IMAGES

Hyperkalemia and the electrocardiogram

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The electrocardiographic (ECG) manifestations associated with hyperkalemia include prominent T waves, prolonged PR interval, loss of the P wave, widening of the QRS complex, sinusoidal waveform of the QRS complex and ventricular arrhythmias. Elevated serum potassium values cause alterations in the electrical activity of the heart - both in cardiac electrical automaticity of the pacemaker and in the efficiency of conduction - and the higher the values, the greater the alteration; finally, increased cardiac irritability produces ventricular fibrillation. In general, the progressive development of hyperkalemia tends to result in less significant ECG manifestations, while sudden increases in serum potassium concentration probably cause a more significant alteration in the ECG - even at lower ranges.

A prominent T wave is the initial ECG manifestation of hyperkalemia (Figure 1A) and is described as tall and narrow with a symmetric structure. The QRS complex widens progressively with increased serum levels of potassium (Figure 1B). Eventually, the QRS complex fuses with the T wave, forming a "sine" or sinusoidal wave in the ECG tracing. At this point, P wave amplitude is reduced and finally disappears.

The development of a sinusoidal wave with loss of the P wave produces the "sinoventricular" rhythm of hyperkalemia (Figure 1C).

The management of hyperkalemia involves three primary objectives: stabilization of the myocardial cell membrane (calcium), displacement of potassium from the vascular to the intracellular space (dextrose, insulin, sodium bicarbonate, salbutamoland magnesium sulfate), and permanently eliminate potassium from the body (resins and hemodialysis).

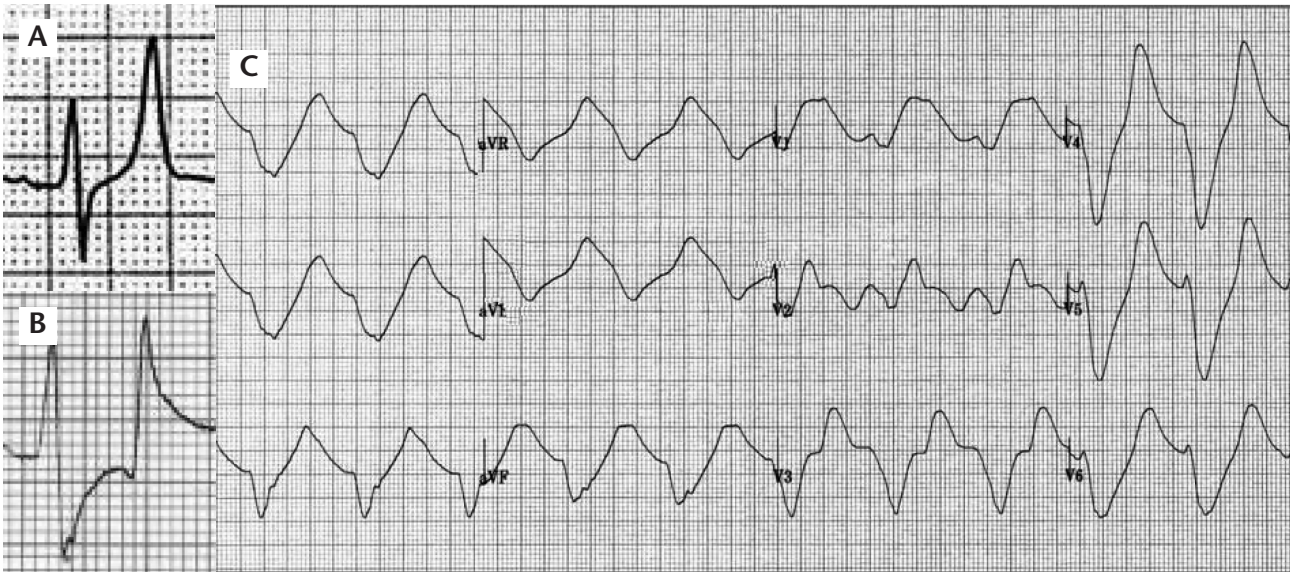

Figure 1. The electrocardiogram: A. Prominent T wave. B. Widened QRS complex with a prominent T wave. C.Sinoventricular rhythm with slow / regular rhythm, absence of P wave and markedly widened QRS complex with a sinusoidal waveform.

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