Title

Severe Hyponatremia due to Microadenoma

Journal

Proceedings of UCLA Health, 25(1)

Authors

Deng, Lin

Ng, Jason

Publication Date

2021-08-04

CLINICAL VIGNETTE

Severe Hyponatremia due to Microadenoma

Lin Deng, MD and Jason Ng, MD

Case Presentation

A 57-year-old male with past medical history of depression on sertraline presented to the emergency room with one week of nausea, vomiting, diarrhea, fever, chills, lethargy and confusion. His vital signs in the emergency room were within normal limits. Physical exam was remarkable only for confusion, as the patient did not know the place or time. Initial labs were significant for severe hyponatremia with Na of 116 (repeat Na 113); serum osm 234; urine osm 549, urine Na 83; TSH 0.299 uIU/ml, total T3 0.49 ng/ml, free T4 0.49 ng/dl; AM and random Cortisol were both <1.0 mcg/dl. CT head followed by MRI sella turcica showed a 16x15x11mm sellar mass suspicious for a Rathke's cleft cyst vs. a macroadenoma without invasion of optic chiasm or cavernous sinuses. Further endocrine labs showed a normal prolactin 14.9 ng/ml, low adrenocorticotropic hormone (ACTH) < 5pg/ml, low testosterone <10 ng/dl, low FSH and LH at 1.2, 0.5 mIU/ml, respectively. Growth hormone (GH) was 0.3 ng/ml, and insulin growth factor-1 (IGF-1) was at the lower end of normal at 79 ng/ml.

The patient was started on pulse dose hydrocortisone, thyroid replacement, empiric antibiotics, salt tablets, and fluid restriction with goal Na correction of no more than 6mmol/L/day. Patient's sodium corrected rapidly from 113 to 118 within 6hrs and required cessation of salt tablets and initiation of D5W. Despite the above intervention, the patient had substantial water diuresis with urine output of 3 liters within a day and Na over-correction to 124 within 24hrs. The patient received DDAVP and replacement of urine output with D5W and oral water intake. His Na slowly corrected to 127 and then 131 over the next 48hrs with improvement in his confusion and lethargy. Neurosurgery was consulted and the patient was transferred another facility for biopsy and resection of his pituitary macroadenoma.

Discussion

We present a case of severe hyponatremia in the setting of hypopituitarism secondary to a sellar mass. Hyponatremia is defined as serum Na concentration <135mEq/L and is one of the most common electrolyte disturbances in hospitalized patients. Severe hyponatremia has been reported in 1% of hospitalized patients, with higher prevalence in the elderly.[1] The etiology of hyponatremia is numerous but is generally attributed to water retention or loss of solutes (such as sodium and potassium) in excess of free water – with primary polydipsia being a notable exception.[2] There are multiple published algorithms that describes hyponatremia assessment.[3-5] One widely adopted approach narrows the differential using the body's extracellular volume status and laboratory data. In a hypotonic, euvolemic patient such as in our case, SIADH is the most common diagnosis.[6] However, it is critical to rule out endocrine disorders such as adrenal insufficiency and hypothyroidism since they can have subtle clinical presentations and similar lab results to SIADH (serum osm <270, urine osm >100, urine sodium >20). In our case, the low TSH, FT4, and cortisol levels on the initial labs suggested secondary adrenal insufficiency from panhypopituitarism as the most likely cause of hyponatremia.

Unlike primary adrenal insufficiency, secondary adrenal insufficiency originates from a problem with the hypothalamus and/or pituitary, leading to impaired release of Corticotropin-releasing hormone (CRH), ACTH, and cortisol, thereby releasing the inhibitory effect of cortisol on antidiuretic hormone (ADH) secretion.[2] This leads to inappropriate ADH secretion, free water retention, and hyponatremia with a biochemical profile identical to SIADH. Clinically, low ACTH and the relatively preserved aldosterone secretion means that the classic signs of skin pigmentation, hypotension, and hyperkalemia are not present in secondary adrenal insufficiency.

