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Polyuria Following Head Trauma

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A 40 year old man weighing 160 lbs is operated on for penetrating trauma to the hypothalamus. At the time of his arrival at the recovery room his urine output is 0.7 L/hr and the osmolality is 70 mOsm/L. He is treated by replacement of losses with 0.7 L/hr of 5% D/W, Solumedrol and Dilantin. After 3 hours his urine volume has risen to 1 L/hr and the urine osmolality is 120 mOsm/L.

1) What was the cause of the initial polyuria?

2) What is the cause of polyuria after 3 hours?

3) How much glucose had he received after 3 hours; in mMol, in mgm?

4) What is his blood glucose after 3 hours (approximately)?

5) Why is his blood glucose elevated?

6) Since urine output is greater than the fluid intake, after 3 hours the patient is becoming depleted. Is proximal tubular reabsorption of water therefore greater than it was at the start?

7) Should the patient receive insulin?

At the third hour the quantity of fluid administered is increased to meet the increased urine output, but now both Na and K are added to the solution, the latter at 40 mEq/L.

1) What is the mechanism of urinary Na loss?

2) What is the mechanism of urinary K loss?

At the sixth hour urine volume is 1.6 L/hr and its osmolality is 180 mOsm/L.

1) What is the total osmolar excretion per hour, and what are the solutes being excreted?

At the ninth hour the urine output is 2.3 L/hr and the replacement fluid, its composition unchanged, is infused at the same rate, 2.3 L/hr. Blood glucose has continued to rise.

1) How much $^{-}$K has the patient received all-told? What is the current rate of K administration?

2) If you inherited the patient at this point what would your orders be?

3) The patient suddenly died at this point; what is the probable cause of death?

4) What would your initial post-op orders have been?