

Alternating bundle-branch block in acute coronary syndrome

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SOUHRN

Kontext: Alternující blokáda levého a pravého raménka Tawarova (raménková blokáda) často „rozostřuje“ ischemické změny na elektrokardiogramu. I když se toho o alternující blokáde levého a pravého raménka Tawarova příliš neví, může být pro klinickou praxi významná.

Kasuistika: Popisujeme případ muže s potvrzenou blokádou levého Tawarova raménka (left bundle-branch block, LBBB), u něhož při akutním koronárním syndromu došlo k rozvoji blokády pravého Tawarova raménka (right bundle-branch block, RBBB). Koronarogram prokázal subtotální proximální stenózu ramus interventricularis anterior (RIA), která byla řešena implantací stentu. Po perkutánní koronární intervenci došlo k vymizení RBBB a znovuobjevení LBBB. Možným důvodem pro alternující raménkovou blokádu v popisovaném případě je nový zdroj komorových impulsů po počáteční farmakoterapii. Nově vzniklá RBBB je záhadnou klinickou entitou, často spojenou s akutním infarktem myokardu. Blokádu pravého Tawarova raménka lze přidat k infarktu myokardu s elevací úseku ST jako rovnocennou indikaci k urgentní reperfuční léčbě. Proč by si měl být lékař na oddělení urgentního příjmu vědom popsané možnosti? Alternující raménková blokáda může ukazovat na reperfuzi, které vyžaduje změnu léčebného postupu u pacienta s akutním koronárním syndromem.

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ABSTRACT

Background: Bundle-branch blocks often blur ischemic ECG changes. Alternating bundle-branch block is not yet fully understood but can hold clinical significance.

Case report: We present a case of a patient with a known left bundle-branch block (LBBB) who developed a new right bundle-branch block (RBBB) in a setting of acute coronary syndrome. Coronary angiogram revealed subtotal proximal LAD stenosis that was resolved with stent implantation. After the percutaneous coronary intervention RBBB disappeared and LBBB reappeared. The probable reason for the alternating bundle-branch block in the presented case is a new origin of ventricular impulses after initial medical treatment. New onset RBBB has been an intriguing clinical entity often associated with acute myocardial infarction. RBBB could be added to ST-elevation myocardial infarction as an equivalent indication for urgent reperfusion therapy.

Why should an emergency physician be aware of this? Alternating bundle-branch block can be an indicator of reperfusion, thus changing the management of an acute coronary syndrome patient.

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Introduction

European Society of Cardiology ST-segment elevation myocardial infarction (STEMI) guidelines from 2012 state that urgent coronary angiography is indicated in patients with STEMI and in patients with new or presumed new left bundle-branch block (LBBB).¹ American College of Cardiology/American Heart Association guidelines on management of STEMI from 2013 however do not recommend that new or presumed new LBBB be considered diagnostic of acute myocardial infarction (AMI).² Several other authors also suggest that new or presumed new LBBB is not a sufficient criterion for urgent coronary angiography.³⁻⁵

In clinical practice, we frequently encounter right bundle-branch block (RBBB) in large anterior STEMI patients. Widimsky et al. recently published a study in which they showed that acute thrombotic coronary occlusion is a frequent finding in patients with RBBB especially if ST elevations are also identified.⁶ This group of patients had the highest mortality rate of all acute coronary syndrome (ACS) patients. Based on his results he suggests that new onset RBBB in ACS clinical setting should be an indication for urgent coronary angiography as in other STEMI patients.

In our case report we present a patient with ACS in whom ECG pattern prior to urgent coronary angiography showed LBBB which unusually changed to RBBB with concomitant ST elevations in precordial leads. After successful reperfusion LBBB reappeared.

