

Tuberculous Meningitis Presenting with Unusually Severe Hyponatremia

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Abstract

We report a patient with tuberculous meningitis who presented with unusually severe hyponatremia, an electrolyte disorder that may cause symptoms similar to those of tuberculous meningitis. The hyponatremia was probably due to the syndrome of inappropriate antidiuretic hormone secretion, and resolved after instituting water restriction and antituberculous medication.

Key Words: Meningitis, hyponatremia, tuberculosis.

Introduction

TUBERCULOSIS involves the central nervous system (CNS) in approximately 10% of patients, with tuberculous meningitis (TM) as the most common presentation (1). TM may present acutely, with altered sensorium, neck rigidity and fever, or much more subtly, with malaise, headache and minimal mental changes. Therefore, for many patients the diagnosis is not easy, and a high index of suspicion is necessary to recognize it. Unfortunately, when TM is not diagnosed and treated early, mortality and permanent disability rates are high (2).

We describe a case of TM that presented with only subtle signs of meningitis, and lethargy induced by severe hyponatremia, which made the correct diagnosis particularly difficult.

Case Report

A 28-year-old male presented with a 10-day history of headache, malaise and low-grade fever, which had not responded to amoxicillin/clavulanate. On the day of admission, he also had a generalized seizure. His medical record included appendectomy, and tobacco and alcohol abuse. Born in Romania, he had arrived in Spain two weeks before admission. All his relatives were in good health. After recovering from the seizure, he was obtunded, but without focal neurologic deficits; temperature was 37.6°C and breath sounds were diminished in the left thorax base; otherwise, physical examination was normal.

Blood laboratory tests revealed severe hyponatremia and decreased osmolality (Table); potassium level was 4.3 mEq/L, creatinine 0.9 mg/dL, blood urea nitrogen 18.2 mg/dL, and uric acid 3.2 mg/dL. All other blood results, including hematology values, chemistries, blood pH and gas analysis, cortisol, thyroid hormones and coagulation tests, were normal. Urine analysis showed inappropriately high osmolality (Table); all other results were normal. Lumbar puncture, carried out on the day of admission, disclosed a mildly turbid cerebrospinal fluid (CSF), with glucose 16 mg/dL (normal: 40–70 mg/dL), protein 111 mg/dL (normal: 15–50 mg/dL), white blood cells 90 per mm³ (60% neutrophils and 40% lymphocytes) (normal: < 5 mononuclear cells per mm³), and adenosine deaminase 16 IU/L (normal: < 8 IU/L). Chest radiographs revealed a minimal left pleural effusion. The specimen obtained by ultrasound-guided diagnostic thoracentesis was inadequate for laboratory tests. Initially, all microbiologic studies, including those of blood, urine, CSF, sputum and pleural effusion, were negative. An electrocardiogram was normal. Computed tomography (CT) scan and magnetic resonance imaging (MRI) of the head revealed minimal hydrocephalus affecting both lateral ventricles. CT scans of the chest and abdomen were normal except for a small left pleural effusion.

When we received CSF analysis results, we instituted treatment with dietary water restriction, saline perfusion, isoniazid, rifampin, pyrazinamide, ethambutol, ceftriaxone, vancomycin, ampicillin, phenytoin, and dexamethasone. The patient's condition slowly improved over the next hours and days, and by the end of the first week of therapy he was completely asymptomatic. In the second week of therapy *Mycobacterium tuberculosis* grew in the CSF, and treatment was continued with isoniazid, rifampin, pyrazinamide, and ethambutol. The organism was susceptible to all first line antituberculous medications. A repeated CT scan of the head was normal.

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TABLE
Sodium Concentration and Osmolality Results in Blood and Urine.

Days after Admission	0	3	6	9
Blood sodium (mEq/L)	113	116	120	136
Blood osmolality (mOsm/kg)	230	241	NA	NA
Urine sodium (mEq/L)	29	33	NA	NA
Urine osmolality (mOsm/kg)	533	527	NA	NA

NA = not available.

Discussion

TM usually results from the hematogenous spread of primary or postprimary pulmonary infection or from the rupture of a subependymal tubercle into the subarachnoid space. Hydrocephalus and paresis of cranial nerves occur frequently in patients with TM. Other neurologic complications, such as brain edema, focal ischemia, myelitis, arachnoiditis, empyema, syringomyelia, etc. are less common, but they must be kept in mind in order to establish an early diagnosis and treatment (3).

Hyponatremia can result from many disease states, injury, surgery, physical exercise, advanced age, or the administration of certain drugs, such as diuretics, antidepressants or anticonvulsants (4). Clinical manifestations of hyponatremia are related to increased intracellular fluid volume, specifically brain cell swelling or cerebral edema, due to osmotic water shift. For this reason, symptoms are mainly neurologic, and their severity depends on the rapidity of onset and absolute decrease in plasma sodium concentration. Patients with mild hyponatremia may be completely asymptomatic or they may complain of nausea, malaise, dizziness, and headache. As sodium concentration falls, symptoms may progress to include lethargy, confusion, obtundation, and psychosis. If concentration falls below 120 mEq/L or diminishes rapidly, stupor, seizures, and coma are also possible. Even death may occur, although it is more commonly due to the underlying disorder than to hyponatremia itself (4).

Clinical presentation of hyponatremia and TM are partly similar; therefore, there is the risk that TM diagnosis will be overlooked when both conditions coexist, which may have deleterious consequences for patients. Symptoms in our patient were initially thought to be due to hyponatremia, with improvement in obtundation and most other symptoms after institution of treatment for hyponatremia. Nevertheless, the presence of fever and hydrocephalus, as well as the initial absence of an explanation for hyponatremia, led us to perform a lumbar puncture, which enabled us to establish the diagnosis of TM.

For patients who present with extracellular fluid volume contraction or expansion, the etiology of hyponatremia is obvious in most cases. Measuring serum osmolality, urine sodium concentration and urine osmolality may also help to differentiate among the possible causes of the electrolyte disorder (5). The syndrome of inappropriate antidiuretic hormone secretion (SIADH) as a cause of hyponatremia is a diagnosis of exclusion, requiring a thorough search for all other possible etiologies (5). SIADH, a classic presentation of TM, as well as other forms of tuberculosis (6, 7), was probably the cause of hyponatremia in our patient. Most of the other etiologies of the electrolyte disorder could be easily ruled out (5). Moreover, the response of hyponatremia to water restriction and saline perfusion, and the lack of recurrence after initiating antituberculous treatment also favor SIADH, induced by TM, as the cause of the electrolyte disorder (8).

Urine sodium in our case was lower than expected, probably reflecting low solute intake. It is generally recommended that correction of hyponatremia be faster than it was in our case (9), although rapid correction of the electrolyte disorder has been related to pontine and extrapontine myelinolysis (10). High-dose steroid treatment may have contributed to the slow decline in sodium level in our patient (4, 5).

In brief, this case is a classic example of TM presenting with hyponatremia, although the electrolyte disorder was unusually severe.

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