International Journal of Medical Evaluation and Physical Report E-ISSN 2579-0498
P-ISSN 2695-2181 Vol 8. No. 6 2024 www.iiardjournals.org Online Version

An Unknown Electrocardiographic Pattern Producing Sudden Cardiac Death

Francisco R. Breijo-Márquez.
Professor of Clinical and Experimental Cardiology.
DOCTOR OF MEDICINE. D. (currently on voluntary leave of absence).
East Boston Hospital. School of Medicine.
02136 Tremont ST. Boston Massachusetts. U.S.A.
E-mail**:** frbreijo@gmail.com. frbm@gmx.us.
DOI: 10.56201/ijmepr.v8.no6.2024.pg1.7

Abstract
In 2008, Professor Breijo-Márquez described an electrocardiographic pattern consisting of the presence of a short PR (or PQ) interval together with a short QT interval in the same individual. It was published under the headline "Decreased cardiac electrical systole" in the International Journal of Cardiology (IJC) ***[1].***
From then until today, this electrocardiographic pattern is increasingly studied and diagnosed by various cardiologists, both in isolation and as part of other well-known entities in cardiology (to be described below).
As is well known, the PR interval on the ECG tracing represents the distance from the onset of atrial depolarization (P wave) to the onset of ventricular depolarization (QRS complex).
*Normalized values, considered within normal ranges, range from 0.120 milliseconds to 0.200 milliseconds (below the 0.120 millisecond digit is considered "short"; above the 0.200 millisecond value is considered "atrioventricular block")****[2].***
Similarly, it is also well known that the QT interval includes both ventricular depolarization (QRS complex) and ventricular repolarization; it spans from the beginning of the Q wave (if present) or the beginning of the R wave to the end of the descending branch of the T wave, when this branch reaches the isoelectric line of the electrocardiographic (ECG) tracing.
However, at present there are still many discrepancies as to which values should be considered as standard when it comes to the QT interval.
The standard values for the length of this interval are not precisely uniform for all authors.
For most authors, including us, the values range from 0.360 milliseconds to 0.450 milliseconds (for some authors in women they would be in ranges up to 0.460 milliseconds).
*The shortening of the PR interval by less than 0.120 milliseconds makes the myocardium more unstable and more prone to cause cardiac electrical disturbances, which can lead to serious arrhythmias that can be life-threatening; the most frequent arrhythmias are tachyarrhythmias in their different types and etiologies [****2****].*
*Short QT interval (equal to or less than 0.350 milliseconds) appears to be a rare form of channelopathy with a high risk of sudden cardiac death, but it is still not well and completely defined, and information on long-term follow-up remains very scarce at the moment [****3****].*

A short QT interval is the major component, but because of a strange relationship between the QT interval and the RR interval in patients with a short QT interval, the shortened QT interval in such patients is often only apparent at a heart rate near 60 bpm.
In fact, a large percentage of physicians consider electrocardiographic tracings carrying the aforementioned pattern to be within normality, when in fact this is not the case.
Because routine ECGs are usually taken at a higher than normal heart rate, many patients with cardiac electrical involvement may go undetected [3].
Many mutations are responsible for the short QT interval, but in published families, only one in four were found, which have been genetically tested ***[4, 5].***
Thus, most diagnoses are based on the patient's own clinical presentation with a relative who has died suddenly, and the latter is also difficult to prove. The treatment of choice is an implantable defibrillator ***[4,5, 6].***

Key words: *Breijo electrocardiographic model; PR interval. QT interval. Arrhythmia. Cardiac arrest; sudden cardiac death.*

Consequently, the standard values for us -and for most authors- are:
PR interval: From 0.120 milliseconds to 0.200 milliseconds
Corrected QT interval: 0.360 milliseconds to 0.450 milliseconds (in healthy women up to 0.460 milliseconds is considered normal) **[3].**
We speak of a corrected QT interval because a calculation must be made between the value of the QT interval obtained and the value of the RR interval measured prior to the QT interval obtained.
Whenever there is a disturbance in the heart's electrical system - in this case, in the duration of the different intervals of the ECG tracing - the heart becomes much more vulnerable and electrical instability manifests itself, leading to numerous serious types of cardiac arrhythmias, some of which could be fatal (as we have written above).
In this case, a shortening of the PR interval together with a shortening of the QT interval in the same individual, the vulnerability discussed above and electrical instability could be much greater and even highly lethal.
But, in addition, when the patient suffering from this type of alterations is in baseline and asymptomatic conditions, the electrocardiographic tracing can be considered as "within normality", and go unnoticed and, therefore, misdiagnosed, when in reality both intervals are short and, therefore, the patient is highly susceptible to severe alterations of the cardiac electrical system, including sudden cardiac death.
The typical patient with this electrocardiographic pattern is a woman in the third decade of her life, with multiple visits to the emergency services, with mild symptoms of palpitations, profuse sweating (which usually disappears on arrival at the hospital), somewhat agitated, with vital signs within average values, and with laboratory values also within the norm, except for blood lithium values which are always below the thresholds. The symptoms reported by the patient are mostly nocturnal, waking the patient up. Nocturnal palpitations that awaken from natural sleep, true syncope, are the most frequent symptoms, but cardiac arrest -although she may recover- and sudden death should never be ruled out.

