Right bundle branch block during the acute phase of myocardial infarction: modern redefinitions of old concepts

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Online publish-ahead-of-print 3 November 2005

This editorial refers to ‘Prognostic differences between different types of bundle branch block during the early phase of acute myocardial infarction: insights from the Hirulog and Early Reperfusion or Occlusion (HERO)–2 trial’† by C.-K. Wong et al., on page 21.

When physicians face a patient with a suspected acute myocardial infarction (MI) and a bundle branch block (BBB), major diagnostic and prognostic issues should be addressed with different considerations, depending on the presence of a left BBB (LBBB) or a right BBB (RBBB).

(i) Is the conduction disturbance new or a presumably new occurrence?
(ii) Does the BBB mask any electrocardiographic features of MI with ST-segment elevation?
(iii) Is it possible to assess the area of myocardium at risk?
(iv) Should these patients always be treated as if they were at high risk?

Many investigators have dealt with the aspects of this problem. Both historical and contemporary registries and randomized clinical trials (RCTs) help us to understand the clinical relevance of BBB in the presence of an acute MI. The prevalence of BBB on arrival in patients with MI varies between 1.6 and 10.9%,1–3 without marked difference between RBBB and LBBB. The true incidence of BBBs of new or probable new onset is a more difficult task to assess and thus this information is often missing in RCTs and registries. When reported, it varies between 15 and 55%.4,5 with a higher incidence of RBBB, despite the fact that LBBB is more prevalent in patients with chronic ischaemic heart disease. The timing of onset of BBB, either left or right, might indicate the pathophysiology of the present acute coronary syndrome and in the case of LBBB, helps to overcome the limitations inherent to the masking of the repolarization phase.

In the presence of a patient with an acute coronary syndrome and an LBBB of undetermined onset, all efforts must be directed to the underlying pathophysiology because the electrocardiogram is not readable in terms of repolarization phase and extension of the acute injury. Despite a similar outlook, the clinical background of these patients is heterogeneous; it ranges from a pre-existing LBBB in the setting of an acute coronary syndrome without ST-segment elevation to an STEMI with a pre-existing LBBB, an anterior STEMI, and an LBBB of new onset. The treatment of course varies greatly. Nonetheless, although an RBBB does not theoretically mask the repolarization phase, nor a pre-existing Q-wave, minor ST-segment elevation in the anterior leads (i.e. V1–V4) can be missed because these are ‘compensated’ by the pseudo-normalization of the negative T-waves.

The difficulty in interpreting the clinical picture of an MI in the presence of any complete BBB is clearly evident in NMRI-2. In this large registry, among patients for whom thrombolytic therapy was clearly indicated, fewer patients with LBBB or RBBB (16.6 and 32.0%, respectively) received this therapy than those with no BBB (66.5%). In addition, the presence of an RBBB is rarely considered, as opposed to LBBB, among the criteria of the STEMI scores.6–8

Many studies, especially in the pre-thrombolytic era, associated both RBBB and LBBB in the presence of MI with a higher mortality. However, results were limited by the small numbers and the lack of strict definitions.

Wong et al.9 analysed the HERO-2 data bank to assess the prognostic value of BBB in the acute phase of an MI. This large RCT is particularly suitable for the purpose because patients with LBBB were included and, by protocol, electrocardiograms were collected at randomization and at 60 min. In this way, the authors could discriminate patients with BBB of definite new onset (i.e. those who developed BBB after randomization) from those with BBB already present on admission (including new, presumably new, and new onset BBBs). In other words, they could separate the prognosis of BBB possibly associated with a pre-existing cardiac disease from that of BBB as a consequence of a large acute cardiac damage.

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† doi:10.1093/eurheartj/ehi622
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The analysis of HERO-2 elegantly demonstrates, and this is probably the major finding of this study, that in the setting of an anterior STEMI, the presence of an RBBB, whatever its onset, is associated with a higher risk of death. When present on admission, RBBB is associated with a worse clinical profile when compared with that of patients with normal conduction, but nevertheless, these patients experienced more extensive MI and a higher 30-day mortality, independently of pre-infarction characteristic and presenting features (adjusted OR 3.24, 95% CI 2.55–4.11). This should prompt us to ‘blindly’ consider the RBBB as a consequence of the current anterior MI (possibly related to the proximal occlusion of left descending coronary artery) rather than a ‘benign bystander’. Supporting this hypothesis, in HERO-2 cohort of patients, the incidence of RBBB after admission was almost five times higher when compared with LBBB.

The prognostic meaning of RBBB developed shortly after admission is similar, with the exception that these patients do not exhibit worse pre-infarction characteristics. Owing to the involvement of the A-V branch of the right coronary artery, RBBB associated with an inferior infarction does not portend a worse prognosis, independently of its onset. Patients with LBBB already present at randomization were found to have worse pre-infarction characteristics (older age and previous MI), responsible, by itself, for the worst prognosis (adjusted OR 0.69, 95% CI 0.48–0.99). However, the occurrence of an LBBB after randomization indicates a ‘true’ ischaemic conduction damage, thus carrying an independent negative prognostic value (adjusted 30-day mortality OR 2.97, 95% CI 1.16–7.57) due to the large percentage of myocardium involved.

Before HERO-2, in the thrombolytic era, few RCTs and registers analysed the significance of RBBB in the setting of MI. However, most of them were limited by the availability of only the ECG at admission.

In a smaller Spanish registry of 1238 patients, RBBB, as a whole, was associated more frequently with heart failure and advanced A-V block and resulted as an independent predictor of 30-day mortality. Sgarbossa et al. showed in GUSTO-I only during univariate analysis the higher 30-day mortality in patients admitted with RBBB (not divided between old and new and by infarct location); the study confirmed the lack of worse prognosis linked to the presence of LBBB. At multi-variable analysis, any BBB carried a 53% higher 30-day mortality. In addition, in NRMI-2, despite the absence of the knowledge of infarct location, RBBB was found to be a more important independent predictor of in-hospital mortality than LBBB.

Although echocardiographic examination should be considered increasingly mandatory in assessing the extension of the jeopardized myocardium in the presence of any acute coronary syndrome and undetermined ECG, the study of Wong et al. suggests that emergency physicians and cardiologists should be familiar with the mechanisms related to BBBs and with the prognostic implications of BBBs in the setting of an acute MI. Such knowledge constitutes an immediate available clinical tool for the management of patients with MI, especially nowadays when the critical pathways to the optimal reperfusion strategy are increasingly complex and tailored for the patients suffering from large MIs.

Conflict of interest: none declared.

References