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ΣΥΝΕΧΙΖΟΜΕΝΗ ΙΑΤΡΙΚΗ ΕΚΠΑΙΔΕΥΣΗ

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Acid-Base Balance-Electrolyte Quiz – Case 65

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Which is the cause of acidemia in a patient with arterial pH 7.06, PCO_2 25 mmHg, HCO_3^- 11 mEq/L, serum creatinine 0.9 mg/dL, glucose 94 mg/dL, Na^+ 132 mEq/L, Cl^- 116 mEq/L, K^+ 4.6 mEq/L, urine Na^+ 12 mEq/L, Cl^- 42 mEq/L, K^+ 36 mEq/L, urea nitrogen 140 mg/dL, Uosm 440 mosmoL/kg?

Comment

The patient exhibited hyperchloremic metabolic acidosis with a normal serum anion gap (5 mEq/L). The two most common causes of hyperchloremic metabolic acidosis are gastrointestinal HCO_3^- losses (diarrhea) and renal tubular acidosis. Measurement of urine ammonium excretion is necessary for the differential diagnosis between the two entities: Increased urine ammonium excretion suggests adequate acid excretion observed in patients with gastrointestinal HCO_3^- losses, while decreased urine ammonium excretion points to inadequate acid excretion, that is renal tubular acidosis (RTA) or other underlying kidney disease. It has been suggested that the urine anion gap ($Na^+ + K^+ + Cl^-$ in a spot urine specimen) is a marker of urine ammonium secretion; a positive urine anion gap is consistent with impaired ammonium secretion (that is with RTA), while a negative urine anion gap reflects adequate H^+ secretion observed in patients with gastrointestinal HCO_3^- losses. In our case urine anion gap was 6 mEq/L (that is consistent with underlying renal disease). However, urine sodium was very low (12 mEq/L), due to coexistent volume depletion. In patients with extracellular volume depletion, the low urinary sodium excretion suggests reduced distal delivery of sodium and subsequently reduced ability for H^+ and NH_4^+ secretion. Thus, hypovolemia is associated with a reversible renal tubular acidosis type I. In such cases, the reliability of the urine anion gap is limited. However, urine NH_4^+ excretion can be calculated by the determination of urine osmolar gap if an osmometer is available. Urine osmolar gap is calculated from the equation:

Urine osmolar gap=measured Uosm (by an osmometer) – [2×(Na^+ + K^+)+ glucose (mg/dL)/18+urea nitrogen (mg/dL)/2.8] (normal value 10–100 mosmoL/kg).

In the present case urine osmolar gap was 294 mosmoL/kg. An increased osmolar gap is indicative of extrarenal bicarbonate losses (diarrhea). It has been reported that one half of urine osmolar gap is approximately the urinary ammonium excretion (that is in our case approximately 150 mmoL/L).

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Answer: *Hyperchloremic metabolic acidosis with a normal serum anion gap*