

Case Series

J Wave Syndrome/Early Repolarization Associated to COVID-19 as a Late Manifestation

Carrillo Fernandez CD*, Leal Cavazos JE, Zaldivar Zurita HJ, Pamplona Avila E, Navarro Lopez VA, Garcia Arreola E, Sanchez Hiza E, Llamas Esperón GA and Llamas Delgado G

Department of Clinical Cardiology, Hospital Cardiologica Aguascalientes in Aguascalientes, Mexico

Abstract

Background: J wave syndrome/Early Repolarization Syndrome (ERS) is characterized by sudden cardiac death (SCD), ventricular fibrillation (VF) and ventricular tachycardia (VT). Tikkanen classifies the elevation of the J point according to the slope of the ST segment and they are malignant (horizontal) and benign (positive) slopes. ERS is classified into three types and is a common cause of SCD due to VT or VF.

Clinical case 1: 42-year-old man, prior history of SARS-CoV2 infection. He was admitted due to chest pain and palpitations, with dizziness and syncope. His physical examination shown no abnormalities and his laboratory studies ; cardiac enzymes were negative and the rest within normal parameters. The echocardiogram did not show structural pathology and the electrocardiogram showed early repolarization and elevation of the J point. The 24-hour Holter monitoring detected episodes of sustained VT, which was initiated by the R/T phenomenon and short QT at the end of the VT episodes.

Clinical case 2: A 27-year-old man with prior SARS-CoV2 infection was admitted to the emergency department for palpitations and dyspnea, his initial electrocardiogram shows fascicular tachycardia with rest of vital signs normal. A modified Valsalva maneuver was performed without remission and increasing the ventricular response, we administrated adenosine 6 mg IV finding reducing of the heart rate and then an amiodarone infusion was started, remitting completely the episode of tachycardia. An echocardiogram was performed without evidence of structural pathology, his laboratories within normal parameters. The Holter study did not demonstrate new episodes of ventricular tachycardia.

Introduction

The J-point syndromes / Early Repolarization Syndrome (ERS) is part of inherited or acquired syndromes [1-4]. The J-point denotes the junction of the QRS complex and the ST segment on the 12-lead surface Electrocardiogram (ECG), which marks the end of depolarization and beginning of repolarization. The J wave is a deviation with a hump morphology that goes in the same direction as the R wave, immediately after the QRS complex of the ECG. It is a channelopathy secondary to a heterogeneous flow of potassium currents (ito K) at the endocardial and epicardial level, which generates an alteration of the electrical gradient. Clinically it is characterized by Sudden Cardiac Death (SCD) due to idiopathic Ventricular Fibrillation (VF). Currently, it is not considered a benign electrocardiographic sign. Premature Ventricular Complexes (PVCs) have been described on some occasions as triggers of VT [1]. The pattern of early repolarization may be associated with a risk of VF [2,3], depending on the location of the early repolarization, the magnitude of the J wave, and the degree of elevation of the ST segment [2,4,5].

Citation: Carrillo Fernandez CD, Leal Cavazos JE, Zaldivar Zurita HJ, Pamplona Avila E, Navarro Lopez VA, Garcia Arreola E, et al. J Wave Syndrome/Early Repolarization Associated to COVID-19 as a Late Manifestation. *Am J Clin Cardiol.* 2021;2(1):1011.

Copyright: © 2021 Carrillo Fernandez CD

Publisher Name: Medtext Publications LLC

Manuscript compiled: Oct 21st, 2021

***Corresponding author:** Carlos Daniel Carrillo Fernández, Department of Clinical Cardiology at Hospital Cardiologica Aguascalientes, Avenida Republica de Ecuador 200 Fraccionamiento las Americas, Mexico, Tel: +524931017776; E-mail: mdkcdf@hotmail.com

Case Series

Clinical case 1

42-year-old man, prior history of SARS-CoV2 infection in 2020. He was admitted to the emergency room due to chest pain and palpitations, with dizziness and syncope. His physical examination shown no abnormalities and his laboratory studies were negative qualitative troponin, CK-MB 2 U/l, CK 131 U/l, laboratories within normal parameters, negative viral panel, the echocardiogram did not show structural pathology and the electrocardiogram showed early repolarization and elevation of the J point (Figure 1). The 24-hour Holter monitoring detected episodes of sustained VT, which was initiated by the R/T phenomenon and short QT at the end of the VT episodes. During these episodes, the patient presented SCD that required placement of an Implantable Cardioverter-Defibrillator (ICD) (Figure 2).

Clinical case 2

A 27-year-old male with no significant antecedent, 6 months previous he presented infection by SARS-CoV2, was admitted to the emergency department for palpitations and dyspnea, his initial electrocardiogram (Figure 3a) shows fascicular tachycardia with HR of 136 bpm, his vital signs: blood pressure 130/80 mmHg, oxygen saturation 93%, respiratory rate 20 bpm. During his hospitalization in the emergency room, a modified Valsalva maneuver was performed without remission and increasing the ventricular response (Figure 3b), we administrated adenosine 6 mg IV finding reducing of the heart rate and then an amiodarone infusion was started, remitting completely the episode of tachycardia (Figure 3c). An echocardiogram was performed without evidence of structural pathology, his laboratories includes thyroid function, serum electrolytes and renal function which within normal parameters. The Holter study did not demonstrate new episodes of ventricular tachycardia.

