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Second-degree interatrial block: A case series

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ABSTRACT

Advanced interatrial block (IAB) (P-wave ≥120 ms and biphasic P-wave in leads II, III and aVF) is a prevalent ECG pattern frequently associated with supraventricular arrhythmias and stroke, especially in patients with structural heart disease. Intermittent IAB is a much more poorly defined electrocardiographic entity with uncertain clinical significance. In this case series, we review and analyze eight cases of second degree intermittent IAB. In six cases, there is normalization of advanced IAB after a premature supraventricular or ventricular contraction, suggesting a functional block that temporarily recovers post extra-systolic pause. Recognition of intermittent IAB (second degree) may help further characterize the prognostic and clinical implications of this ECG pattern.

Introduction

Interatrial block (IAB) is defined as a conduction block between the right and left atrium, located in the middle septum at the Bachmann region [1]. IAB can be classified into three grades based on electrocardiogram (ECG) findings: first degree (partial) with P-wave ≥120 ms, third degree (advanced) with P-wave ≥120 ms + biphasic P-wave morphology in leads II, III, and aVF, and second degree or intermittent IAB [2]. Of the three grades of IAB, intermittent IAB is the least well characterized. In this paper, we review eight cases of second degree IAB to help further characterize this ECG pattern and highlight the potential relationship with atrial fibrillation (AF) and stroke.

Results

We report eight cases of intermittent or second-degree IAB observed in daily clinical practice, the summary of clinical characteristics for each patient can be found in Table 1. The mean age (standard deviation) was 77.8 (±6.0) years, four patients were female (50%). Seven patients had hypertension, one patient had mitral regurgitation and left ventricular hypertrophy, one had a history of coronary artery disease requiring two coronary stents. Six patients exhibited second-degree IAB with resolution of advanced IAB after a premature supraventricular or ventricular contraction. Fig. 1 highlights two cases of P-wave normalization after a premature atrial contraction (PAC), Fig. 2 highlights a case of P-wave normalization following the pause after a premature ventricular contraction (PVC). In two cases where there was no PAC or PVC trigger, intermittent IAB was diagnosed with the finding of alternating biphasic and positive P-waves in the inferior leads in the context of a constant P—P and P-R interval, indicating a common site of electrical impulse but differential inter-atrial conduction. One patient had concomitant history of AF and ischemic stroke, another had history of paroxysmal AF. It was unknown if AF was present in two patients as outpatient investigations were loss to follow-up.

Discussion

Second degree or intermittent interatrial block is an ECG pattern that has only briefly been described in literature [3–5]. In the largest case series to date, we describe eight cases of second degree IAB. Six of these cases show a change of P-wave morphology from advanced IAB to normal or first degree IAB after a premature supraventricular or ventricular contraction.

The proposed mechanism of second-degree IAB resembles that of aberrant ventricular blocks [6,7]. Interatrial aberrancy where P-wave morphology changes from normal or first degree IAB to advanced IAB can occur on a beat-to-beat basis with or without relation to premature beats. This may be triggered by shortening of the P—P cycle in tachycardia, or after a supraventricular or ventricular premature contraction induced pause [3]. We suggest that the extra-systolic pause after a PVC or PAC allows recovery of the refractory period at Bachmann's region,

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Table 1
Patient characteristics and description of ECG in eight patients with second degree interatrial block.

Age, sex	Medical history	Relevant medications	P-wave duration and morphology	P-P interval	P-R interval	PVC/PAC trigger	AF	Stroke
77, F	HTN, overweight	Lercanidipine 10 mg daily	206 ms when biphasic, 150 ms when positive	720 ms	250 ms	No	No follow-up available	
84, M	HTN, prostate cancer	Digoxin 0.25 mg daily (stopped day of ECG)	162 ms when biphasic, 100 ms when positive	830 ms	240 ms	Yes	No	No
80, F	HTN	None	140 ms when biphasic, 124 ms when positive	928 ms	188 ms	No	No	No
84, M	HTN, sedentary	None	170 ms when biphasic, 110 ms when positive	800 ms	260 ms	Yes	No	No
83, M	HTN, palpitations	Diltiazem 120 mg daily	130 ms when biphasic, 80 ms when positive	1060 ms	218 ms	Yes	No follow-up available	
70, F	HTN	None	160 ms when biphasic					
130 ms when positive	1024 ms	220 ms	Yes	No	No			
75, M	HTN, CAD with 2 stents, chronic Chaga's	Digoxin 0.25 mg daily, clopidogrel 75 mg daily	130 ms when biphasic and when positive					
*Holter ECG only	980 ms	210 ms	Yes	Yes	Yes			
69, F	Mitral regurgitation, LVH	Propafenone 150 mg twice daily	136 ms when biphasic, 130 ms when positive	650 ms	166 ms	Yes	Yes	No

