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ECG quiz

Raquel Adeliño, MD [a], Franco Gregorietti, MD [a], Felipe Bisbal, MD, PhD, FESC [a,b,*]

[a] Heart Institute - Germans Trias i Pujol University Hospital, Badalona, Barcelona, Spain
[b] Centro de Investigación Biomédica en Red Enfermedades Cardiovasculares (CIBERCV), Instituto de Salud Carlos III, Madrid, Spain

A 78-year-old male with remote inferolateral myocardial infarction and mild left ventricular systolic dysfunction underwent surgical revascularization of 3-vessel coronary disease. The baseline ECG showed sinus rhythm with narrow QRS complexes and presence of Q wave in inferior leads. At the postoperative day 12, the patient complained of palpitations and dizziness. A 12-lead ECG was obtained (Fig. 1): what is the diagnosis?

The ECG suggests:

1. **Sinus tachycardia with long PR interval and premature ventricular complexes**
2. **Atrial fibrillation and rate-dependent alternating bundle-branch block**
3. **Polymorphic ventricular tachycardia**
4. **Monomorphic ventricular tachycardia and premature ventricular complexes from the outflow tract area**

Sinus tachycardia with long PR interval and premature ventricular complexes (PVC)

The tracing shows a wide QRS complex tachycardia where 2 different QRS morphologies are identified, alternating QRS-complex "A" (right bundle-branch block [RBBB] with northwest axis) and QRS-complex "B" (Left bundle-branch block [LBBB] with southeast axis). At first glance, sinus tachycardia with 3:1 PVCs might be considered into the differential diagnosis. Although no clear P wave is identified, there is a consistent notch at the terminal part of each complex A, compatible with atrial activation, which conducts to the following QRS with a long PR interval. However, several features go against the diagnosis of sinus tachycardia: [1] the notching is negative in inferior leads, [2] lack of baseline RBBB and (3) northwest QRS axis.

AF with rate-dependent alternating bundle-branch block

As the ECG exhibits an irregular wide QRS complex rhythm, AF might be considered. However, a "regularly irregular" rhythm is observed, with complex "B" coupling in a 3:1 fashion into complex "A". On top, as mentioned previously, a negative-polarity notching at the end of all QRS complexes "A" is consistently observed, suggesting 1:1 retrograde conduction to the atrium (Fig. 1) and therefore making AF diagnosis unlikely. This finding can be confirmed by observing Fig. 2 (ECG recorded few minutes later) which shows AV dissociation. Those QRS preceded by a P wave don't present a final notch.

Polymorphic ventricular tachycardia

As stated before, AV dissociation during a wide QRS complex tachycardia is a diagnostic criterion for VT (Fig. 2). As two morphologies can be identified a bidirectional VT might be considered. Nevertheless, the 3:1 relation, the alternation of the axis and the bundle-branch block pattern, as well as the absence of typical clinical setting (as digitalis intoxication or catecholaminergic VT) do not support this diagnosis [1]. A scar-related VT with 2 different exit sites is unlikely due to the fact that the 2 QRS morphologies arise from opposite locations (mid inferolateral LV –scar area- and anteroseptal outflow tract –outside scar-), as well as a short coupling interval of complex "B" [2].

Monomorphic ventricular tachycardia and outflow tract premature ventricular complexes

Fig. 2 recorded few minutes later shows a wide QRS complex tachycardia (morphology "A") with presence of AV dissociation, confirming the diagnosis of monomorphic VT for morphology "A" and therefore the notch after complex "A" is, indeed, a retrograde atrial conduction. Moreover, the RBBB morphology with northwest axis is consistent with a tachycardia exit site at inferolateral scar.

The morphology of QRS complex "B" is strongly suggestive of a PVC originating from the ventricular outflow tract area (LBBB, inferior axis). Also, the presence of retrograde P wave preceding the PVC rules out the diagnosis of atrial capture without the need of a baseline ECG (Fig. 2). Thus, the diagnosis of this ECG quiz is **outflow tract ventricular trigeminy over ongoing scar-related ventricular tachycardia**.