The most frequent cause of secondary adrenal insufficiency is a tumor of the hypothalamic-pituitary region causing panhypopituitarism from tumor growth. Pituitary adenomas are the most frequent cause of sellar masses after the third decade, and only those greater than 1cm (also called macroadenomas) can cause secondary adrenal insufficiency.[7] MRI of the sellar region is the method of choice to diagnose a space-occupying lesion, and if the sellar mass is >1cm in size, testing for hormone hypersecretion (prolactin, IGF-1, cortisol) and hypopituitarism should be performed along with visual field testing. In a patient like ours without clinical or laboratory findings of acromegaly or cushing's syndrome, and a serum prolactin <100 ng/ml, the diagnosis of non-functioning pituitary adenoma is likely, and neurosurgery should be consulted for transsphenoidal surgery.[8]

The treatment of hyponatremia due to secondary adrenal insufficiency and hypopituitarism involves exogenous hormone replacement starting with glucocorticoids.[9] While water restriction is commonly used, some argue that it is important not to limit fluid intake after initiation of steroid replacement

due to the prompt water diuresis that follows. Rapid aquaresis can result in over-correction of serum Na and osmotic demyelination syndrome especially in those with chronic hyponatremia. Thus, it is vitally important to monitor serum Na concentrations and urine output frequently often in a 4 to 6 hour interval to avoid correction of serum Na by more than 8 mmol/L in any 24-hour period. If the correction rate exceeds the recommended 8mmol/L per 24-hour limit such as in our case, ongoing measures to increase serum Na should be withheld and further urinary free water losses should be replaced with oral water or 5% dextrose in water. 2-4µg of desmopressin can also be used to stop further urinary water loss.[9,10]

In conclusion, while SIADH is the most common diagnosis in euvolemic hyponatremia, endocrine disorders such as adrenal insufficiency and hypothyroidism should always be ruled out as part of the assessment, as these disorders respond quickly to hormone replacement, and the repercussions of missing the diagnosis can be severe.

REFERENCES

1. **Flear CT, Gill GV, Burn J**. Hyponatraemia: mechanisms and management. *Lancet*. 1981 Jul 4;2(8236):26-31. doi: 10.1016/s0140-6736(81)90261-0. PMID: 6113402.
2. **Liamis G, Milionis HJ, Elisaf M**. Endocrine disorders: causes of hyponatremia not to neglect. *Ann Med*. 2011 May;43(3):179-87. doi: 10.3109/07853890.2010.530680. Epub 2010 Oct 22. PMID: 20964584.
3. **Milionis HJ, Liamis GL, Elisaf MS**. The hyponatremic patient: a systematic approach to laboratory diagnosis. *CMAJ*. 2002 Apr 16;166(8):1056-62. PMID: 12002984; PMCID: PMC100882.
4. **Hoorn EJ, Zietse R**. Hyponatremia revisited: translating physiology to practice. *Nephron Physiol.* 2008;108(3):p46-59. doi: 10.1159/000119709. Epub 2008 Mar 5. PMID: 18319606.
5. **Kumar S, Berl T**. Sodium. *Lancet*. 1998 Jul 18;352(9123):220-8. doi: 10.1016/S0140-6736(97)12169-9. PMID: 9683227.
6. **Hannon MJ, Thompson CJ**. The syndrome of inappropriate antidiuretic hormone: prevalence, causes and consequences. *Eur J Endocrinol*. 2010 Jun;162 Suppl 1:S5-12. doi: 10.1530/EJE-09-1063. Epub 2010 Feb 17. PMID: 20164214.
7. **Arlt W, Allolio B**. Adrenal insufficiency. *Lancet*. 2003 May 31;361(9372):1881-93. doi: 10.1016/S0140-6736(03)13492-7. PMID: 12788587.
8. **Dekkers OM, Pereira AM, Romijn JA**. Treatment and follow-up of clinically nonfunctioning pituitary macroadenomas. *J Clin Endocrinol Metab*. 2008 Oct;93(10):3717-26. doi: 10.1210/jc.2008-0643. Epub 2008 Aug 5. PMID: 18682516.
9. **Verbalis JG, Goldsmith SR, Greenberg A, Korzelius C, Schrier RW, Sterns RH, Thompson CJ**. Diagnosis, evaluation, and treatment of hyponatremia: expert panel recommendations. *Am J Med*. 2013 Oct;126(10 Suppl 1):S1-42. doi: 10.1016/j.amjmed.2013.07.006. PMID: 24074529.
10. **Diederich S, Franzen NF, Bähr V, Oelkers W**. Severe hyponatremia due to hypopituitarism with adrenal insufficiency: report on 28 cases. *Eur J Endocrinol*. 2003 Jun;148(6):609-17. doi: 10.1530/eje.0.1480609. PMID: 12773132.