Abbreviations: HTN = hypertension, CAD = coronary artery disease, LVH = left ventricular hypertrophy PVC = premature ventricular contraction, PAC = premature atrial contraction, AF = atrial fibrillation.

leading to a normal P-wave morphology and duration for a few beats before return of advanced IAB. Similar analysis of beat-to-beat P-wave morphology variations has described alternate routes of interatrial conduction in cases of atrial remodelling and atrial fibrillation [8,9]. Other proposed causes of intermittent functional interatrial block include autonomic and electrolyte disturbances, and atrial strain in the context of heart failure [4,10]. Further electrophysiologic studies of patients susceptible to intermittent IAB are required to confirm these hypotheses.

In this case series, two patients had co-existing AF, one of which required hospitalization after an ischemic stroke despite anticoagulation. It is important to recognize intermittent IAB to further characterize its clinical significance and correlation with atrial arrhythmia, particularly AF. IAB can lead to an electromechanically dysfunctional left atrium and heterogeneous electrical activation, predisposing atrial arrhythmias and thromboembolism. Advanced IAB has already been identified as an independent ECG pattern which predicts risk of AF [4,11–14] and stroke [15–18], suggesting that presence of this ECG marker alone may warrant therapeutic anticoagulation to reduce stroke risk [13]. Further prospective controlled trials are required to confirm this hypothesis. This recognized association between advanced IAB and supraventricular arrhythmia is termed Bayés' syndrome [11,19,20]. More recently, atypical patterns of advanced-IAB have been identified, which can potentially have similar associations with supraventricular arrhythmia [21]. Though the clinical significance of intermittent IAB is unknown, previous reports have shown that intermittent IAB may develop into fixed advanced IAB [22] and therefore may have similar clinical consequences. Clinician recognition of second-degree interatrial block is essential to allow for further research into the clinical significance of this ECG pattern.

