et al. The SYNTAX Score: an angiographic tool grading the complexity of coronary artery disease. EuroIntervention. 2005; 1(2):219-27.
10. Da Costa D, Brady WJ, Edhouse J. Bradycardias and atrioventricular conduction block. Bmj. 2002; 324(7336):535-8.
11. Mitchell C, Rahko PS, Blauwet LA, Canaday B, Finstuen JA, Foster MC, et al. Guidelines for Performing a Comprehensive Transthoracic Echocardiographic Examination in Adults: Recommendations from the American Society of Echocardiography. J Am Soc Echocardiogr. 2019; 32(1):1-64.
12. Galderisi M, Cosyns B, Edvardsen T, Cardim N, Delgado V, Di Salvo G, et al. Standardization of adult transthoracic echocardiography reporting in agreement with recent chamber quantification, diastolic function, and heart valve disease recommendations: an expert consensus document of the European Association of Cardiovascular Imaging. Eur Heart J Cardiovasc Imaging. 2017; 18(12):1301-10.
13. Turan B, Erkol A, Mutlu A, Daşli T, Erden İ. Effectiveness of Left Judkins Catheter as a Single Multipurpose Catheter in Transradial Coronary Angiography From Right Radial Artery: A Randomized Comparison With Conventional Two-Catheter Strategy. J Interv Cardiol. 2016; 29(3):257-64.
14. Brzozowski P, Bulak L, Rakotoarison O, Zimoch W, Kosowski M, Tomasiewicz B, et al. Utility of the SYNTAX Score in the risk stratification of patients undergoing rotational atherectomy. Arch Med Sci Atheroscler Dis. 2020; 5:e313-e9.
15. Papadopoulos K, Lekakis I, Nicolaides E. The Predictive Value of the Syntax Score in Patients With Chronic Coronary Artery Disease Undergoing Percutaneous Coronary Intervention or Coronary Artery Bypass Grafting: A Pilot Study. Open Cardiovasc Med J. 2017; 11:28-32.
16. Al-Daydamony MM, Mustafa TM. The relation between coronary artery disease severity and fragmented QRS complex in patients with left bundle branch block. Egypt Heart J. 2017; 69(2):119-26.
17. Nguyen K, Cigarroa JE, Lange RA, Hillis LD, Keeley EC. Presence and extent of angiographic coronary narrowing in patients with left bundle branch block. Am J Cardiol. 2004; 93(11):1426-7, a10.
18. Ghanem I, El-damanhory AS, Shaker A. Predictors and morphologic characteristics of ischemic left bundle branch block. Zagazig University Medical Journal. 2023; 29(3):768-76.
19. Jeevanantham V, Manne K, Sengodan M, Haley JM, Hsi DH. Predictors of coronary artery disease in patients with left bundle branch block who undergo myocardial perfusion imaging. Cardiol J. 2009; 16(4):321-6.
20. Zhu T, Chen M, Hu W, Wang B, Jiang H. Clinical characteristics and the severity of coronary atherosclerosis of different subtypes of bundle-branch block. Annals of Noninvasive Electrocardiology. 2022; 27(1):e12883.
21. Nassir H, Abdulbari A, Abbood A. Association of Fragmented Wide QRS Complex with Coronary Artery Disease in Patients with Left Bundle Branch Block. Cardiol Belar. 2024; 16(3):302-12.
22. Bekler A, Barutçu A, Tenekecioglu E, Altun B, Gazi E, Temiz A, et al. The relationship between fragmented QRS complexes and SYNTAX and Gensini scores in patients with acute coronary syndrome. Kardiol Pol. 2015; 73(4):246-54.
23. Hatamnejad MR, Heydari AA, Salimi M, Jahangiri S, Bazrafshan M, Bazrafshan H. The utility of SYNTAX score predictability by electrocardiogram parameters in patients with unstable angina. BMC Cardiovasc Disord. 2022;22(1):8.
24. Zhu T, Chen M, Hu W, Wang B, Jiang H. Clinical characteristics and the severity of coronary atherosclerosis of different subtypes of bundle-branch block. Ann Noninvasive Electrocardiol. 2022;27(1):e12883.

Citation

Abd El-karim Kenawy, A., Ismail Mohamed Magar, H. A. E., Beshay Mina, M., Mahmoud Sultan, G. Severity of Coronary Artery Disease on Patients with Left Bundle Branch Block. *Zagazig University Medical Journal*, 2025; (5196-5205): -. doi: 10.21608/zumj.2025.422590.4176