ARCHIVES OF HELLENIC MEDICINE: ISSN 11-05-3992

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ΣΥΝΕΧΙΖΟΜΕΝΗ ΙΑΤΡΙΚΗ ΕΚΠΑΙΔΕΥΣΗ

ARCHIVES OF HELLENIC MEDICINE 2021, 38(2):276–277
ΑΡΧΕΙΑ ΕΛΛΗΝΙΚΗΣ ΙΑΤΡΙΚΗΣ 2021, 38(2):276–277

Surgery Quiz – Case 31

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An otherwise healthy 61-year-old and 70 kg female patient with benign bilateral symptomatic multinodular goiter submitted after a 14-hour midnight fasting to a 2-hour total thyroidectomy without intraoperative neuromonitoring and without intraoperative complications. The patient received during surgery IV overall 1,900 mL of Ringer's lactate (RL) solution including 500 mL of fluid deficit pre-induction of anesthesia, 750 mL of fluid deficit plus 110 mL of fluid maintenance at first hour and 300 mL of fluid deficit plus 110 mL of fluid maintenance plus 140 mL of third space losses at the second hour of the procedure (fluid deficit before surgery, fluid requirements per hour of surgery and third space losses per hour for superficial procedures were estimated using the [60+(weight in kg–20)] mL of fluids multiplied by total nil *per os* hours before surgery, the [60+(weight in kg–20)] mL of fluids per hour of surgery and the 0–2 mL/kg per hour of surgery formula, respectively). Within the first 24-hours of surgery, the patient experienced severe postoperative nausea with three small volume episodes of emesis necessitating 6 doses of 5-HT3 serotonin receptor antagonist, and was unable to tolerate any oral intake necessitating 3 L (2 L of RL and 1 L of D5W solution) of IV fluids intake. At postoperative day 1, the patient experienced fatigue, muscle weakness, cramps, and headache. Surprisingly, laboratory work-up showed no evidence of postoperative hypoparathyroidism (serum total calcium level of 8.7 mg/dL, albumin level of 3.9 g/dL, ionized calcium 1.1 mmoL/L, pH 7.42, phosphate level of 3.8 mg/dL, magnesium level of 0.9 mmoL/L, 25-hydroxy vitamin D level of 44 ng/mL, TSH level of 3.7 μU/mL); however, laboratory work-up showed evidence of severe hyponatremia, including serum sodium level of 119 mmoL/L, serum osmolality 262 mOsm/kg, and decreased urine osmolality.

What was the cause of hyponatremia?

Comment

Surprisingly, patient's symptoms such as fatigue, muscle weakness, cramps, and headache were not attributed to postoperative hypoparathyroidism but to severe hyponatremia. In the postoperative setting, normovolemic hypotonic hyponatremia can be attributed to: (a) Syndrome of inappropriate antidiuretic hormone (SIADH), (b) severe hypothyroidism, and (c) adrenal insufficiency. As hypothyroidism and adrenal insufficiency were excluded, SIADH was the most prominent diagnosis. In fact, SIADH criteria such as: (a) decreased serum osmolality (<275 mOsm/kg), (b) increased urine osmolality (>100 mOsm/kg), (c) normovolemia, (d) increased urine sodium (>20 mmoL/L), and (e) no other cause for hyponatremia (no use of diuretic drugs, no suspicion of hypothyroidism, adrenal insufficiency, marked hyperproteinemia, hyperlipidemia and hyperglycemia) were present. At postoperative day 1, the estimated sodium deficit was 252 mmoL and managed successfully with strict water restriction and continuous IV administration of 500 mL 3% normal saline (NS) solution over a 12-hour time needed for correction with 42 mL per hour rate of infusion with 126 mmoL/L serum sodium level at re-assessment.

Hospital-acquired non-symptomatic and symptomatic hyponatremia occurs in approximately 30% and 20% of hospitalized patients, respectively; it is primarily the result of continued secretion or action of antidiuretic hormone (ADH) along with administration of hypotonic fluids in the setting of normo- or hyper-volemia. Postoperative patients are at the highest risk for developing hyponatremia as they are subjected to multiple stimuli for ADH secretion such as surgical and anesthetic stress, nausea, vomiting, pain, and drugs such as opiates. Emergency management includes: (a) Management of a potential neurologic emergency such as seizure or coma with 150 mL 3% NS solution IV over 5 min with re-assessment of serum sodium until neurological restoration; (b) assessment of intravascular volume. In the setting of: (i) hypovolemia, management of hyponatremia includes restoration of adequate circulating volume with RL than NS solution which lowers the risk of potential osmotic demyelination syndrome due to a slower rise in serum sodium, (ii) hypervolemia, management of hyponatremia includes strict fluid restriction and diuretics, (iii) euvolemia, management includes prevention of further exacerbation of hyponatremia with strict fluid restriction and saline lock IV; (c) increase in serum sodium of no more than 6 mmoL per day. The approximate sodium deficit can be estimated by using the (desired sodium – measured sodium) × 0.6 × weight in kg formula (3% NS solution includes 513 mmoL/L of sodium). Assuming the rate of hyponatremia correction 0.5 mmoL/L per hour, the approximate time needed for correction can be estimated using the (desired sodium – measured sodium)/0.5 mmoL/L per hour formula and

the rate of infusion can be estimated with the volume of 3% NS solution/time needed for correction formula.

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Diagnosis: *Acute severe hyponatremia after total thyroidectomy for benign multinodular goiter, SIADH*