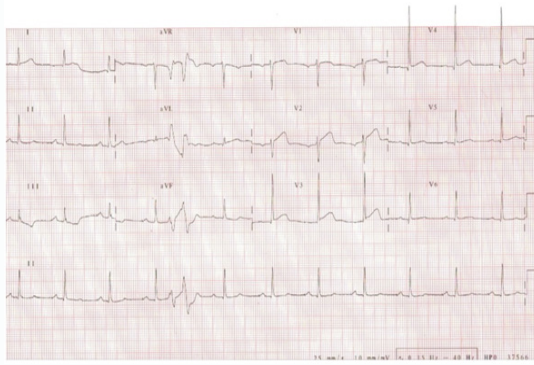


Figure 1: ECG 12 shows early repolarization pattern type 3 (J wave elevation in V4-V6, DII, DIII, aVF, DI, aVL) and R/T phenomenon.

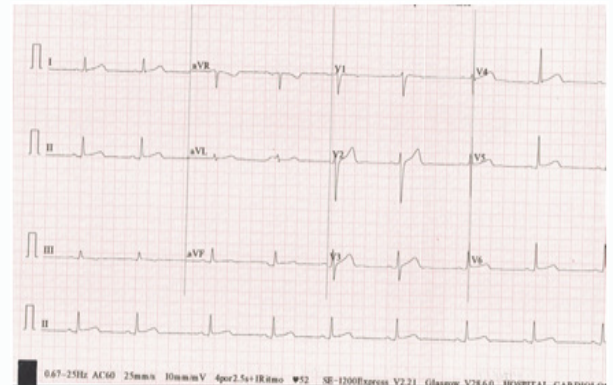
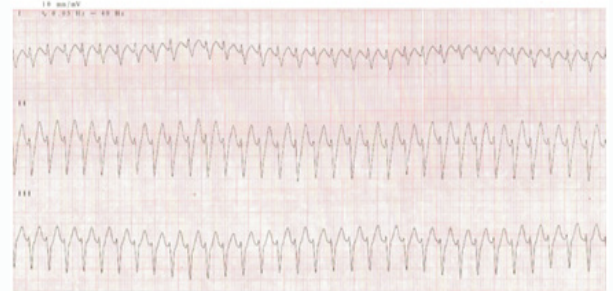
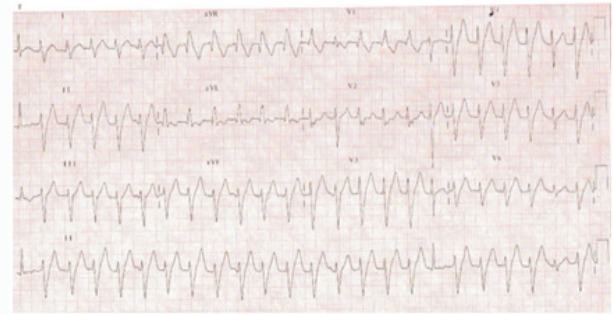


Figure 3: A) fascicular ventricular tachycardia, B) VT after Valsalva maneuver, C) ECG in sinus rhythm, with ERS in lateral and inferior derivations, J wave point elevation in V4-V6, DI, aVL, DII, DIII and aVF.

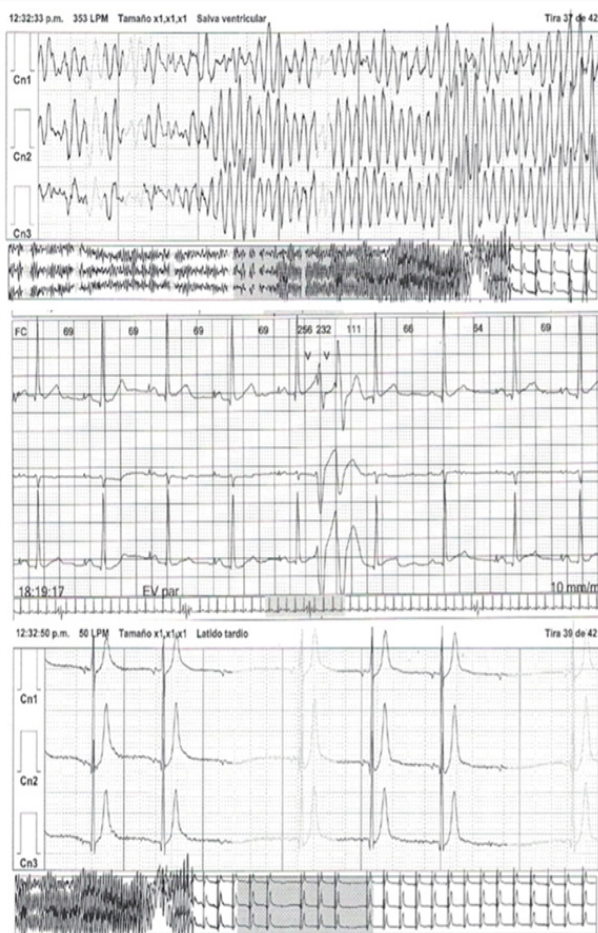


Figure 2: Holter tires A) ventricular tachycardia. B) R/T phenomenon and J wave elevation. C) after of ventricular tachycardia we appreciated sinus node dysfunction, QT short and acuminate T waves.

