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## Electrocardiographic signs of hyperkalemia in a patient with a cardiac pacemaker

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### ABSTRACT

We report the case of a patient with a dual chamber pacemaker admitted to the emergency room with hyperkalemia. Although the pacemaker was present, the classical sings of hyperkalemia can be seen. After the adequate treatment and dialysis, the electrocardiogram progressively improves and the patient was discharged asymptomatic.

**Keywords:** Pacemaker artificial; Hyperkalemia; Electrocardiography.

### CASE REPORT

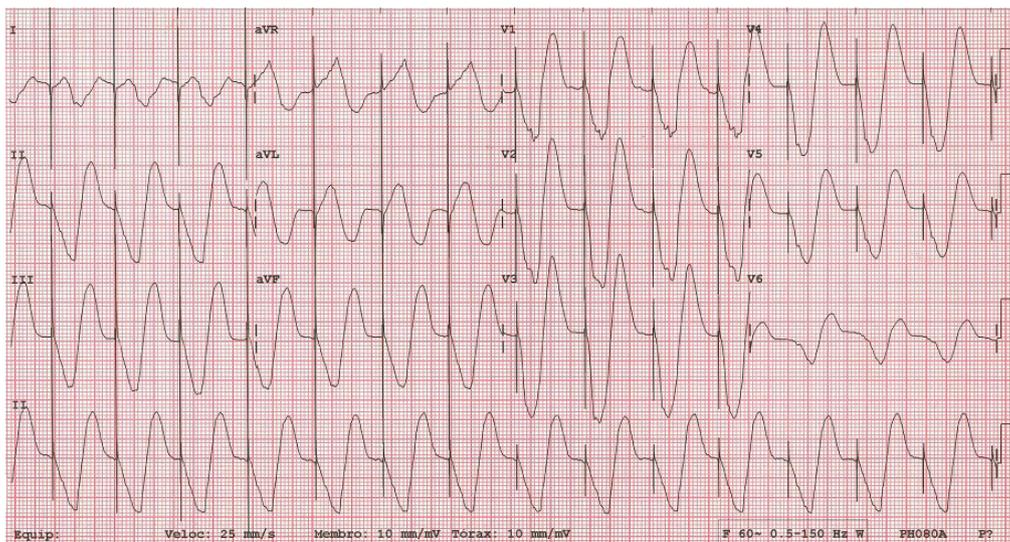
An 84 year old male presented to the emergency department complaining of chest pain, nausea and recent onset of weakness over the last day. The previous medical history included ischemic cardiomyopathy with an ejection fraction of 27%, 2 previous coronary stents and coronary artery bypass surgery 10 years prior to presentation, dual chamber cardiac pacemaker for 5 years, hypertension, diabetes and chronic kidney disease

on hemodialysis. The family referred adequate dialysis compliance.

The first electrocardiogram (Figure 1) shows a regular heart rate of 88 bpm, a P wave almost not detectable, followed by the ventricular pacemaker spike which generates an abnormal sinusoidal QRS with duration of 226 mS and aberrant T waves.

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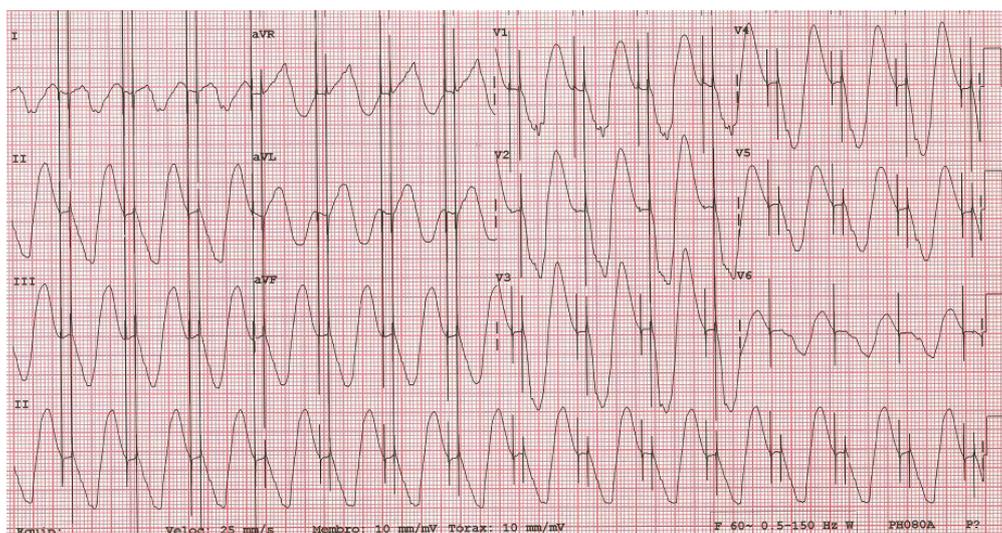
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**Figure 1** - ECG upon arrival with K: 8.8mEq/L.

