

CONTINUING MEDICAL EDUCATION ΣΥΝΕΧΙΖΟΜΕΝΗ ΙΑΤΡΙΚΗ ΕΚΠΑΙΔΕΥΣΗ

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Acid-Base Balance-Electrolyte Quiz – Case 14

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A patient with metastatic lung cancer with a serum concentration of sodium 122 mEq/L. His urine output was 1,100 mL/day with a Uosm 620 mosmoL/kg. Urine sodium and potassium levels were 80 and 86 mEq/L, respectively. How can we increase serum sodium levels?

- Administration of isotonic saline (NaCl 0.9%)
- High salt and protein diet
- Water restriction only
- Thiazide administration

Comment

Thiazide administration is occasionally followed by a decrease in serum sodium levels. In this case, water restriction cannot increase serum sodium levels, since the patient had a negative electrolyte-free water clearance (CH_2O_e); a process that will aggravate his hyponatremia if he drinks water, is the following one:

$$CH_2O_e = V_{urine} \times \left[1 - \frac{\text{Urine sodium+potassium}}{\text{Serum sodium}} \right]$$
$$= 1100 \times \left[1 - \frac{166}{122} \right] = -400 \text{ mL}$$

Furthermore, the administration of 1 L of isotonic saline

(osmolality equals 308 mosmoL/kg) will be excreted in the urine in a volume of only 490 mL (308/620), since the Uosm is relatively constant. Thus, more than one-half of water will be retained and there will be a further reduction in the plasma sodium concentration. On the contrary, the increase in solute output achieved by putting the patient on a high-salt, high protein diet will be followed by a significant increase in serum sodium levels. In fact, high salt and protein diet may increase the patient's solute excretion and subsequently his urine flow to 1.6 L. This will dilute the urine sodium and potassium concentration to 40 and 46 mEq/L. Thus, the CH_2O_e will be increased to:

$$1600 \times \left[1 - \frac{166}{122} \right] = 480 \text{ mL/d}$$

Now, the patient is actually excreting electrolyte free water and a water restriction to approximately 500 mL/day will result in a significant increase in serum sodium levels.

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