Severe Neurological Signs Due to Hyponatremia in Patient with Acute Myeloid Leukemia; Ethiological Factors and Therapeutic Approach

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Abstract

28-year-old male patient with acute promyelocytic leukemia developed pneumonia subsequent to chemotherapy. *Geotrichum capitatum* was isolated from sputum. Patient was admitted to intensive care unit due to respiratory distress. Linezolid, imipenem, caspofungin and parenteral nutrition therapy (PNT) were initiated. Caspofungin was changed to voriconazole due to widespread reticulonodular and consolidated areas in chest computed tomography. During follow-up at intensive care unit, confusion, hyperkinesia, agitation and rigidity developed due to severe hyponatremia (113 mEq/L). Blood and urine osmolality with hyponatremia indicated inappropriate ADH syndrome. Linezolid and TPN were discontinued and isotonic solution was administered. Hyponatremia and clinical symptoms associated with pneumonia recovered after 15 days of follow-up under voriconazole therapy that was administered for one month.

Keywords: Acute myeloid leukemia; Hyponatremia; *Geotrichum capitatum*; Inappropriate ADH syndrome

Introduction

Electrolyte imbalance is commonly seen in patients with acute leukemia. The most common cause of electrolyte abnormality is hypokalemia. But severe hyponatremia is infrequent. Metabolic studies defined disturbances as early increase of urinary sodium excretion, negative water clearance, and higher urine osmolality [1,2]. Central diabetes insipidus (CDI) develops in patients with acute myeloid leukemia (AML) because of infiltration of leukemic cells into the neurohypophysis or another reasons [3].

It is postulated that different etiologies cause this syndrome. In this case report, a patient who had acute myeloid leukemia (AML) and developed hyponatremia with all symptoms of inappropriate SIADH is being evaluated with probable causes and pathogenetic mechanisms of hyponatremia and CDI that is more likely to cause hyponatremia and related severe neurologic symptoms.

Case

28-year-old male patient with acute promyelocytic leukemia developed pneumonia subsequent to chemotherapy. *Geotrichum capitatum* was isolated from sputum. Patient was admitted to intensive care unit due to respiratory distress. Linezolid, imipenem, caspofungin and parenteral nutrition therapy (PNT) were initiated. Caspofungin was changed to voriconazole due to pneumonia caused by *Aspergillus spp*. *Geotrichum capitatum* was isolated from sputum and susceptible to voriconazole. Patient had recovered after ten days of treatment and control chest CT at first month of follow-up was normal (Figure 3). Laboratorial findings were Na with 113 mmol/L, plasma osmolality with 235 mOsm/kg H₂O (normal range: 285-295), and urine osmolality with 398 mOsm/kg H₂O. Antidiuretic hormone (ADH) could not be measured because of technical inconvenience. These results were consistent with inappropriate ADH syndrome and patient was consilated with nephrology. Isotonic solutions were administered. Serum Na decreased to 112 mmol/L and serum sale was added to isotonic solution (500cc) that was infused as adjusted to 25 cc/hour. There was no definitive signs in brain MRI for diagnosis. Lumbar puncture to evaluate the cerebrospinal fluid could not be implemented due to incooperation with patient.

Figure 1: Chest CT scan (sagittal section) shows widespread reticulonodular and consolidated areas.
Figure 2: Upper abdominal CT reveals multiple hypodense lesions in the liver and spleen in accordance with the fungal infection.

Figure 3: Control CT after one month of voriconazole treatment, resolution of lung infection was monitored.

Figure 4: Cranial MRI shows Gliotic subcortical ischemic foci.

Discussion

Anorexia, nausea, vomiting, weakness, confusion, and coma generally develop in patients with hyponatremia associated with inappropriate ADH syndrome. Urine and blood osmolality should be measured for the diagnosis. Essential treatment is fluid restriction. In case whom acute neurological symptoms appear (Na level 110 mEq/L), hypertonic solutions should be initiated. Furosemide and saline infusions are recommended as well. Due to hormones and cytokines secreted by the tumor, neuropathy and myopathy may occur. Hyponatremia can appear with signs and symptoms regarding central nervous system, such as hallucinations, disorientation and hypokinesia, dyskinesia in the extremities. Disatroph developed in muscle as much as patient could not walk. Hyponatremia may occur due to malignancies, drugs, lung infections, etc. Hyponatremia may be a part of paraneoplastic syndrome in the course of malignancy with inappropriate ADH syndrome (SIADH). However, there are a few studies about hyponatremia and SIADH in patients with acute leukemia [4]. Although the reason of hyponatremia remains unclear in our case, pneumonia caused by Geotrichum capitatum, or medication (eg.linezolid) may be considered.

Geotrichum capitatum, a fungus causing systemic infections in immunosuppressed patients. G. capitatum infections most frequently occur (80%) in patients with acute leukemia [5,6]. MIC is the lowest with a value of anti-fungal drug, voriconazole [7]. Therefore, this drug was initiated as soon as possible and the response was achieved in our patient.

Retrospective immunohistochemical analysis of blast cells was reported to be positive for antidiuretic hormone (ADH) protein, which clearly demonstrated that the tumor cells produced ADH [8]. To measure serum ADH level is needed for accurate diagnosis. It could not be measured due to technical inconvenience. This diagnosis was supported with blood and urine osmolalities and patient was treated on the assumption of inappropriate ADH syndrome. Clinical symptoms and causes of hyponatremia in patient with acute leukemia are presented and discussed in line with literature.

Consequently, hyponatremia should be taken in to consideration in patients with hyperkinesia, rigidity and confusion under acute leukemia chemotherapy.
References


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