

Case Report

Hyponatremia Due to Pneumatocele

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Abstract: Pulmonary pneumatoceles are thin-walled air-filled cystic lesions occurring in lung parenchyma. Pneumatocel is rarely seen in adults. Hyponatremia is defined as a serum sodium level being below 135 mEq/L. Syndrome of inappropriate antidiuretic hormone secretion (SIADH) is a common cause of hyponatremia. SIADH is the most common cause of normovolemic (euvolemic) hyponatremia. Pneumatocele was detected in a 22 year old female patient who is presented with hyponatremia in this article.

Keywords: Pneumatocel, hyponatremia, inappropriate antidiuretic hormone secretion.

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INTRODUCTION

Hyponatremia is defined as the concentration of serum sodium being below $<135\text{mmol/L}$ and it is the most common electrolyte disorder in clinical practice. Clinically, the symptoms of hyponatremia vary depending on the level of plasma sodium, the rate of development of hyponatremia, and the underlying disease. Clinically, they range from asymptomatic to coma. The main symptoms are nausea, vomiting, headache, loss of appetite, lethargy, fatigue, apathy, disorientation, fainting sensation, agitation, muscle cramps, convulsions and coma. In a physical examination, dehydration findings, impaired consciousness, ataxia, decrease in deep tendon reflexes and pathological reflexes may be seen (Renneboog, B. *et al.*, 2006). Hyponatremia is classified as mild hyponatremia if the serum sodium level is between 130 – 135 mmol/L, moderate hyponatremia if the serum sodium level is between 120 – 129 mmol/L and the levels under 120 mmol/L are considered as severe hyponatremia.

Pneumatocel is a thin-walled air filled cyst that develops in the lung parenchyma. Although different theories have been proposed about the exact pathophysiological mechanism of the formation of pneumatocele, it still remains unclear. It is usually associated with infections and its thought to may develop after trauma and mechanical ventilation (Sangro, P. *et al.*, 201; & Al-Saleh, S. *et al.*, 2008).

Pneumatocel can be single or multiple, oval or spherical and can vary in size from 2 to 14 cm (Erbaş, M. *et al.*, 2012). In this article, a 22-year-old woman who developed pneumatacel due to trauma was diagnosed as inappropriate ADH syndrome. No case was found as such in the literature.

CASE

A 22-year-old patient that was diagnosed with hyponatremia was transferred to our clinic. She had been on sertraline tablets for 2 years with a diagnosis of depression. On 12.11.2018, the patient was admitted to the emergency room due to falling from a height and was hospitalized. Laboratory tests on 12.11.2018 identified glucose as 112mg / dl (70-110), blood urea nitrogen as 24mg / dl (7-25), serum creatinine as 0.6mg / dl (0.5-1.1), serum sodium as 145mmol / L (130-145), as potassium 4.9mmol / L (3.5-5.5), and creatinine kinase as 4267 U / L (25-200). Thorax tomography revealed diffuse contusion in the posterior segments of the right lung, and an approximate 7x4 cm of hemorrhage was observed in the parenchyma at the posterior level of the right lung. A millimeter pneumothorax was observed in the apical area. Sensorineural hearing loss due to trauma in the ear was detected. On 21.11.2018, the patient was found to have hyponatremia (serum sodium 125 mmo / L) and the patient was treated. On 26.11.2018 the patient with the sodium level being 109mmol / L was treated, and on 28.11.2018 the patient was referred to our outpatient

