

Progressive development of giant J wave and extreme prolongation of QT interval in induced hypothermia

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ABSTRACT

The appearance of J waves is the most common event observed in the electrocardiogram of a patient with hypothermia. We report the case of 47 years-old man, who underwent cardiac arrest using hypothermia for cardiac surgery. In the electrocardiographic tracing the progressive development of giant J waves is evident. These waves can mimic acute myocardial infarction and are considered a predictor of arrhythmogenesis.

Key words: J wave, QT interval, Electrocardiogram, Hypothermia

Desarrollo progresivo de onda J gigante y prolongación extrema del intervalo QT en la hipotermia inducida

RESUMEN

La aparición de ondas J es el suceso más común observado en el electrocardiograma de un paciente con hipotermia. Se presenta el caso de un hombre de 47 años, que le fue inducido un paro cardíaco mediante hipotermia para una cirugía cardíaca. En el trazo electrocardiográfico se evidencia el desarrollo progresivo de una onda J exuberante. Estas ondas pueden simular un infarto agudo de miocardio y se consideran una variable predictora de arritmogénesis.

Palabras clave: Onda J, Intervalo QT, Electrocardiograma, Hipotermia

INTRODUCTION

J wave is the most common event observed in the electrocardiogram of a patient with hypothermia¹⁻³. It appears in 80% of cases¹, but is not the only finding. Sinus bradycardia, junctional rhythm, atrial fibrillation, premature ventricular contractions (at temperatures below 30 ° C), and prolongation of PR and QT intervals and of QRS2 complex can be observed².

CASE REPORT

47-year-old male patient that underwent cardiac surgery for removal of infectious endocarditis vegetations on pacemaker electrode. Cardiac arrest using hypothermia was induced. The trace shows the progressive development of a giant J wave through representative moments in a period of 26 minutes (Figure). In the first beats it can be seen that such wave manifested as a late slowing of QRS complex to become a well-defined graphoelement, which reminds us of a monophasic action potential of a cardiomyocyte (arrows).

With temperature decrease a sinus bradycardia of 32 beats/minute was established, also a P wave flattening and PR interval prolongation occurred. In the last strip (Panel G) the patient had a rectal temperature of 23 °C, QT interval of the penultimate beat was 1.26 seconds (QTc 0.92s) the most prominent J wave reached 11 mm and ST segment depression was 3.5 mm.

COMMENT

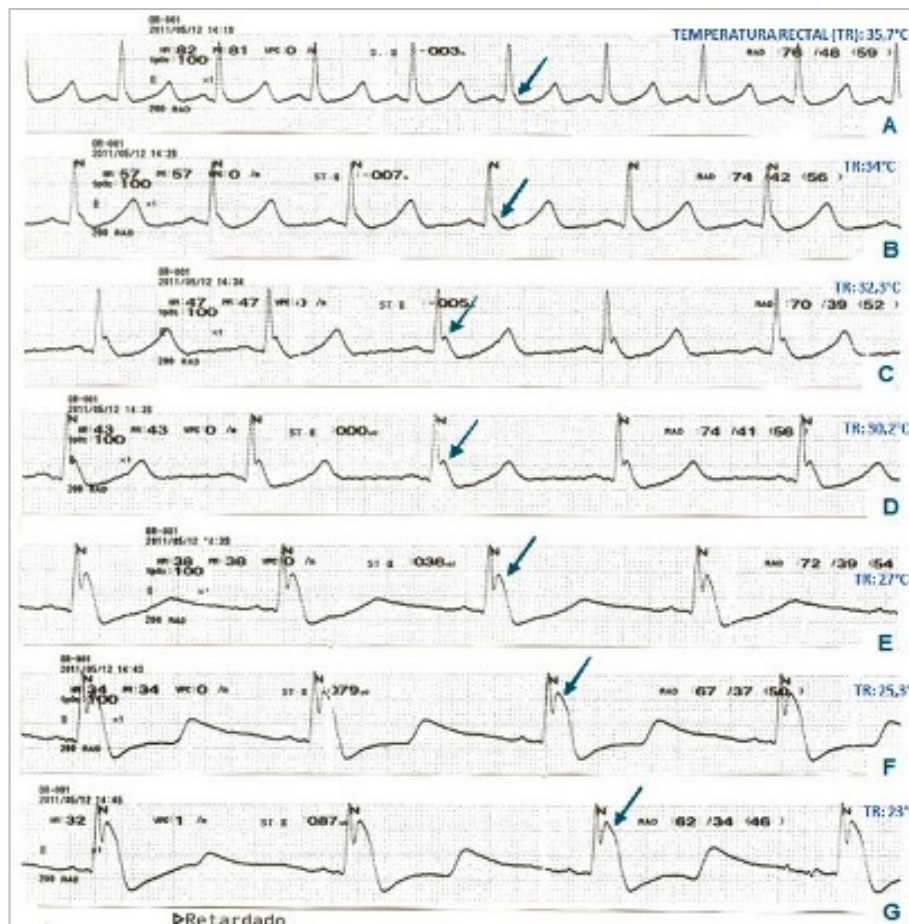
Sauza *et al.*⁴ in a study of 59 hypothermic patients found 2 cases with J waves of large amplitude, one of 17 and another of 19-mm. These represent the largest J wave size ever published, which can be confused with right bundle branch block and Brugada syndrome patterns. The latter almost always appears in lateral precordial leads, although in severe hypothermia it may be seen in any lead, so it can be found in previous leads and in D_{II}.

Hypothermia electrocardiogram may be confused with acute myocardial infarction; when J waves mimic classic myocardial damage. J waves may be regarded as a predictor variable of arrhythmogenesis. Lassing⁵ recently suggested that J waves are associated with incessant ventricular fibrillation during therapeutic hypothermia. While Haisaguerre *et al.*⁶ relate it to more severe forms of idiopathic ventricular fibrillation in patients with early repolarization pattern. There are other situations beyond hypothermia in which J waves

can be observed such as: hypercalcemia, subarachnoid hemorrhage, brain damage, and myocardial ischemia after cardiac resuscitation due to ventricular fibrillation¹. They may also precede ventricular fibrillation in patients with Brugada syndrome. Their ionic bases involve mainly I_{TO1} current, but details of its occurrence are beyond the interest of this article.

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