Identification of High-Risk Patients Based on Electrocardiogram During Acute Anterior ST-Elevation Myocardial Infarction: The qRBBB Pattern

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See article by Paul et al., pages 1764–1769 of this issue.

New right bundle branch block (RBBB) as a consequence of anterior myocardial infarct (MI) is, in most cases, related to the proximal occlusion of the left descending coronary artery with compromised circulation of the septal arteries supplying the bundle branches.

Due to the anterior location of the right ventricle, activation of the right ventricular free wall can neutralise the abnormal septal forces associated with an anteroseptal MI, masking right-precordial Q waves. Therefore, in most patients with an anteroseptal myocardial infarction, abnormal Q waves in the right precordial leads are particularly manifest during RBBB manifesting the classical qRBBB pattern, with delayed activation of the right ventricle that allows unmasking of the abnormal septal forces. In theory, RBBB does not mask the repolarisation phase, but minor ST-segment elevation in the anterior leads (V1-V4) can be missed because these are “compensated” by the pseudo-normalization of the negative T waves. Thus, the presence of RBBB may lead to the misdiagnosis of transmural ischemia and mask the early diagnosis of ST-elevation myocardial infarction (STEMI) and potentially further delay the reperfusion time.1-3

The incidence of new bundle branch block in the setting of acute anterior MI varies between 15% and 55%, with a higher incidence of RBBB, despite the fact that left bundle branch block (LBBB) is more prevalent in patients with chronic ischemic heart disease.3-6

Current guidelines recommend reperfusion therapy in anterior MI with STEMI or LBBB. Only the last set of guidelines from the European Society of Cardiology7 for management of patients with STEMI mentions that patients with acute MI and RBBB have a poorer prognosis and that it may be difficult to detect transmural ischemia in these patients and, therefore, a primary percutaneous coronary intervention (PCI) strategy (emergent coronary angiography and PCI, if indicated) should be considered when persistent ischemic symptoms occur in the presence of RBBB. In addition, the presence of RBBB is rarely considered, as opposed to LBBB, among the criteria of the STEMI scores.6,7 Furthermore, there is no mention that the qRBBB pattern should be considered as an indication for reperfusion therapy.6,7

In their analysis of the Hirulog and Early Reperfusion or Occlusion-2 (HERO-2) databank, Wong et al. studied the prognosis value of the different bundle branch blocks presented during the early phase of MI. They identified a 30-day mortality rate of 6.9% in patients with normal conduction, 11.4% in those with RBBB at randomisation, and 16.7% in those developing new RBBB within 60 minutes of admission. They concluded that RBBB accompanying anterior acute MI at presentation and new BBB (including LBBB) early after fibrinolytic therapy are independent predictors of high 30-day mortality.8

Moreover, Wang et al.9 published a meta-analysis including 874 anterior MIs, demonstrating higher long-term mortality, ventricular arrhythmia, and cardiogenic shock in patients with new-onset RBBB when compared with those with pre-existing RBBB.9

The aforementioned studies are among the few showing the importance of new RBBB in the context of anterior STEMI, but the presence of qRBBB pattern as a marker of poor prognosis was not extensively investigated.

In this issue of the Canadian Journal of Cardiology, Paul et al. report the results of a single-center retrospective study conducted among patients who presented with acute anterior STEMI over a period of 5 years to a tertiary-care referral center in southern India.10 The aim of this study was to estimate the incidence of short-term mortality and in-hospital complications during acute anterior STEMI manifesting qRBBB electrocardiogram (ECG) pattern and to identify the...
associated ECG predictors of poor outcome. They included 272 patients with qRBBB ECG pattern and compared them with a non-qRBBB control group. Among them, 64% had a Thrombolysis in Myocardial Infarction (TIMI) risk score of ≥ 6, and 41% were in Killip class III or IV at the time of presentation. The in-hospital mortality rate was 42.6%. There was a high incidence of ventricular tachyarrhythmia (12%), complete heart block (13%), heart failure (69%), and cardiogenic shock (52%).

The median period from onset of chest pain to time of hospital presentation was 6 (interquartile range, 3.5-12) hours and only 24% of patients reached the hospital within 12 hours. Although this is a real-world scenario, it has been pointed out that delayed access to reperfusion has a negative impact on in-hospital mortality (regardless of ECG at presentation). This is perhaps part of the explanation of the elevated mortality found in this study. Moreover, when compared with the non-qRBBB anterior MI control group, there was a statistically nonsignificant 0.5-hour difference in the critical window period (6.0 [3.5-12.0] hours vs 5.5 [3.0-8.5] hours; \( P = 0.105 \)).

In the same framework, it is important to note that only 30% of the patients received primary PCI in this study. In other studies, a lower mortality (18.8%) was reported when PCI was performed in a larger percentage of patients (80.1%). The in-hospital mortality was higher among patients presenting with new or presumably new RBBB, followed by new or presumably new LBBB (13.2%), old LBBB (10.1%), and old RBBB (6.4%). Among 35 patients with acute left main coronary artery occlusion, 26% presented with RBBB on admission ECG. In this study, cardiac asystole was shown to be the most common terminal event (82%). Only a small number of patients died from refractory ventricular tachycardia or ventricular fibrillation. Thus, very close rhythm monitoring should be encouraged in this population to achieve an early diagnosis of fatal complications.

After multivariate analysis, Paul et al. detected associated ECG features to be predictive of early mortality: north-west QRS axis (180°-269°) in the baseline ECG (odds ratio [OR], 13.43; \( P = 0.021 \)); ventricular fibrillation/tachycardia (OR, 19.02; \( P = 0.009 \)); and prolonged QTc on baseline ECG (OR, 1.02; \( P = 0.009 \)). An extreme right-axis deviation in the setting of an acute anterior MI could be explained by extensive damage to the left ventricle. In addition, the presence of a concomitant left posterior fascicular block could perhaps play a role as a contributor to the axis deviation (indicating extensive myocardial lesion).

In conclusion, we have highlighted the importance of the qRBBB pattern in patients presenting with an anterior STEMI, adding to the literature more data supporting the increased mortality rates and new ECG predictors of early mortality.

These findings suggest that all physicians involved in the care of these patients should be familiarized with the qRBBB ECG pattern and aware of the prognostic implications in the setting of acute anterior MI.

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**References**