Clinical case

64-Year-old male with history of arterial hypertension and hyperlipidemia had an acute episode of chest pain. After 1 h of severe pain he called the physician-staffed prehospital emergency unit. The emergency physician recorded a 12-lead ECG (Fig. 1) which showed LBBB with ST elevations in leads I, aVL, (V₁-V₃) and contralateral ST depressions in leads II, III, aVF, V₆. The physician decided to activate the 24-h cardiac intervention center for an emergency coronary intervention. The patient received acetylsalicylic acid 500 mg, unfractionated heparin 5000 IU and morphine 6 mg. While awaiting the interventional team (due to late night hours the team was on call)

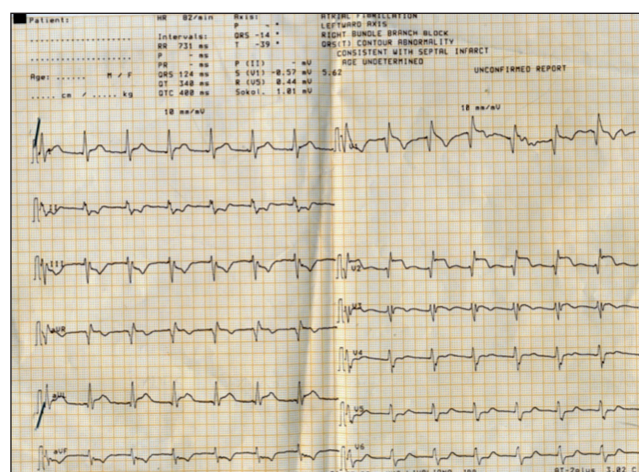


Fig. 2 – ECG recorded in the ER with patient having reduced chest pain: RBBB with ST elevations in aVL, V₁ and V₂.

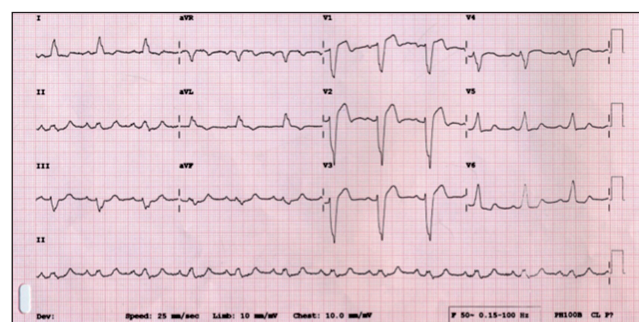


Fig. 3 – ECG after successful PCI: LBBB with appropriate ST changes, negative according to both Sgarbossa and modified Sgarbossa criteria.

the patient was brought to the in-hospital emergency department. While the chest pain significantly decreased a second ECG was recorded (Fig. 2). Surprisingly, an accelerated idioventricular rhythm with RBBB and typical ST segment elevations in anteroapical leads was found. The patient received a loading dose of 600 mg clopidogrel.

Urgent coronary angiography performed within 30 minutes showed a single vessel disease with acute thrombotic lesion in proximal LAD and severe lesion in mid LAD, both with TIMI 2–3 flow. On both sites drug eluting stents were implanted with the resulting TIMI 3 flow. Eptifiba-

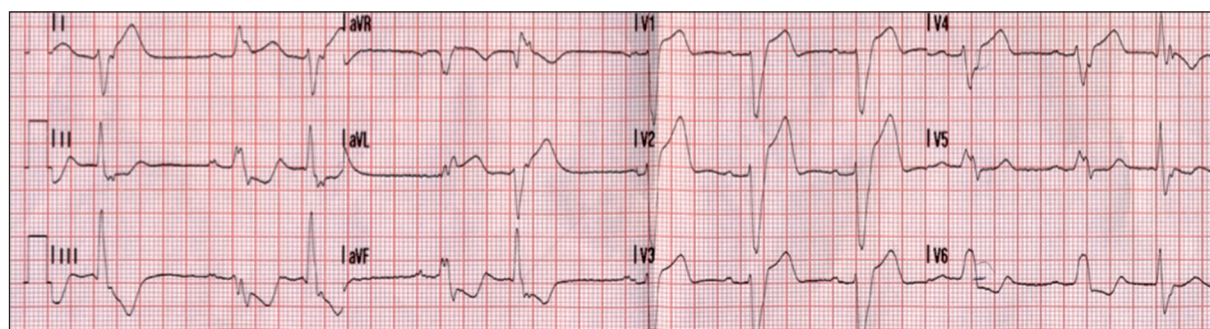


Fig. 1 – ECG recorded by EMS at patient's home: LBBB with ST elevations in leads I, aVL, V₁-V₃ and contralateral ST depressions in leads II, III, aVF, V₆. Patient with ongoing chest pain.

tide bolus and infusion were used. The patient's chest discomfort has resolved completely. After the percutaneous coronary intervention (PCI) another ECG was recorded which again revealed a sinus rhythm with LBBB and resolution of ischemic ST changes (Fig. 3). The patient's hospitalization was uneventful and he was discharged home from the hospital after 5 days without any disabilities.