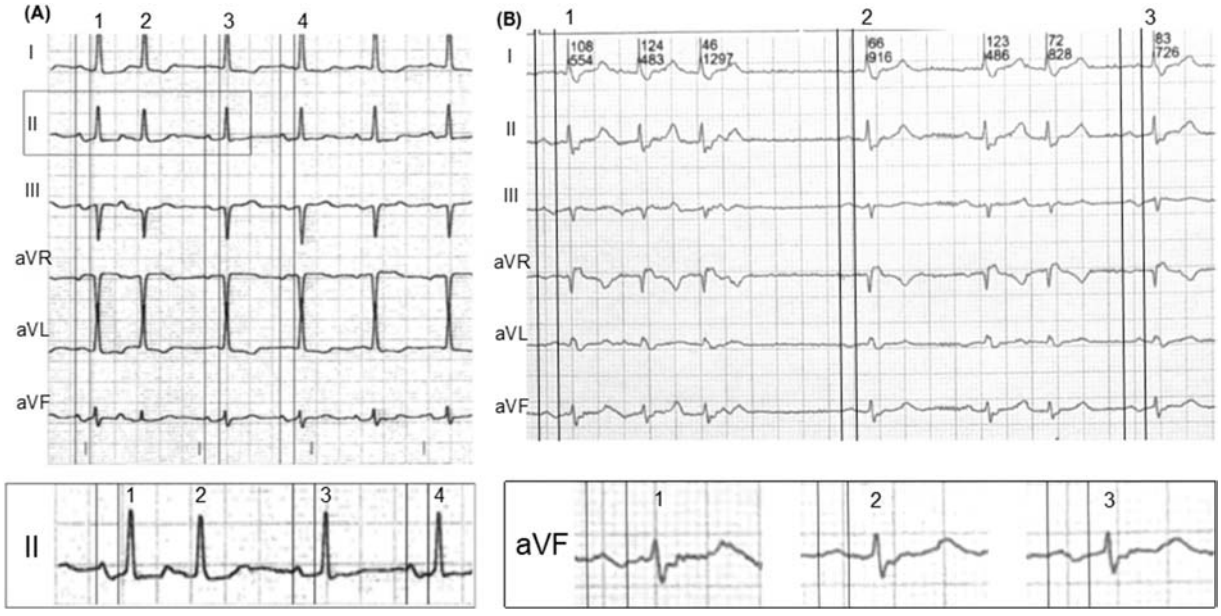

Fig. 1. (A) ECG of limb leads from a 69-year-old woman showing normalization of advanced IAB after a PAC. Advanced IAB is seen in complex 1 (duration >120 ms, biphasic plus/minus P-wave in the inferior leads II, III and aVF). After the premature atrial contraction in complex 2, there is a pause followed by a P-wave with only a positive deflection. The next P-wave of complex 4 then again shows advanced IAB. (B) ECG tracing of limb leads from a 84-year-old man showing similar normalization of IAB after a PAC. Complex 1 shows advanced IAB, this is the first complex of an atrial triplet with the last complex exhibiting a "P on T" phenomenon that is followed by a long extrasystolic pause. The P-wave immediately follow is positive lead II (complex 2). Complex 3 shows return of advanced IAB. Of note, this patient also demonstrates a left anterior fascicular block.

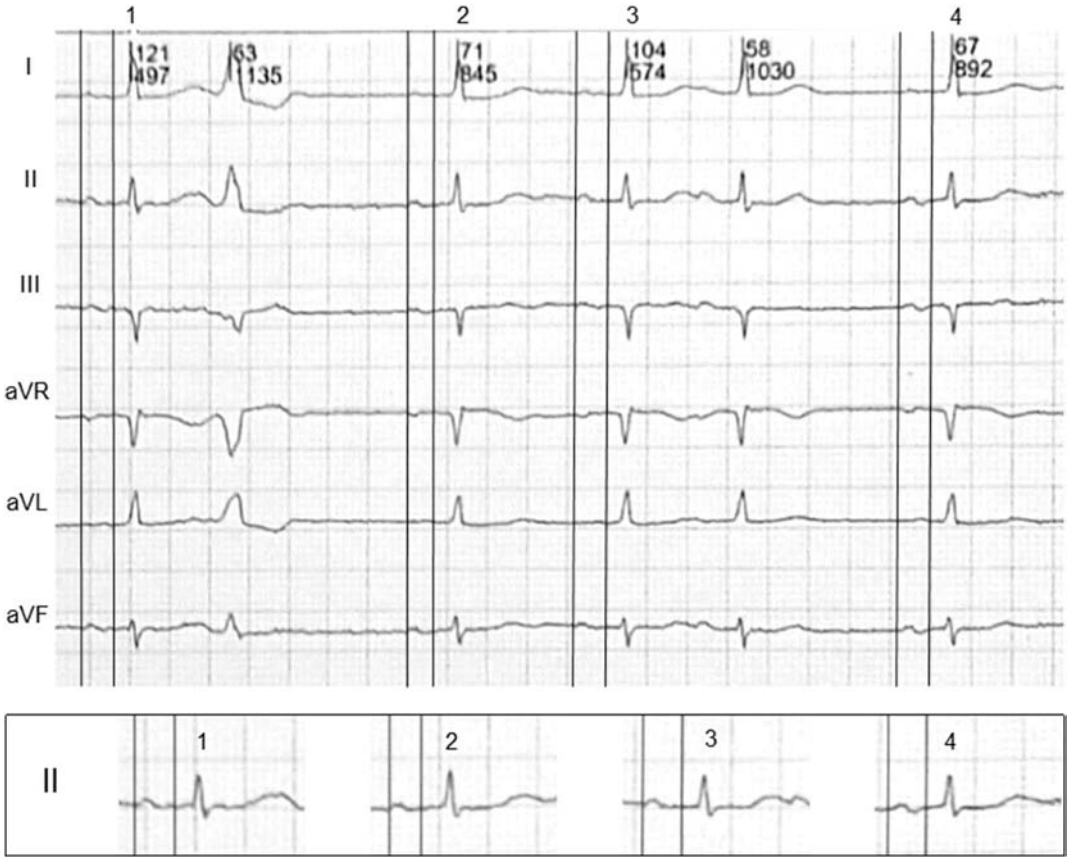

Fig. 2. ECG strip of limb leads from an 84-year-old man showing normalization of advanced IAB after a PVC. Advanced IAB is seen in the first beat, with biphasic P-wave and a duration >120 ms (complex 1). A premature ventricular contraction (PVC) is then seen followed by a long pause and then a P-wave of normal morphology and duration (complex 2). The next P-wave shows prolonged P-wave duration (complex 3) with full return of advanced IAB and a clear biphasic P-wave morphology in the inferior limb leads in complex 4.

Conclusions

Intermittent IAB may result from a functional block at the Bachmann's region, which can recover after an extrasystolic pause. This leads to a normalization or change in P-wave morphology after a PVC or PAC. Further research is required to identify if second degree IAB has a clinical association with supraventricular arrhythmia and stroke.

Declaration of conflict of interest

None.

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