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Acid-Base Balance-Electrolyte Quiz – Case 57

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Which is the predicted change of serum sodium levels in a patient with hyponatremia (serum sodium 125 mEq/L) after the administration of 1 L of isotonic sodium chloride solution (0.9%) + 60 mEq of potassium chloride? Twelve hours later Vurine was 1.0 L with urine sodium 25 mEq/L and potassium 40 mEq/L. Body weight: 60 L, total body weight (TBW): 30 L.

- 1 mEq/L
- 3 mEq/L
- 5 mEq/L
- 8 mEq/L.

The infusate formula proposed by the Adrogue and Madias and verified by Liamis et al can reliably project the effect of gaining of 1 L of any infusate on the patient's serum sodium concentration

$$\Delta Na^+s = \frac{(Na^+ + K^+ \text{ of the infusate}) - (\text{serum } Na^+)}{TBW+1} =$$

$$\frac{(154+60)-125}{31} \simeq 3 \text{ mEq/L}$$

Thus, the administration of 1 L of isotonic sodium chloride solution (+60 mEq of KCl) will be associated with approximately a 3 mEq/L increase in serum sodium. However, during treatment of hyponatremia when ongoing fluid losses (mainly renal) are substantial (>1 L/day), the fluid loss formula should be used, since its projects the effect of losing 1 L of any fluid (mainly urine) on the patient's serum sodium.

$$\Delta Na^+s = \frac{(\text{serum } Na^+) - [\text{urine } (K^+ + Na^+)]}{TBW-1} = \frac{125-65}{29} =$$

$$\frac{60}{29} = 2 \text{ mEq/L}$$

Thus, the predicted serum sodium concentration is much higher than that calculated by the Adrogue-Madias equation (3+2=5 mEq/L). Thus, this formula predicts a rather inappropriate increase in serum sodium levels; in this case, proper modifications of the infused solutions should be performed (for example, administration of hypotonic sodium solutions) to prevent and reverse inadvertent overcorrection of hyponatremia.

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Answer: 5 mEq/L