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Answer: Hypokalaemia Secondary to Furosemide Abuse.

The ECG reveals minor ST segment sag (leads II, III), t wave inversion (leads V2, V3) - not biphasic t waves (see supplementary text), small u waves, Prolonged QT (480ms from direct measurement).

His initial biochemistry on admission reveals K⁺ of 2.4 mmol/L and normal serum levels of magnesium, calcium, blood glucose and bicarbonate. His CK was 791 U/L with negative urine myoglobin. His dipstick urine pH was 7.0. On further questioning, the patient admitted to abusing furosemide 40mg daily for 3 days prior to the bodybuilding competition in conjunction with no fluid intake for aesthetic purposes. Additionally, he was a current smoker but did not use other performance enhancing drugs or other illicit substances.

This patient had severe hypokalemia with associated periodic paralysis and associated ECG changes and a mild degree of rhabdomyolysis. After correction of his hypokalaemia and rehydration, the patient's serial ECG findings gradually normalized. An echocardiogram revealed borderline left ventricular hypertrophy.

Severe hypokalemia (K⁺ < 2.5 mmol/L) is a potentially life-threatening condition which is associated with a spectrum of skeletal muscle weakness, rhabdomyolysis to the point of paralysis.¹ On rare occasions, diaphragmatic paralysis from hypokalaemia can lead to respiratory arrest.² Smooth muscle of the gut may have decreased motility resulting in ileus or urinary retention. Cardiac manifestations of severe hypokalemia may include fatal arrhythmias such as Torsade De Pointes from acquired prolonged QT interval. Other ECG changes include ST segment depression, u waves, and t-wave flattening or inversion.

Other common causes of hypokalaemia should be considered including extra renal potassium losses and renal potassium losses (e.g. renal tubular acidosis and potassium depleting diuretics). Other causes include hypokalaemia due to potassium shifts, familial periodic hypokalemic paralysis and thyrotoxic hypokalaemic paralysis.

It is suspected that a large proportion of bodybuilders abuse diuretics,³ therefore these drugs should always be considered as a cause of hypokalemic paralysis in bodybuilders. An ECG revealing biphasic t waves can be seen on this link for comparison: https://en.wikipedia.org/wiki/File:Wellens%27_Syndrome.png.

REFERENCES

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