As most of the time physicians consider the ECG tracing to be normal, patients are discharged from the hospital with the prescription of benzodiazepines and with a request for psychiatric evaluation considering them as a cardiac neurosis.
If we examine these patients in depth, we can find that more than 90% of them presented seizures in childhood without any electroencephalographic substrate and empirically treated with different types of anticonvulsants.
The referred symptoms are repetitive, and the attendance to the emergency department is constant, with the same hospital discharge result. The patients are regular visitors to the emergency department.
Until a moment may come when the patient no longer comes on her own, since the access has been very serious and she is either in cardiac arrest or has suffered sudden cardiac death due to an erroneous diagnosis.
To conclude, we can state that not all patients with this type of symptomatology have a psychosomatic basis, but that their cardiac electrical system has an altered substrate and, therefore, their heart is much more prone to malignant arrhythmias than that of healthy people.
Therefore, the study of each of the parameters to be assessed must be meticulous. In this way, we can avoid much greater evils, such as cardiac arrest and even sudden cardiac death.
As "closure" we can state that the electrocardiographic pattern with short PR and QTc intervals exists, that it can produce high cardiac electrical instabilities and that, therefore, it should always be evaluated in detail in every electrocardiographic tracing and never be discharged from the hospital without being sure of its presence.
Of note, the author and his team have seen and diagnosed this variety of arrhythmia both in isolation and as part of other cardiac disorders such as Wellens Pattern **[7] (Figure 3)**, Wolf-Parkinson-White **[8] (Figure 4)** and others **[9]**.

As a graphic example of this cardiac electrical abnormality, we can see below the image of a baseline ECG in a patient suffering from PR and short QTc interval.
The PR interval is 0.100 milliseconds: Short.
The QTc interval was evaluated according to the most commonly used formulas; in no case did it exceed 0.350 milliseconds.

Figure nº 1: This figure was the first electrocardiographic tracing studied by the author and corresponded to a 36-year-old male with the symptoms mentioned in the text. **[1]**

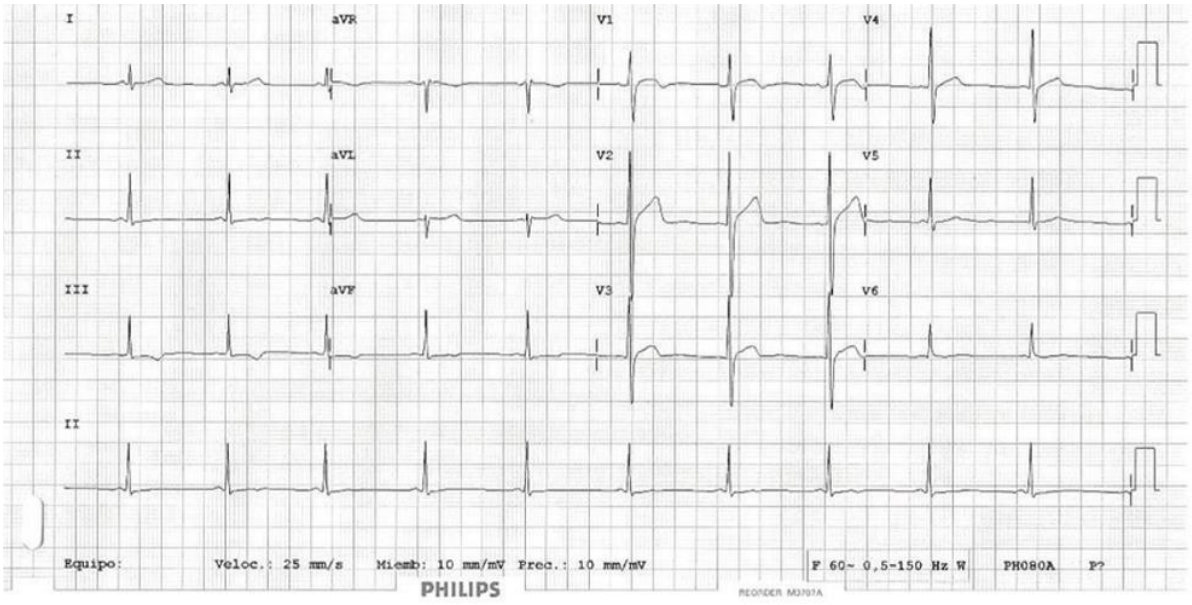


Figure 2: Values obtained using the most commonly used formulas relating the measured value of the QT interval and the RR interval (heart rate).

