Deacon's Challenge

No 150 - Answer

A 75-year old man had a convulsion four days after a transurethral prostatectomy. He is found to have a serum sodium concentration of 105 mmol/L. His estimated weight was 64 kg. Calculate the volume of 2.7% saline required to increase his serum sodium concentration to 125 mmol/L stating any assumptions that you make (atomic weights of sodium 23, chlorine 35.5).

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Assume the following:

- All the administered Na remains in the ECF i.e. no redistribution or loss by renal (or other) routes.
- That the water contained in the saline solution is excreted and does not alter the ECF volume.
- That the resulting increase in ECF osmolality does not shift significant water from the ICF to ECF compartments.
- That initially his total body water was normal (i.e. 60% of body weight) which was distributed between ICF and ECF compartments in the normal 2:1 ratio.

First calculate amount of Na needed:

Target Na concentration change = 125 - 105 = 20 mmol/L

Total Na needed = Target Na concentration change (mmol/L) x ECF vol

Since ECF vol = Body wt (Kg) x $\frac{60}{100}$ x $\frac{1}{3}$ = $\frac{64 \times 60}{100 \times 3}$ = 12.8 L

Total Na needed = 20 x 12.8 = 256 mmol

Next calculate concentration of 2.7% NaCl in mmol/L:

MW NaCl = 23 + 35.5 = 58.5

2.7% = 2.7 g/100 mL = 27 g/L = 27,000 mg/L

Concn (mmol/L) = $\frac{\text{Concn (mg/L)}}{\text{MW}}$ = $\frac{27{,}000}{58.5}$ = 462 mmol/L

And finally the volume of 2.7% saline needed:

Vol 2.7 % NaCl needed = $\frac{\text{Total Na needed}}{\text{Fluid NaCl (mmol/L)}}$

= $\frac{256}{462}$ = **0.554L** (554 mL)

Question 151

As part of the evaluation of a new serum creatinine assay a quality control sample is analysed in duplicate on twenty consecutive days with the following results (µmol creatinine/L serum):

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1st result	100	98	101	99	104	96	98	100	101	99	103	101	99	94	100	98	95	100	100	101
2nd result	102	96	104	101	101	94	101	104	96	97	104	99	102	97	101	96	94	101	99	103

Calculate the within-day imprecision.