Discussion

The Early Repolarization Pattern (ERP) located in the inferolateral leads is associated with VF [2]. As an electrocardiographic criterion, there should be an elevation of the J point greater than >1 mm in the inferior and/or lateral leads [2,6,7]. It is frequent in pediatric age, males and physically active young individuals and athletes. There may be a family history of SCD and is related to a mutation in the KCNJ8

gene [8], which encodes an ATP-sensitive potassium channel-forming subunit, other mutations such as CACNA1C, CACNB2B, CACNA2D1 and SCN5A [4,9] have been also described and associated with idiopathic VF [1,8,9]. Quattrini studied 704 athletes, without previous cardiovascular disease, who were followed up to 18 years, finding that 14% (102 patients) had the presence of J wave in the anterior, in 72% lateral and inferior leads, 25% pure lateral leads and in the pure inferior leads 3%. During this follow-up, no athlete developed VT or SCD. Tikkanen analyzed athletes who had J wave alterations and described 2 electrocardiographic patterns; the first benign pattern had fusion of the ST segment "rapidly ascending" with the T wave and the second pattern, was an early repolarization syndrome that presented an ST segment that remained flat, horizontal, or even descended towards the T wave, this pattern "horizontal/descending" is denominated pro arrhythmic [1,6]. There are 3 types of ERP: type 1 shows an early repolarization pattern in the lateral precordial leads, it is common in healthy male athletes [1,5]. Type 2 shows an early repolarization pattern in the inferior, inferolateral and right leads (global), is associated with a higher level of risk of VF [7] and also with VF storms [1,5]. Type 3: shows a pattern of early repolarization

in the inferior, lateral, and right precordial leads, it is associated with the highest level of risk for the development of malignant arrhythmias and is often associated with VF storms [1,3,5].

Conclusion

The malignant pattern of elevation of the J point is a pro arrhythmic condition that sometimes triggers VT through premature ventricular complexes and is characterized by an inclined/horizontal ST segment slope. We have three types according to the affected leads. Type 1 affects the lateral leads, type 2 the inferolateral leads and type 3 the inferior, lateral, and right leads associated with VF storms. In our present cases we show two patients who developed VT as a late manifestation of SARS-CoV2 infection. In the first case the diagnosis of J wave/ERS syndrome was made by electrocardiographic findings, which triggered VT through the R/T phenomenon perpetuated by the presence of PVCs and presenting SCD which required a placement of an ICD. In the second case we show another ERS type 3, he developed VT a few months after of the infection of SARS-CoV2 without SCD. Both cases did not present structural cardiac disease and share the characteristics of prior infection of SARS-CoV2.

References

1. Kamal K, Kabir S, Surendra C. J Wave Syndrome: Clinical Diagnosis, Risk Stratification and Treatment. *J Atr Fibrillation*. 2014;7(4):1173.
2. Macfarlane P, Antzelevitch C, Hassaguerre M, Huikuri H, Potse M, Rosso R, et al. The early repolarization pattern: a consensus paper. *J Am Coll Cardiol*. 2015;66(4):470-7.
3. Charles A, Gan-Xin Y. J Wave Syndromes. *Heart Rhythm*. 2010;7(4):549-58.
4. Yan G, Lankipalli R, Burke J, Musco S, Kowey P. Ventricular repolarization components on the electrocardiogram: cellular basis and clinical significance. *J Am Coll Cardiol*. 2003;42:401-9.
5. Kalla H, Yan G, Marinchak R. Ventricular fibrillation in a patient with prominent j (osborn) waves and ST segment elevation in the inferior electrocardiographic leads: a brugada syndrome variant?. *J Cardiovasc Electrophysiol*. 2000;11:95-8.
6. Tikkanen J, Anttonen O, Junttila M. Long-term outcome associated with early repolarization on electrocardiography. *N Engl J Med*. 2009;361:2529-37.
7. Takagi M, Aihara N, Takaki H, Taguchi A, Shimizu W, Kurita T, et al. Clinical characteristics of patients with spontaneous or inducible ventricular fibrillation without apparent heart disease presenting with J wave and ST segment elevation in inferior leads. *J Cardiovasc Electrophysiol*. 2000;11:844-8.
8. Haissaguerre M, Chatel S, Sacher F. Ventricular fibrillation with prominent early repolarization associated with a rare variant of KCNJ8/Katp channel. *J Cardiovasc Electrophysiol*. 2009;20:93-8.
9. Burashnikov E, Pfeiffer R, Barajas Martinez H. Mutations in cardiac I type channel associated with inherited J wave syndromes and sudden cardiac death. *Heart Rhythm*. 2010;7:1872-82.