

CONTINUING MEDICAL EDUCATION ΣΥΝΕΧΙΖΟΜΕΝΗ ΙΑΤΡΙΚΗ ΕΚΠΑΙΔΕΥΣΗ

Acid-Base Balance-Electrolyte Quiz – Case 62

Which of the following is associated with renal potassium wasting?

- Distal renal tubular acidosis (type 1)
- Administration of ticarcillin
- Proximal renal tubular acidosis (type II) in the steady state
- Metabolic alkalosis with marked increase in serum HCO_3^- (due to vomiting).

Comment

Distal renal tubular acidosis is associated with renal potassium wasting due to acidemia, which leads to decreased NaCl reabsorption in the proximal tubules resulting in hypovolemia and activation of the renin-angiotensin-aldosterone system, as well as in increased delivery of sodium and tubular flow in the collecting tubules, changes responsible for the increased potassium secretion through the renal outer medullary potassium channel (ROMK) and maxi- K^+ channels. Furthermore, the administration of ticarcillin is associated with increased delivery of Na^+ and penicillin anions (which are not reabsorbed in the proximal tubules) in the distal tubules. Since these anions are not reabsorbed in the distal tubules, the Na^+ reabsorption through the ENaC (epithelial sodium channels) is associated with

kaliuresis due to a more negative voltage development. Similarly, in patients with vomiting-induced metabolic alkalosis and increased HCO_3^- concentration, the increased NaHCO_3 delivery in the distal tubules along with hypovolemia-induced increased aldosterone levels is associated with kaliuria and hypokalemia. In patients with proximal renal tubular acidosis in the steady state no significant change in renal potassium excretion is observed, since filtered HCO_3^- is reabsorbed in the proximal tubules. However, treatment with HCO_3^- is associated with increased NaHCO_3 loss in the urine leading to both increased sodium delivery into the distal tubules along with hypovolemia-associated aldosterone excess, changes that lead to increased potassium secretion.

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Answer: Proximal renal tubular acidosis (type II) in the steady state