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Image in cardiology

# Epsilon Wave in the 12-Lead Electrocardiogram: Is Its Frequency Underestimated?

## Onda épsilon en el electrocardiograma de 12 derivaciones. ¿Está subestimada su frecuencia?

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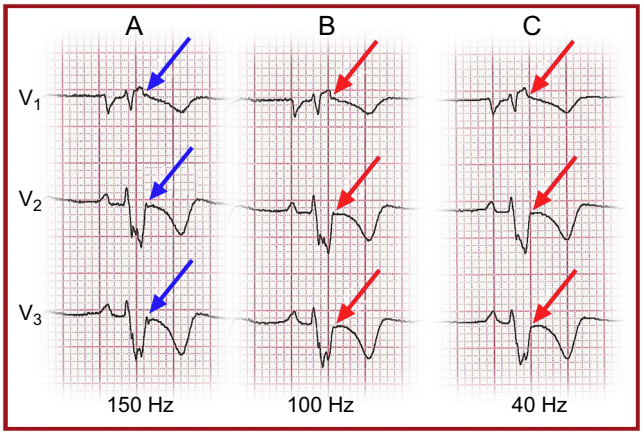


**Figure.**

An epsilon wave on a 12-lead electrocardiogram is an important diagnostic criterion for arrhythmogenic right ventricular dysplasia. This delayed right ventricular depolarization manifests as low amplitude electrical potentials between the end of the QRS complex and the beginning of the T wave, most prominently in leads $V_1$ to $V_3$. The epsilon wave is detected in 30% of individuals with arrhythmogenic right ventricular dysplasia; however, the epsilon wave can be masked by excessive low-pass filtering, and the true rate may therefore be higher.

The Figure shows how low-pass filter cutoff frequency influences the detection of the epsilon wave in arrhythmogenic right ventricular dysplasia: At the recommended 150 Hz cutoff frequency (Figure A), the epsilon wave is detected in leads $V_1$-$V_3$. At a 100 Hz cutoff frequency (Figure B), the epsilon wave is attenuated in $V_1$-$V_2$ and absent in $V_3$. At 40 Hz (Figure C), the epsilon wave disappears from leads $V_1$-$V_3$.

The low-pass filter cutoff frequency needs to be optimally adjusted to ensure that important clinical information is not lost (the QRS complex and its notches, the J wave and the pacemaker spike). Current electrocardiography guidelines set the cutoff at 150 Hz for adolescents and adults. Nonetheless, in routine clinical practice a 40 Hz cutoff frequency is used to reduce muscle noise and improve the appearance of the trace.

This practice results in the loss of important information, leading us to conclude that the presence of an epsilon wave in patients with arrhythmogenic right ventricular dysplasia may be seriously underestimated.

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