Discussion

In patients with ACS typical ECG changes may not always be present. In our case, the patient presented with a previously known LBBB, this time with ischemic changes of the ST segment positive according to both original and modified Sgarbossa criteria (Fig. 1). Nevertheless the ECG is not straightforward for a STEMI diagnosis if the physician is not familiar with the Sgarbossa criteria. After initial medical treatment with a bolus of heparin and acetylsalicylic acid the pain reduced and the ECG changed, now showing a RBBB during accelerated idioventricular rhythm with elevation in precordial leads (Fig. 2). The probable explanation for the ECG change in our patient is that the RBBB was a reperfusion rhythm with an origin distal to previously existing LBBB. After successful PCI sinus rhythm reappeared and so did the preexisting LBBB without ischemic ST changes (Fig. 3).

In literature, we can find few case reports of alternating bundle-branch blocks (BBB). Explanations for the alternating BBB include different origins of ventricular impulses⁷ and differing refractory periods of conduction branches in RR intervals of different duration.⁸

Serial ECGs are useful in patients with suspected AMI and non-diagnostic initial ECG. The authors of this case report feel that serial ECGs in patients with non-diagnostic first ECG are not stressed enough in the current ACS guidelines. In our case the initial ECG was diagnostic but the serial ECGs nonetheless showed an interesting progression. In cases where serial ECGs are used to detect dynamic ST changes, the variation of position of precordial leads can cause significant changes in ST segment deviations.⁹ Serial ECGs should thus be recorded via adhesive electrodes that are not moved or electrodes positioned on marked skin locations.

Several studies have shown low prevalence of AMI in patients with new or presumed new LBBB,³⁻⁵ suggesting the need to revise recommendations for urgent coronary angiography in this clinical setting. The left bundle is a diffuse structure that usually has a dual blood supply, indicating that a single coronary lesion could hardly produce a LBBB.¹⁰ Sgarbossa and colleagues suggested ECG criteria for diagnosing AMI in the presence of LBBB.¹¹ A meta-analysis of studies on Sgarbossa criteria showed a sensitivity of 20% and specificity of 98% for diagnosing AMI with a cut-off of 3 or more points.¹² Smith and colleagues derived a modification of the Sgarbossa criteria that showed a sensitivity of 91% and specificity of 90% in their study.¹³ A retrospective case-control validation study for the modified Sgarbossa criteria showed a sensitivity of 80% and specificity of 99%.¹⁴ Our patient's prehospital ECG with a LBBB (Fig. 1) is positive according to both Sgarbossa and modified Sgarbossa criteria.

Traditional teaching leads us to believe that RBBB does not influence the ST changes associated with AMI. Our patient indeed had the typical ST changes when he developed the accelerated idioventricular rhythm with RBBB morphology (Fig. 2). Widimsky and colleagues however report that it is often not the case.⁶ Out of 427 patients with AMI and RBBB on ECG in their study, 201 (47%) did not have ST elevations. Among patients with RBBB and no ST elevation, TIMI flow 0–2 was found in 135 (67%). They conclude that a new onset RBBB should be included among the indications for an urgent coronary angiography. The right bundle is commonly supplied by a single coronary artery and thus a RBBB is more easily explained in the setting of AMI than a LBBB.¹⁰

Why should an emergency physician be aware of this?

An alternating BBB could, in an appropriate clinical setting, be an indicator of myocardial reperfusion, thus changing the management and urgency of an ACS patient. Bundle-branch blocks are a perplexing entity that often blurs the AMI diagnosis, but there are ways to recognize myocardial ischemia despite the presence of a BBB. In patients with LBBB the diagnosis can be made with the original or modified Sgarbossa criteria. In RBBB however, relying on ST elevations could lead to a significant under diagnosis of AMI.

Conflict of interest

None.

Funding body

None.

Ethical statement

Authors state that the research was conducted according to ethical standards.

Informed consent

Patient's informed consent was obtained.

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