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Acid-Base Balance-Electrolyte Quiz – Case 52

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A 60 kg male (80 years) was admitted to the Internal Medicine Clinic with serum sodium 168 mEq/L. Laboratory investigation showed serum glucose 120 mg/dL, urea 110 mg/dL, creatinine 1.8 mg/dL and potassium 4.2 mEq/L; V urine 1.2 L, urine sodium 25 mEq/L, urine potassium 40 mEq/L.

Which of the following treatment schedules should be used for the appropriate patient's management?

a. Normal saline 0.9%, 80 mL/h

b. Half normal saline 0.45%, 260 mL/h

c. Glucose solution 5%, 250 mL/h

d. Ringer lactate solution, 120 mL/h

The patient exhibited hypovolemic hypernatremia. Increased urea/creatinine ratio and low urine sodium suggest extracellular volume depletion. Thus, half-normal saline (0.45%) solution should be used.

The calculated water deficit is:

$$TBW = \frac{(\text{Serum sodium} - 1)}{140} = 0.5 \times \text{body weight (60 kg)} \times \left(\frac{168}{140} - 1\right) = 6 \text{ L}$$

Taking into account that a decrease of serum sodium by 8 mEq/L should be achieved within the next 24 hours, 1.7 L of water should be given (at a rate of 70 mL/h). Additionally, the insensible water losses (40 mL/h), as well as the renal water losses should be taken into account. The latter can be estimated by the determination of electrolyte-free water clearance:

$$C^{e}_{H2O} = V\,\text{urine} \times \left(\frac{\text{Urine sodium + potassium}}{\text{Serum sodium}}\right) = 480 \text{ mL (20 mL/h)}$$

Thus, the infusion rate of free water is: 70+40+20=130 mL/h
1 L of hypotonic (N/2) saline solution is a combination of 500 mL of free water and 500 mL of isotonic saline. Thus, about 260 mL/h of this solution must be administered to provide 130 mL/h of free water.

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Answer: *Half normal saline 0.45%, 260 mL/h*