The baseline ECG of this patient (Fig. 3A) revealed sinus rhythm with a 2:1 atrioventricular block and narrow QRS, as well as frequent PVC from the outflow tract area. Of note, PVC acted as the trigger for VT (Fig. 3B) and persisted during ongoing VT in a trigeminy fashion (Fig. 1). The patient suffered from VT storm which was initially managed with deep sedation and antiarrhythmic drugs. Additional VT ablation procedure was required to stabilize the patient.

* Corresponding author at: Heart Institute - Hospital Universitari Germans Trias i Pujol, Carretera Canyet s/n, 08916 Badalona, Spain.
E-mail address: f.bisbalvb@gmail.com (F. Bisbal).

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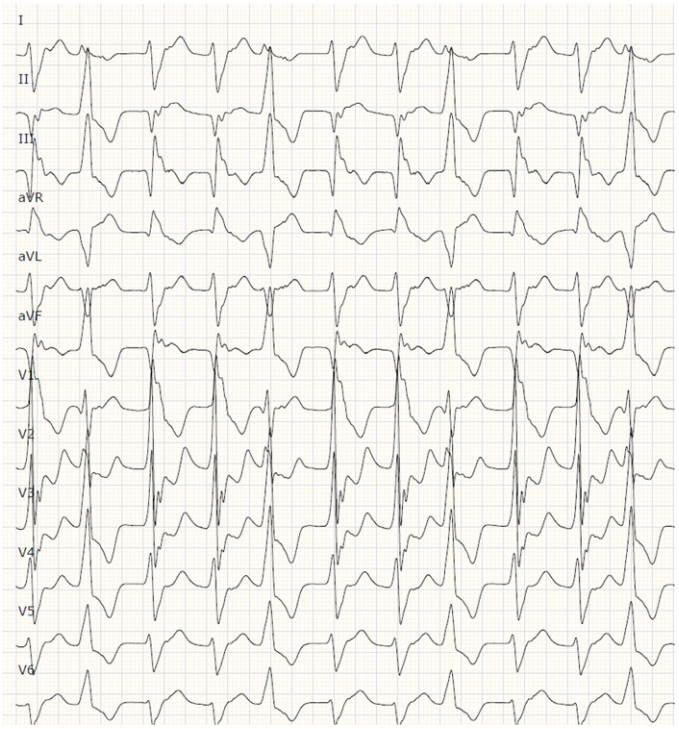

Fig. 1. 12-lead ECG tracing during symptoms of palpitations and dizziness.

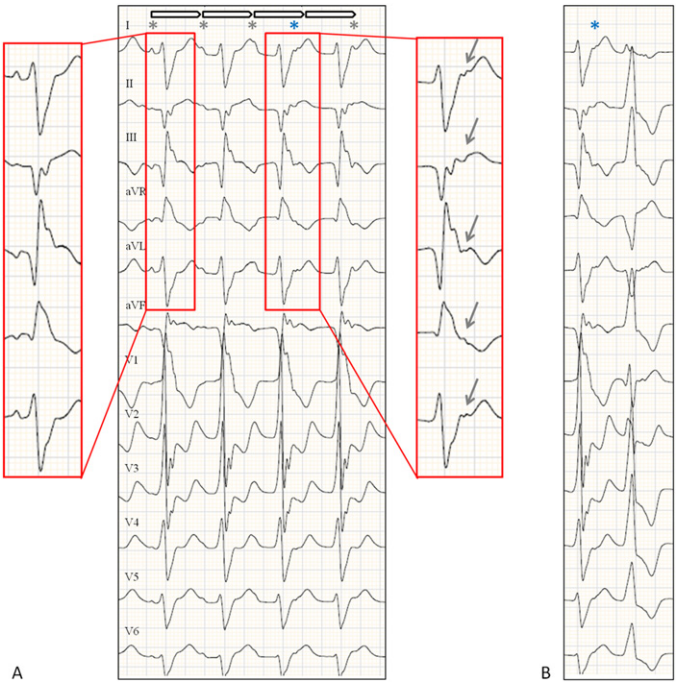

Fig. 2. Panel A shows wide complex tachycardia with underlying AV dissociation (grey asterisk). The blue asterisk shows a retrograde atrial activation (advanced P wave) corresponding to the notching at the terminal part of every QRS complex "A" in Fig. 1 ECG (panel B).