When turned on to the DDO mode (both chamber sensed inhibited) by using a magnet, the only visible change was the appearance of atrial spike, and the QRS complex remained unchanged (Figure 2). Based on the ECG abnormalities, the patient was started on Calcium gluconate IV, insulin-glucose solution, inhaled terbutalin and bicarbonate IV considering the clinical diagnosis of hyperkalemia. When the first results came out the potassium was 8.8 mEq/L. Four hours after treatment initiation, the

ECG already showed significant improvement (Figure 3) with an easily visualized normal P wave, a shortened QRS of 190 mS and a T wave as usually seen in pacemaker patients. After dialysis the ECG returned to the previous baseline (Figure 4), with a heart rate of 74 bpm, a normal P wave and a ventricular spike generating a 167 mS QRS. At this moment the potassium was 4.5 mEq/L. The patient was discharged asymptomatic.



**Figure 2** - ECG upon arrival, with the use of a magnet to set it at DDO magnetic rate.

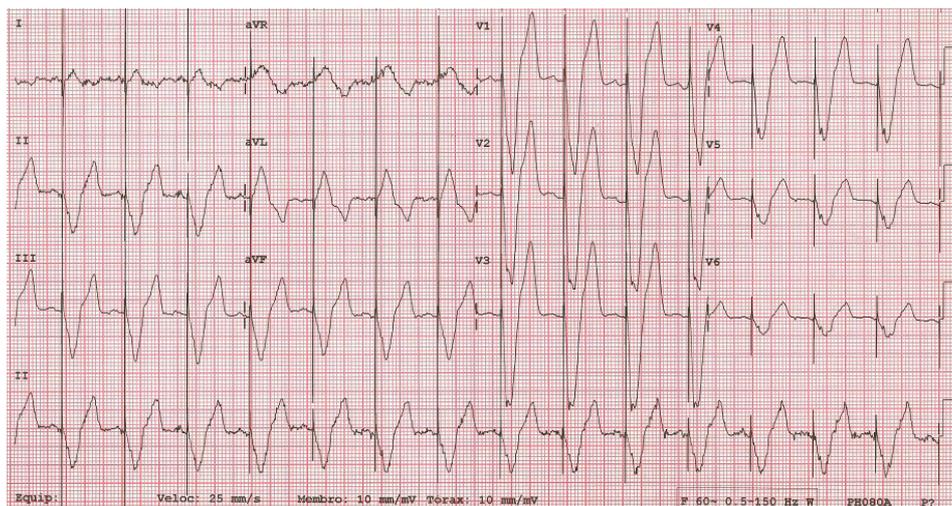


Figure 3 - ECG after initial measures for hykperkalemia.

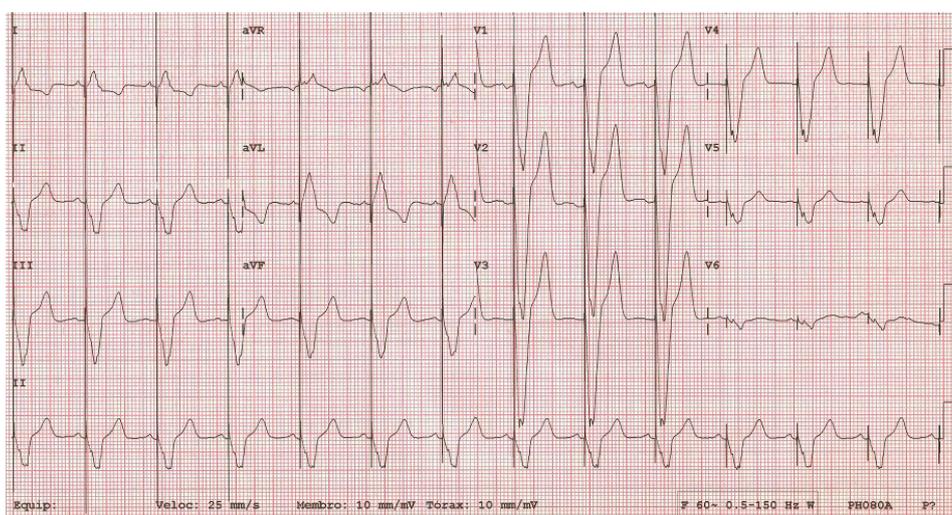


Figure 4 - ECG after stabilization and dialysis.

## DISCUSSION

The association of cardiovascular and renal disease is common. Therefore, the occurrence of renal complications in cardiology is not rare. Previous reports have well documented the loss of capture of pacemakers due to hyperkalemia<sup>1,2</sup>, as well as inadequate shock therapy in patients with ICDs and hyperkalemia<sup>3</sup>. However, the classical hyperkalemia pattern in patients with cardiac pacemakers is not a

frequent finding<sup>4</sup>. Although pacemakers could interfere with ventricular depolarization and repolarization, the major electrocardiographic abnormalities due to increased potassium blood levels can be observed even in the presence of cardiac pacemakers, as we demonstrate in this report. It is important to early recognize signs of hyperkalemia to adopt an adequate and prompt treatment.

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**Conflict of interest: None**

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