Extreme example of early repolarization

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Introduction

Once accepted as a benign phenomenon, electrocardiographic early repolarization pattern is now considered to have significant clinical importance. Haïssaguerre et al. (1) were first to describe the possible association between early repolarization pattern and idiopathic ventricular fibrillation. Since then, numerous studies have documented the clinical association between early repolarization pattern and future arrhythmic events. Due to different definitions, the prevalence of early repolarization pattern varies widely between 2% and 31% (2). The 2015 European Society of Cardiology Guidelines for the management of ventricular arrhythmias and the prevention of sudden cardiac death recommend that early repolarization syndrome (ERS) should be diagnosed only in patients with early repolarization pattern on electrocardiography (ECG) and a history of resuscitated cardiac
arrest or a documented episode of ventricular fibrillation and/or polymorphic ventricular tachycardia (3). Also, due to lack of clear evidence, the panel experts could not make recommendations for the management.

**Case Report**

A 68 year-old woman presented to our outpatient clinic for preoperative evaluation before total knee replacement. ECG showed atrial fibrillation with ST-segment elevation on precordial and inferior derivations, most striking in V3 through V6 (Fig. 1). ECG was alarming but there was no chest pain, and anamnesis revealed that the patient previously had an abnormal ECG. In addition, coronary angiography was performed twice, first 3 years ago and the second one last year in different hospitals, which showed normal coronary artery anatomy. Thus, previous hospital records were also evaluated, which revealed identical ECG findings (Fig. 2). Troponin was also negative, and thus, ECG findings were accepted as early repolarization pattern. Transthoracic echocardiography revealed normal left ventricular systolic function, biatrial enlargement, and moderate rheumatic mitral regurgitation. We wanted to perform a provocative test with ajmaline to reveal if the patient had Brugada syndrome (BrS), but the patient absolutely denied the procedure due to need for intensive care unit hospitalization and minor risk of triggering lethal arrhythmias. The patient was taking rivaroxaban 20 mg, metoprolol 50 mg, candesartan/hydrochlorothiazide 16/12.5 mg, and digoxin 0.25 mg half tablet daily (1×1/2). The patient did not have any history of syncope or aborted sudden death. Perioperative recommendations were made, and the patient underwent uneventful total knee arthroplasty surgery. Routine follow-up was recommended at hospital discharge.

**Discussion**

We have presented an extreme example of ECG that can only be explained by early repolarization pattern.

In the current ECG (Fig. 1), the QRS pattern in V1 suggests the Brugada pattern, but ST-segment elevation in V3 through V6 could not explained by the Brugada pattern. ST-segment elevation in V2 resembles the type 2 Brugada pattern; however, currently, only type 1 ECG pattern is accepted as diagnostic for BrS. Digoxin use was also considered as diagnostic, but as already known, digoxin is associated with “sagging” ST depression; thus, it was ruled out. Since coronary angiography was performed twice and revealed normal coronary artery anatomy, myocardial ischemia was also ruled out.

There is a semantic confusion regarding early repolarization pattern and the J wave. However, a recent consensus document has made clear recommendations (4). First, J point was defined
as the onset or peak of the ST segment. The consensus proposes the following definition: J onset (Jo) suggests the onset of a notch, J peak (Jp) suggests the peak of a notch or onset of a slur, and J termination (Jt) suggests the end of a notch or slur. The report also emphasizes that ST-segment elevation without a slur or notch cannot be accepted as early repolarization. Our patient had a notch on the descending part of QRS, most visible in V3. Figure 3 is a magnified picture of the V3 derivation from Figure 1, which clearly delineates the notch on the descending limb of the QRS complex.

Tikkanen et al. (5) revealed that the presence of early repolarization pattern on the surface ECG does not indicate increased arrhythmic risk per se; rather, the morphology of the ST segment defines the risk of sudden death. In their study, they found that early repolarization with rapidly upsloping ST segment is not associated with arrhythmic risk; however, early repolarization with horizontal or descending ST segment is significantly associated with an increased risk of arrhythmic death. Our patient had a notch on the descending part of QRS, most visible in V3. Figure 3 is a magnified picture of the V3 derivation from Figure 1, which clearly delineates the notch on the descending limb of the QRS complex.

The localization of the ST-segment elevation is also important with respect to the risk of arrhythmic death. Two major population-based studies consistently showed that inferior localization of early repolarization pattern carries the highest risk of arrhythmic death (6, 7). Our case had minimal ST elevation on leads II, III, and aVF, but there was no notch or slur; thus, this cannot be accepted as early repolarization pattern.

J wave syndrome is an umbrella term comprising BrS and ERS. There are many similarities between these two entities. One major difference is the localization of the affected region; the anterior right ventricular outflow tract is the most affected segment in BrS, and the inferior region of the left ventricular wall is the most affected segment in ERS (8). It is common to see the two ECG patterns in the same patient.

Conclusion

Herein, we presented an extreme example of electrographic early repolarization pattern. Since our patient did not experience aborted sudden death or sustained ventricular tachycardia attacks, this was accepted solely as an ECG phenomenon.

References

1. Haïssaguerre M, Derval N, Sacher F, Jeseil L, Deisenhofer I, de Roy L, et al. Sudden cardiac arrest associated with early repolarization. N Engl J Med 2008; 358: 2016-23.
2. Maury P, Rollin A. Prevalence of early repolarization/J wave patterns in the normal population. J Electrocardiol 2013; 46: 411-6.
3. Priori SG, Blomström-Lundqvist C, Mazzanti A, Blom N, Borggreve M, Camm J, et al.; ESC Scientific Document Group. 2015 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death: The Task Force for the Management of Patients with Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death of the European Society of Cardiology (ESC). Endorsed by: Association for European Paediatric and Congenital Cardiology (AEPC). Eur Heart J 2015; 36: 2793-867.
4. Macfarlane PW, Antzelevitch C, Haissaguerre M, Huikuri HV, Potse M, Rosso R, et al. The early repolarization pattern: a consensus paper. J Am Coll Cardiol 2015; 66: 470-7.
5. Tikkanen JT, Junttila MJ, Anttonen O, Aro AL, Luttinen S, Kerola T, et al. Early repolarization: electrocardiographic phenotypes associated with favorable long-term outcome. Circulation 2011; 123: 2666-73.
6. Tikkanen JT, Anttonen O, Junttila MJ, Aro AL, Kerola T, Rissanen HA, et al. Long-term outcome associated with early repolarization on electrocardiography. N Engl J Med 2009; 361: 2529-37.
7. Sinner MF, Reinhard W, Müller M, Beckmann BM, Martens E, Perz S, et al. Association of early repolarization pattern on ECG with risk of cardiac and all-cause mortality: a population-based prospective cohort study (MONICA/KORA). PLoS Med 2010; 7: e1000314.
8. Antzelevitch C, Yan GX, Ackerman MJ, Borggreve M, Corrado D, Guo J, et al. J-Wave syndromes expert consensus conference report: Emerging concepts and gaps in knowledge. Europace 2017; 19: 665-94.

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