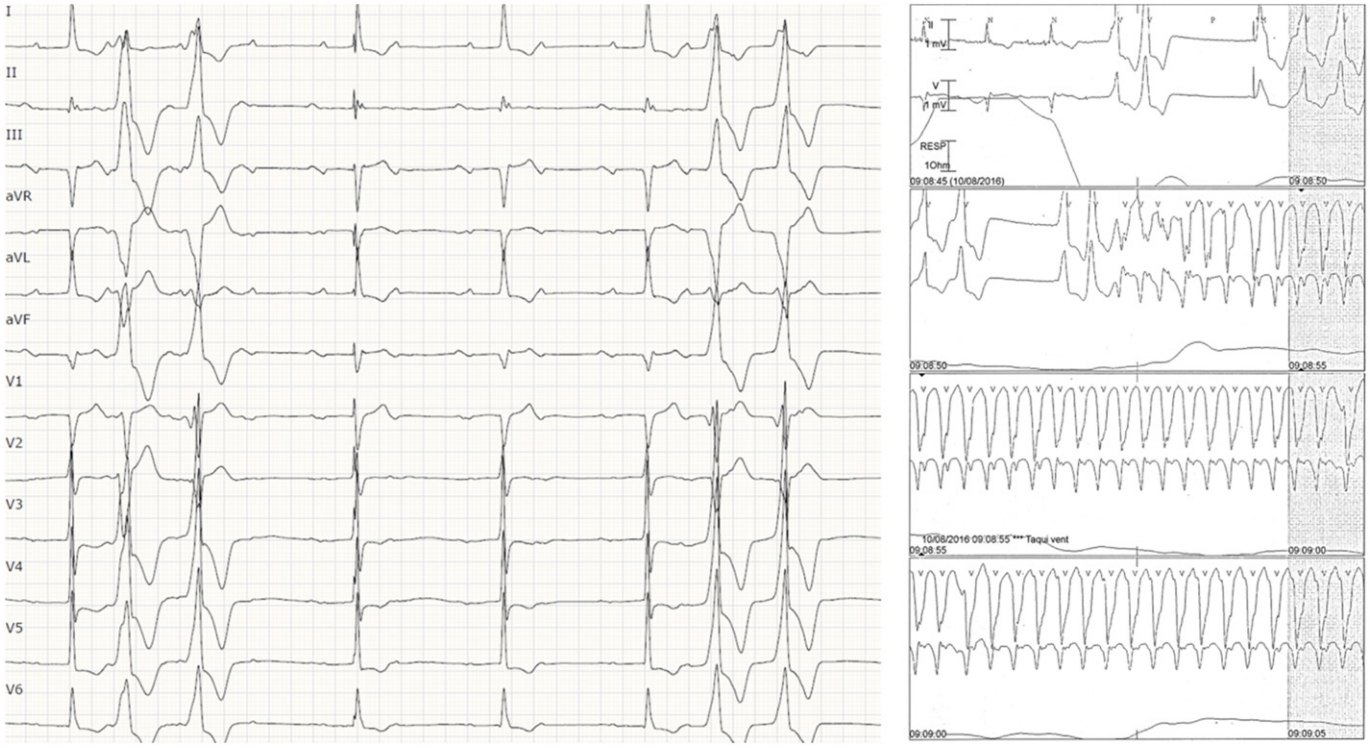

Fig. 3. A. Baseline ECG: sinus rhythm with a 2:1 atrioventricular block and narrow QRS, as well as frequent PVC from the outflow tract area. B. 2-channel ECG monitoring showing sinus rhythm with frequent ventricular ectopic beats triggering monomorphic non-sustained VT.

References

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