

# An ECG with U waves

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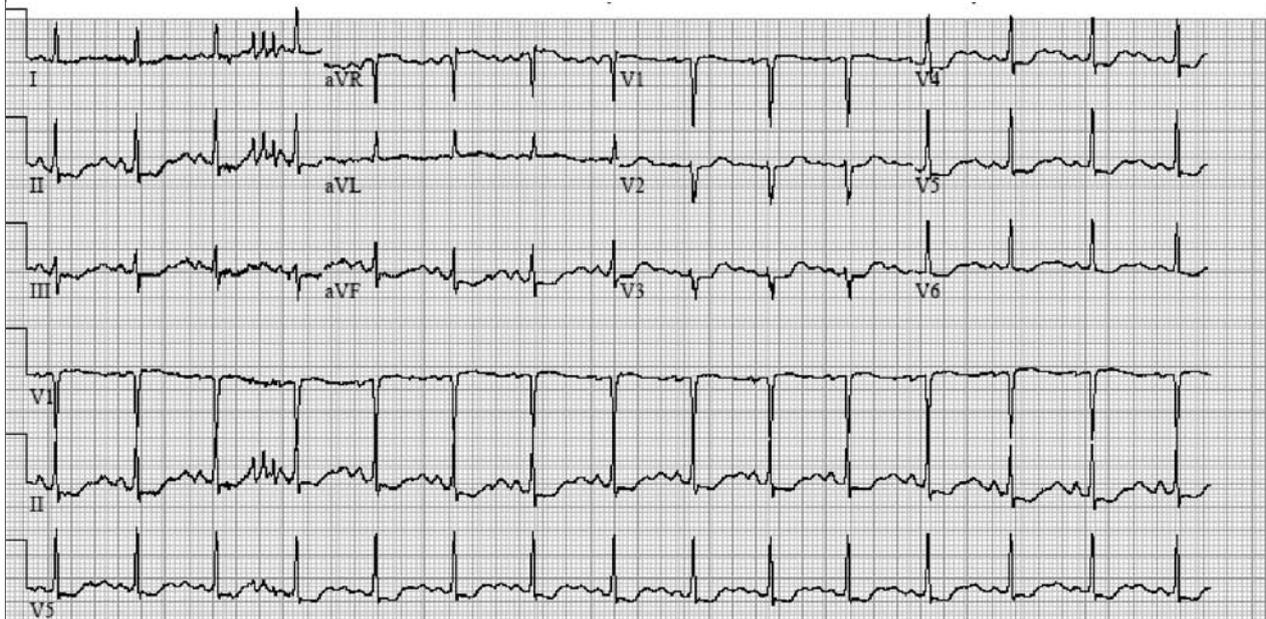
## CASE REPORT

A 45-year-old woman was seen on the emergency ward because of muscular weakness for several weeks. Her medical history revealed hypertension and constipation, for which she was taking hydrochlorothiazide and furosemide (both prescribed by her physician), and laxatives. At admission the patient was responding normally and the physical examination revealed no abnormalities. An ECG was taken (figure 1).

## WHAT IS YOUR DIAGNOSIS?

See page 443 for the answer to this photo quiz.

**Figure 1.** ECG at admission, showing low T waves in leads I, aVL, and V<sub>1</sub>, U waves in leads V<sub>2</sub> to V<sub>6</sub> and ST depression in leads II, II, aVF, and V<sub>3</sub> to V<sub>6</sub> (some artefacts are seen in I and II)



ANSWER TO PHOTO QUIZ (ON PAGE 442)

AN ECG WITH U WAVES

DIAGNOSIS

The laboratory results revealed a hypokalaemia of 1.7 mmol/l (normal range 3.5 to 5.0 mmol/l), a metabolic alkalosis (pH 7.52, HCO<sub>3</sub> 30 mmol/l) and a slight hypochloreaemia. The ECG abnormalities (especially the U waves) are seen in patients with severe hypokalaemia. U waves can also be seen in hypercalcaemia, with antiarrhythmic drugs, in thyrotoxicosis, intracranial hemorrhage, exercise and in the congenital long-QT syndrome. The low T waves and ST depression are also seen in severe hypokalaemia, but myocardial ischaemia should be considered. The patient did not complain about chest pain and the cardiac enzymes were normal, so myocardial ischaemia does not seem to be present. The hypokalaemia (and the metabolic alkalosis) were probably caused by the use of excessive amounts of diuretics and laxative abuse.<sup>1</sup> Primary hyperaldosteronism was excluded. The patient is seen by a psychiatrist.

After treatment of the hypokalaemia, the ECG normalised (figure 2).

The severity of the manifestations of hypokalaemia tends to be proportionate to the degree and duration of

the hypokalaemia. Symptoms generally do not become manifest until the serum potassium is below 3.0 mmol/l and usually resolve with correction of the hypokalaemia. Clinical manifestations are severe muscle weakness or paralysis, rhabdomyolysis, renal abnormalities, cardiac arrhythmias and ECG abnormalities. Cardiac arrhythmias and ECG abnormalities are, for instance, premature, atrial and ventricular beats, atrioventricular block, intraventricular conduction abnormalities and ventricular arrhythmias. Hypokalaemia can be life-threatening, especially in patients with coronary artery disease. Treatment should be correction of the potassium and treatment of the underlying cause.<sup>2</sup>

REFERENCES

1. Gennari FJ. Hypokalemia. N Engl J Med. 1998;339(7):451-8.
2. Alfonzo AV, Isles C, Geddes C, Deighan C. Potassium disorders--clinical spectrum and emergency management. Resuscitation. 2006; 70(1):10-25.

Figure 2. Normalised ECG after treatment of the hypokalaemia

