

The Syndrome of Inter-atrial Conduction Block

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Abstract

The formulation of the syndrome of interatrial conduction block is an important step for improved identification of patients at high risk of developing atrial fibrillation (those with advanced, that is, third degree interatrial block, which includes retrograde instead of normal activation of the left atrium). The rationale and potential benefits of prophylactic antiarrhythmic treatment of patients with advanced interatrial block currently seems not sufficiently convincing and requires further study including prospective trials. In addition to the identified future directions for research in this syndrome, it seems important also to explore novel electrocardiogram (ECG) methods (e.g. new electrode positions and ECG leads) for improved characterisation of the atrial electrical events. Oesophageal electrocardiography and vectorcardiography are old, venerable and unjustifiably forgotten ECG techniques: their additional use of for better diagnosis of interatrial conduction block is highly commendable.

Keywords

Electrocardiography, P wave, interatrial block, atrial fibrillation, atrial abnormality, oesophageal electrocardiography, vectorcardiography

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The two most important, both medically and socially, cardiac arrhythmic problems of our time are sudden cardiac death due to ventricular fibrillation (VF) (mainly in the setting of coronary artery disease) and atrial fibrillation (AF). For both of them, the identification of electrocardiogram (ECG) markers that can reliably predict the occurrence of the arrhythmia is generally an unresolved matter.

An important step towards the identification of one such marker of sharply increased risk of occurrence of AF is the formulation of the syndrome of interatrial block (or syndrome of Bayes de Luna, if the medical community will accept the eponym), which needs to be distinguished from the more general (and currently more widely used) term 'left atrial abnormality'. The ECG criteria for third degree (advanced) interatrial block proposed by Bayes de Luna and associates are P wave duration of 120 ms or more and biphasic (plus-minus) P wave in the inferior leads II, III and AVF reflecting delayed and retrograde activation of the left atrium (instead of its normal activation via the Bachman bundle). The late and retrograde activation of the left atrium can be demonstrated more clearly with the simultaneous recording of surface and oesophageal (that is, left atrial) ECG recording and with the abnormal inscription of the second part of the P wave loop on the vectorcardiogram (VCG). Bayes de Luna and associates have investigated the interatrial conduction abnormalities for more than 20 years and have convincingly demonstrated that patients with advanced interatrial block have significantly increased risk of atrial fibrillation compared with those with less-severe forms of interatrial block (e.g. those with first degree block – delayed but still normal and not retrograde infero-superior activation of the left atrium).

As is often the case in cardiology, it is less clear what to do with these patients. The rationale and the potential benefits of prophylactic antiarrhythmic treatment of patients with advanced interatrial conduction

block for prevention of AF as formulated by de Luna et al.¹ does not sound to me sufficiently convincing. The use of Class I medications that will further depress conduction seems counterintuitive and, of course, against our bitter experience with the application of these medications for prevention of VF during the years before the Cardiac Arrhythmia Suppression Trial (CAST) trial.² On the other hand, current evidence of the effect of various modes of pacing for prevention of AF is not consistent.³ However, the ultimate verdict about the effectiveness (or lack thereof) of such preventive therapy will be given, of course, only by carefully designed prospective trials, as suggested by the authors.

The authors have identified important directions for future research on this syndrome, including the creating of international registry to enable follow-up of these patients, ECG-morphological studies to identify the underlying substrate, possible genetic influences and others. To this I would add one more purely electrocardiographic aspect, as described below.

The standard 12-lead ECG, at least in its present format and currently available methods for visual and computerised analysis, has important limitations when applied to the study of the atrial electrical events. Its format and method of acquisition (that is, the number and positions of the nine recording electrodes and the specific interelectrode connections for construction of the eight independent leads) has remained virtually unchanged since the late 1940s, that is, decades before the beginning of the modern era of interest in AF. As noted recently, historically this system has been optimised for assessment of ventricular rather than atrial electrical events.^{4,5} I think it is important to explore alternative chest lead positions and, possibly, alternative lead constructions (such as bi- and multipolar leads) that could probably be more suitable for assessment of atrial abnormalities and conduction defects.

To overcome the limitations of the standard 12-lead ECG and better characterise the interatrial conduction delays, Bayes de Luna and colleagues have also applied two old and venerable electrocardiographic methodologies, namely oesophageal ECG recording and VCG. This is highly commendable. Regrettably, both methods are largely unknown to young generations of electrocardiographers.

The oesophageal ECG recording provides a high-amplitude, sharply delineated (left atrial) P wave and thus can considerably help the analysis of left atrial activation. The method is easily applicable (think of transesophageal echocardiography), very often even in emergency settings, when the detection and assessment of the P wave can be crucial for ECG rhythm analysis (e.g. during broad QRS complex tachycardia). The normal and abnormal morphology of oesophageal P wave and its temporal relation to the surface ECG, to my knowledge,

have not been sufficiently investigated. Intuitively, the quantitative assessment of the much larger and more clearly delineated (compared with the surface ECG) oesophageal P wave (that is, its duration, amplitude, morphology, notching/fractionations, etc.) especially if the recording is saved in a digital format to enable the application of software programs, could further enhance the assessment of atrial conduction defects.

Vectorcardiography is not only a very useful method for morphological ECG analysis, it is also a powerful tool for teaching, comprehension and mental visualisation of the sequence in space of depolarisation and repolarisation. Sadly, several generations of ECG readers have been deprived of the merits of this method during their training. Luckily, in recent years, VCG seems to have undergone a revival due to the effort of some researchers, among them de Luna and his associates. ■

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