RR 0.9523809523809523 seg
QTc (Rautaharju) 402 mseg
QTc (Bazett) 341 mseg
QTc (Framingham) 333 mseg
QTc (Friderica) 338 mseg
QTC (Call) 339 mseg

Figure No. 3: A typical association of the Breijo model and the Wellens pattern. **[7]**

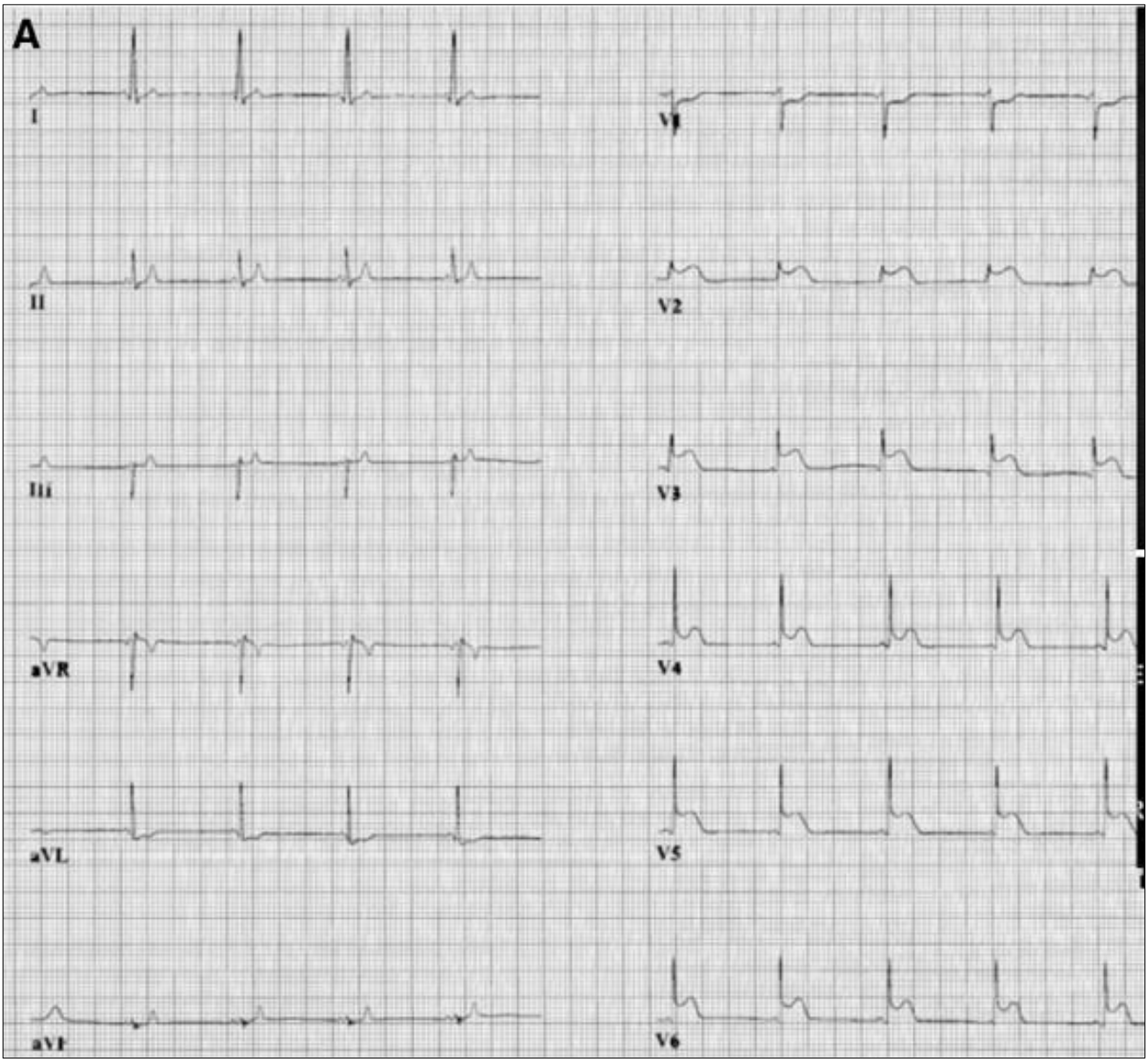
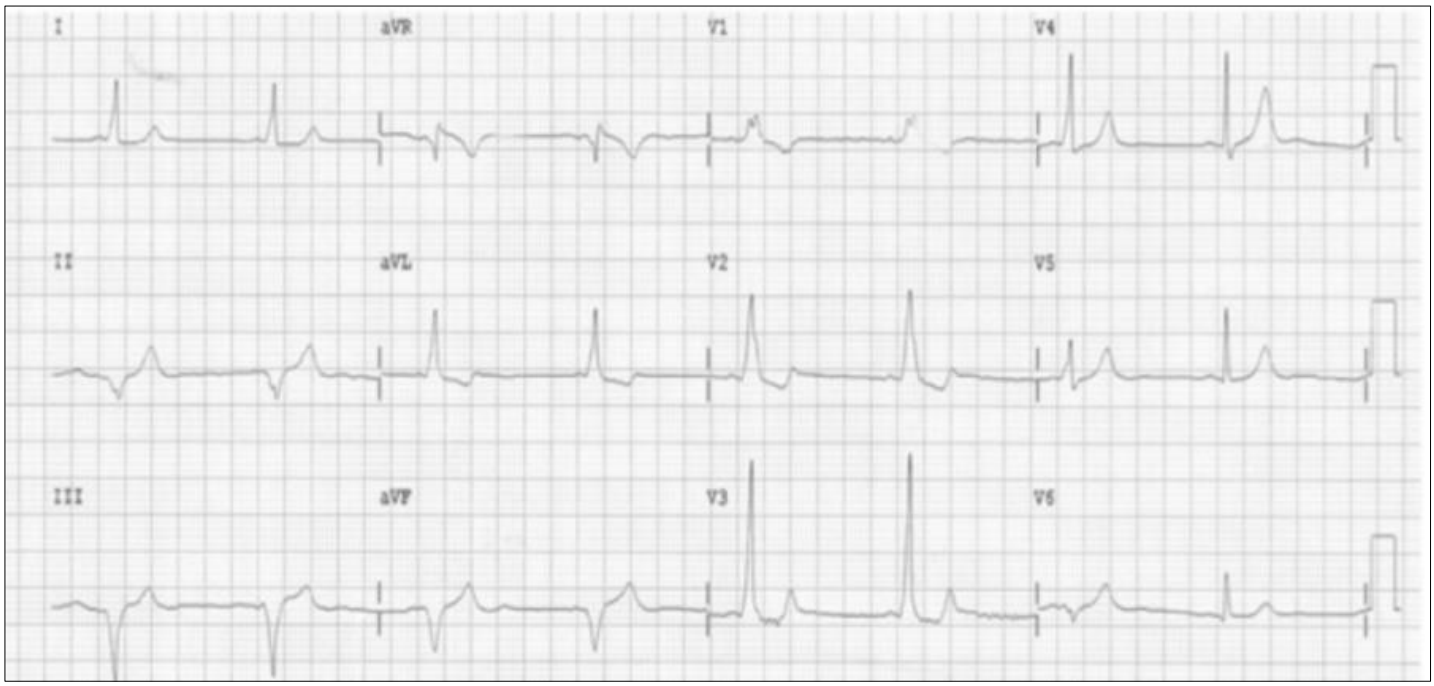


