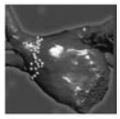
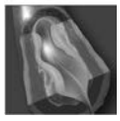
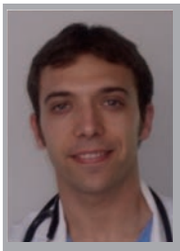




Bundle branch block during primary angioplasty: reperfusion success remains encrypted in the ECG!

"There are some reports addressing the incidence and prognosis of bundle branch block in this setting, but hardly anyone addresses the importance of different kinds of [bundle branch block]."

KEYWORDS: acute myocardial infarction ■ bundle branch block ■ ECG ■ primary angioplasty ■ stent



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It has been known for years that the finding of bundle branch block (BBB) in patients with ST-segment elevation myocardial infarction (STEMI) is associated with a high mortality rate [1]. In the prethrombolytic era, several studies demonstrated that the presence of left BBB (LBBB) and right BBB (RBBB) was associated with large infarct sizes often accompanied by heart failure, ventricular arrhythmias or cardiovascular death [2]. Although thrombolytic reperfusion decreased mortality in STEMI patients, the appearance of BBB was still associated with a poor short- and long-term prognosis [3–6]. Current guidelines recommend primary percutaneous coronary intervention (PCI) as the gold-standard therapy for the management of patients with STEMI [7–9]. There are some reports addressing the incidence and prognosis of BBB in this setting, but hardly anyone addresses the importance of different kinds of BBB; is it the same as a previous (already known) BBB or a *de novo* (transient vs persistent after reperfusion) BBB?

Why are BBBs associated with such a poor prognosis?

The mechanisms explaining why BBBs are associated with such a dismal prognosis remain poorly understood. Previous studies have speculated that the high mortality might be related to the bundle branches' blood supply. Interestingly, both right and left bundle branches are irrigated by branches arising from proximal coronary arteries, and their occlusion induces large infarctions unless reperfusion therapy is carried out promptly [10]. It is worth noting that the right bundle branch often has a dual blood supply and therefore the involvement of the two main coronary arteries is theoretically required for the appearance of RBBB. Therefore, the association between BBB and an acute myocardial infarction reveals a poor prognosis. However, if the patient presents the BBB before the onset of the STEMI, it is possible that this finding is not associated with the same poor prognosis (Figure 1).

Evidence in the literature

A systematic assessment of the implications of the different kinds of BBB (e.g., previous, transient and persistent) has not been performed in primary PCI patients in the stent era. However, previous studies have suggested that the success of reperfusion therapy may be followed by the disappearance of BBBs, and this factor could be considered as an early marker of a better prognosis [3,11,12]. Our group designed a prospective study that analyzed all consecutive patients with STEMI treated with primary angioplasty (n = 913) [13]. Data from our study demonstrated that the prognosis of patients with previous RBBB/LBBB was similar to that observed in patients without RBBB/LBBB, whereas patients with persistent RBBB/LBBB presented higher rates of mortality, reinfarction, stent thrombosis, malignant arrythmias and major bleeding. Notably, patients with transient RBBB/LBBB were associated with higher peak enzymes, more extensive infarcts, malignant arrhytmias and heart failure than patients without RBBB during in-hospital stay; however, they were not associated with a higher mortality. The reasons explaining why transient RBBB/LBBB is associated with a lower mortality remains speculative. Although an early reperfusion decreases overall mortality, in some cases it may be associated with reperfusion injury, which might explain the occurrence of some adverse effects [14,15]. Available information assessing implications of different types of BBB is scarce. Tomoda and Aoki observed that patients with transient RBBB had an in-hospital prognosis similar to that of patients without RBBB, whereas the mortality rate of patients with

