CASE REPORT

ONLINE EXCLUSIVE

THE PATIENT

17-year-old-boy

SIGNS & SYMPTOMS

- Headache, dizziness, lethargy, weakness
- Vomiting twice daily for 3 years
- Darkened skin
- Salt cravings

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THE CASE

A 17-year-old boy presented to the emergency department (ED) with a headache, dizziness, lethargy, and weakness that he'd had for 2 weeks. The patient was taking a selective serotonin reuptake inhibitor (SSRI) for depression (sertraline 25 mg/d). He had been vomiting twice daily for the past 3 years. (Although he had been seen multiple times in urgent care clinics, he did not have regular medical care.) The boy was fatigued and had dark yellow urine. His father indicated that his son's skin had darkened over the last 5 to 6 years and that he had been adding salt, in large quantities, to nearly all of his meals for 10 years.

The boy's health issues were impacting his school life. He was dismissed from school often because his teachers felt he was skipping class and using the excuse of needing to urinate or vomit. He had traveled back and forth to Mexico about 2 times a year, with the last time being about 3 months before his trip to the ED.

The patient's vitals included a temperature of 96.3° F, heart rate (HR) of 77 beats/min, respiratory rate of 16 breaths/min, and a supine blood pressure (BP) of 102/58 mm Hg. (The patient's BP was not obtained when sitting or standing, because he felt dizzy when trying to stand or sit up and the HR monitor increased to 100 beats/min.) His weight was 106.9 pounds and height was 5 feet 8 inches. The teen was ill-appearing and somnolent. No jugular vein distention, murmurs, or gallops were noted on exam. The patient's lips were dry and cracked, gums were darkened, and his skin was clammy to the touch. His abdomen was soft with hypoactive bowel sounds and no ascites. His extremities were non-edematous.

A chemistry panel showed a low sodium level of 99 mEq/L, a somewhat high potassium level of 5.2 mmol/L, low chloride (69 mEq/L) and CO_2 (5 mEq/L) levels, a high glucose level (124 mg/dL), and normal creatinine (0.79 mg/dL), albumin (5.2 g/dL), and thyroid stimulating hormone (2.4 mIU/L) levels. A tuberculosis (TB) test, acute hepatitis panel, human immunodeficiency test, and urine drug screen were all negative. Liver enzymes and lipase levels were normal.

The patient was admitted to the pediatric intensive care unit (PICU) on 200 mL/hr normal saline (twice the normal maintenance rate) and we took over his care.

THE DIAGNOSIS

Because of the patient's severe hyponatremia, the differential diagnosis included heart failure, cirrhosis, syndrome of inappropriate antidiuretic hormone secretion (SIADH), SSRI-induced SIADH, cerebral salt wasting, severe hypothyroidism, adrenal insufficiency, malignancies, ecstasy use, renal failure, low dietary solute intake, and psychogenic polydipsia.

A random cortisol test taken in the ED returned and was noted to be very low

(<1 mcg/dL). This information, plus the signs of aldosterone deficiency (low sodium and elevated potassium levels) and adrenocorticotropic hormone (ACTH) excess (skin darkening), prompted us to perform a 250-mcg ACTH stimulation test. Results at 30 and 60 minutes both showed cortisol at <1 mcg/dL, which led us to suspect adrenal insufficiency. The diagnosis of autoimmune adrenalitis, or Addison's disease, was confirmed after inpatient lab work returned with positive 21-hydroxylase antibodies and an elevated ACTH (1117 pg/mL; normal, 10-65 pg/mL).

We noted that the patient's sodium level was gradually increasing while he was receiving the intravenous (IV) fluids. We were concerned, though, that too rapid a sodium correction would put the patient at risk for central pontine myelinolysis (CPM). So we held off on steroids until 24 hours after he was admitted to the PICU, when his sodium level reached 110 mEq/L.

The first evidence of Addison's disease is usually an increase in plasma renin activity with low serum aldosterone.