Figure No. 4: A WPW and a Breijo model together on the same ECG tracing. **[8]**



REFERENCES

1.- Breijo-Marquez, FR. Decreased electrical cardiac systole. Int J Cardiol 2008; 126, 2, Pages e36-e38.

Ward DE, Bexton R, Camm AJ. Characteristics of atrio-His conduction in the short PR interval, normal QRS complex syndrome. Evidence for enhanced slow-pathway conduction. Eur Heart J, 4 1983, pp. 882-8.

Gollob MH, Redpath CJ, Roberts JD The short QT syndrome: proposed diagnostic criteria. J Am Coll Cardiol 2011 ;57: 802-812.

4.- Bjerregaard Preben, Gussak Ihor. Short QT Syndrome Electrical Diseases of the Heart 2013; Springer London, pp.569-58.

Gussak I; Brugada P, Brugada J et al. Idiopathic short QT interval: a new clinical syndrome? Cardiology *2000;* 94(2): 99.

6.- Antzelevich Charles, Burashnikov Alexander. Mechanisms of cardiac arrhythmias. Electrical Diseases of the Heart 2013; Springer London. pp.93-128.

Breijo-Márquez FR, Ríos MP, Baños MA. Presence of critical stenosis in left anterior descending coronary artery together with a short "P-R" and "Q-T" pattern in the same electrocardiographic recording. J Electrocardiol 2010; 43(5):422-4.

8.- Breijo-Marquez FR . A Breijo pattern associated with a Wolff-Parkinson-White pattern. J Cardiol Curr Res 2016; 5(3): 00161.

9.- Breijo-Márquez FR. Sudden cardiac death in a young adult diagnosed with Tietze's syndrome. Rev Soc Esp Dolor 2009; 17(2):99-103.