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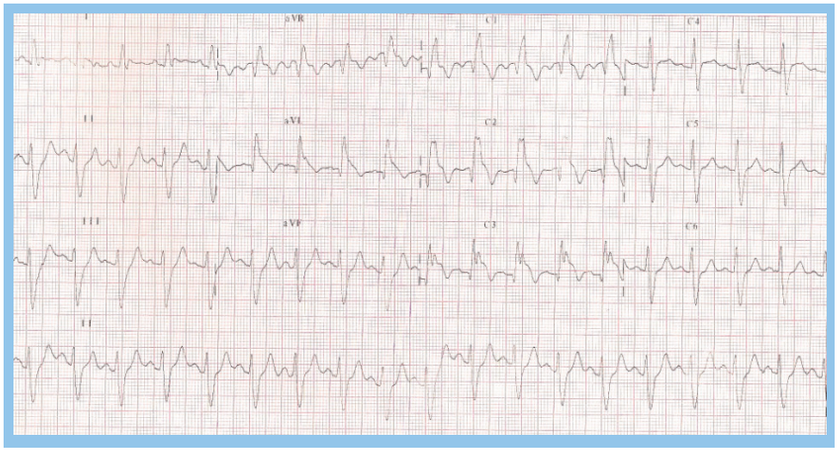

Figure 1. ECG shows an anterior ST-segment elevation myocardial infarction in a patient with a *de novo* right bundle branch block and left anterior fascicular bundle branch block.

persistent RBBB was significantly higher than that found in patients without RBBB [14]. Unlike our study, they did not distinguish between patients with and without previous RBBB, and this potential caveat should be considered when interpreting their results [13].

BBB as an independent risk factor of cardiovascular outcomes

The significance of BBB as an independent predictor of outcomes has been assessed by prior studies, with controversial results [16,17]. A *post hoc* analysis of the Primary Angioplasty in Myocardial Infarction (PAMI) trial revealed that the presence of LBBB, but not RBBB, was an independent predictor of in-hospital mortality [16]. Conversely, Moreno *et al.* found that LBBB was not an independent predictor of mortality [17]. In our study, neither RBBB nor LBBB were independent predictors of in-hospital mortality [13]. Nevertheless, persistent RBBB and LBBB were revealed as strong independent predictors of in-hospital death and reinfarction [13]. These findings emphasize the importance of revisiting the time-honoured ECG as a reliable and readily available clinical tool in the assessment of prognosis in STEMI patients.

BBB & long-term outcomes

Long-term outcomes in patients with STEMI and BBB have been poorly studied and the available information is derived from *post hoc* analyses. Guerrero *et al.* demonstrated significant differences in mortality at 1 year between patients with BBB (16% with LBBB and 15% with RBBB) and those without BBB (6%) [16]. Similar to this, Abidov *et al.* assessed conduction disturbances in STEMI patients, including RBBB and atrioventricular block, and found these patients to have a higher mortality rate at 1 year compared with patients without conduction disturbances [5]. In our study, survival curves revealed significant differences in long-term mortality only with persistent BBB in both RBBB and LBBB. Neither transient nor previous BBB showed significant differences at long-term follow-up regarding the primary outcome. Therefore, our data reinforce the theory that the disappearance of BBB after successful reperfusion improves long-term prognosis [13].

Conclusion

Although overall mortality in patients with STEMI has decreased with primary angioplasty in the stent era, the short- and long-term prognosis of patients with STEMI associated with RBBB or LBBB has not changed significantly. Therefore, further dedicated studies should evaluate the best therapeutic strategies in these challenging patients. The risk is particularly high in patients with persistent BBB, whereas patients with previous BBB are associated with a clinical outcome comparable with that observed in patients without BBB. Notably, in patients with BBB, the disappearance of this conduction disturbance is associated with a lower short- and long-term mortality rate, despite the presence of large infarct sizes and other adverse prognostic markers.

> *"Paying due attention to the 'old' ECG remains critical to ensuring excellence in clinical practice."*

Despite the excellent angiographic results obtained during primary PCI procedures, total normalization of the ST segment is obtained in only a minority of patients. We should humbly recognize that optimizing reperfusion at the microvascular level still remains a challenge. The presence of BBB also remains a major prognostic marker. All of these findings emphasize the importance of carefully monitoring ECG changes in STEMI patients. Paying due attention to the 'old' ECG remains critical to ensuring excellence in clinical practice.

Financial & competing interests disclosure

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

No writing assistance was utilized in the production of this manuscript.

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