DISCUSSION

Primary adrenal insufficiency in the developed world is commonly caused by autoimmune adrenalitis, also known as Addison's disease. Addison's disease is the cause of primary adrenal insufficiency in 70% to 90% of cases, with the remainder caused by TB, adrenal hemorrhage, infarction, lymphoma, cytomegalovirus, adrenoleukodystrophy, or metastatic cancer. We also considered adrenoleukodystrophy in our patient, but felt it unlikely in a 17-year-old with normal mental status and positive adrenal antibodies.

The first evidence of Addison's disease is usually an increase in plasma renin activity with low serum aldosterone. This might explain our patient's years of salt cravings prior to presentation. There is typically a decrease in serum cortisol response to ACTH stimulation several months to years after the onset of salt cravings. The next sign of deterioration in adrenal function is an increase in basal serum ACTH; the process concludes with a decreased basal serum cortisol level.[1-3] By the time our patient presented to the ED, his ACTH was very high, his cortisol was low, and his ACTH stimulation response was low.

Acute adrenal insufficiency crisis usually occurs after a prolonged period of nonspecific complaints due to a loss of both glucocorticoids and mineralocorticoids; by the time overt symptoms occur, 90% of the adrenal gland may be destroyed.[3] Patients (such as ours) may present with symptoms such as abdominal pain, weakness, vomiting, fever, and decreased responsiveness. Hyponatremia and hyperkalemia are commonly seen at initial diagnosis. BP can be compromised in some patients due to loss of vascular tone; our patient did not present with this finding.

Treatment includes hydrocortisone and fludrocortisone for life

Initial management focuses on rehydration, maintenance of BP, cardiac monitoring, and electrolyte monitoring with a focus on slow normalization of electrolyte abnormalities. Patients should be treated with hydrocortisone (approximately 10 mg/m^2/d) and fludrocortisone (usually 0.1 mg/d), and they will be maintained on this regimen for life.[1,3]

During acute illness, the doses of hydrocortisone are usually tripled and given 3 times per day to address the increased cortisol needs of the stress response. Lack of stress dose steroids in the setting of illness can lead to repeat adrenal crisis events.

Patients should be taught about intramuscular (IM) hydrocortisone use (100 mg IM) for emergencies and should have medical identification. In many states, emergency medical technicians (EMTs) are now able to administer the patient's own supply of hydrocortisone. EMTs have even begun carrying hydrocortisone in some states in response to a campaign by the CARES Foundation, a nonprofit organization dedicated to helping families and individuals affected by congenital adrenal hyperplasia.

We started our patient on 100 mg/m^2/d hydrocortisone 24 hours after he was admitted to the PICU. (At that time, his sodium level was 110 mEq/L.) Forty-eight hours after admission, we started the patient on fludrocortisone for mineralocorticoid effect

at 0.1 mg/d. (The patient's sodium level was 122 mEq/L). At 72 hours after admission, the patient's sodium level was 137 mEq/L and his mental status was normal. Normal saline was discontinued when sodium normalized. He was discharged 2 days later. He was informed he should continue these medications for life, though doses might be adjusted slightly with time.

Two weeks later, our patient's sodium level had reached 141 mEq/L and his weight loss, depression, vomiting, and fatigue had resolved. He stopped taking his SSRI. He was still craving extra salt, but not as much, and his urine was no longer a very dark yellow.

In retrospect, starting this patient on steroids earlier may not have resulted in any more of a rapid sodium rise than that which occurred otherwise, but we believe that our concern for CPM at that time justified the delay in steroid use. We felt it was safe to delay steroids because the patient's BP was stable and his clinical picture was rapidly improving. In most cases, however, delaying steroids is not advisable.

THE TAKEAWAY

Adrenal insufficiency can be clearly diagnosed via labs and clinical presentation, and is potentially lethal if unrecognized. The predominant manifestations of adrenal crisis are hypotension and shock, usually with hyponatremia and hyperkalemia. During stressful events or illness, patients should increase their glucocorticoid dose. If they are on hydrocortisone, instructions are usually to triple the dose, and give the medication 3 times a day. Patients require instruction beforehand on how and when to increase doses for illness so that they can handle this on their own. Patients should carry a medical identification card so that their condition is evident to anyone caring for them in the ED. JFP

References

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