clinic with a serum sodium level of 120mmol / L. On physical examination, blood pressure was 120 / 70mmHg, body temperature was 36.6C, heart rate was 78 / min and no other pathology was observed. In the laboratory examination, glucose level was 87mg / dl, blood urea nitrogen 9mg / dl, serum creatinine level 0,32mg / dl, sodium 119mmol / L, potassium 4,8mmol / L, chlorine 85mmol / L (95-110), calcium 8,8mg / dl (8,6-10), serum uric acid 0,8 mg / dl (2,6-6), the thyroid hormones were in normal range, cortisol 14,9ug / dl (6,2-19,4) and blood gas was evaluated as normal. The patient's urine analysis was normal and urine sodium was 70mEq / L. Serum osmolality was calculated as 246mOsm / kg. The patient with normovolemic hyponatremia was thought to have inappropriate ADH syndrome due to sertraline. She underwent a fluid restriction, and sertraline was discontinued, but serum sodium did not improve, so, a 3% sodium chloride treatment was initiated. The patient with a serum sodium level of 133mmol / L was discharged with recommendations. The serum sodium value was 116 mmol / L after two weeks. Brain and thoracic tomography were performed to evaluate the etiology in the patient after having hyponatremia. Brain tomography of the patient was normal, thorax tomography of the right lung lower lobe was superior and posterobasal segments of the thick walled 5.5 cm diameter pneumatocele was present (figure 1). On the right 7,8,9 and 10th of the posterolateral corner of the ribs was an old fracture, oblique fracture was found in the costovertebral junction of the right 1,2 and 3rd ribs, and oblique fractures were found in the left transverse projections of the C7, T1, T2, T3, T4, T5, and T6 vertebrae. Chest diseases, consultation was requested, ARB was negative. The markers of inflammation were within normal limits. When asked, she indicated that she had chest pain and coughing again. Gemifloxacin was given by the chest diseases physician. Fluid restriction was given at 3% sodium chloride plus furosemide for hyponatremia. The patient was discharged with a serum sodium level of 135mmol / L. Later check ups of the patient indicated a serum sodium level of 136 mmol / L after two weeks.

DISCUSSION

Traumatic pneumatocele is a rare complication of blunt chest trauma. Pulmonary laceration represents trapped air and is a benign self-limiting condition. It is mostly seen in children and young adults. Symptoms are usually not initially specific. Chest pain, cough and shortness of breath can be seen in the first few days. In-sputum blood traces may be the first symptom, but gross hemoptysis is rarely seen (Yang, T. C. *et al.*, 2010). Common causes of pneumatocele-induced acute pneumonia include staphylococcus aureus, streptococcus pneumoniae, hemophilus influenzae, E. coli, group A streptococcus, serrata marcescens, klebsiella pneumoniae, adenovirus, pneumocystis jirovecii pneumonia, tbc (Gholap, P.M., & Shankar, A. S. 2017). It was observed that our patient developed pneumatocele

after trauma. The patient had chest pain and cough. ARB negative and sputum did not grow.

The first treatment for asymptomatic pneumatocele is antibiotics. The use of prophylactic antibiotics is still controversial, but is not necessary in most cases. Most asymptomatic pneumatocele are dissected by natural and conservative methods, and do not require surgical and percutaneous intervention. Traumatic pneumatocele usually resolves itself spontaneously within 1-4 months with supportive treatment. If the patient has no other trauma-related complications, the only treatment required is observation. Invasive treatment may be necessary only for complications such as tension pneumatocele and respiratory distress (Renneboog, B. *et al.*, 2006; Sangro, P. *et al.*, 2018; Al-Saleh, S. *et al.*, 2008; Erbaş, M. *et al.*, 2012; Yang, T. C. *et al.*, 2010; & Gholap, P.M., & Shankar, A. S. 2017).

There are many causes of inappropriate ADH syndrome etiology. Causes of inappropriate ADH syndrome include; Central nervous system disorders (stroke, hemorrhage, infection, trauma, mental diseases, psychosis), malignancies (small cell lung cancer, extrapulmonary small cell cancer, head and neck cancers, neuroblastoma), drugs (the most common are carbamazepine, oxcarbazepine, chlorpropamide, cyclophosphamide, and selective serotonin reuptake inhibitors, ecstasy, less NSAIDs, opiates, interferons, methotrexate, vincristine, vinblastine, ciprofloxacin, haloperidol, and imatinib) and pulmonary diseases (pneumonia, asthma, atelectasis, ARDS, pneumothorax). Inappropriate ADH syndrome is diagnosed as such: Serum sodium level being below 135mEq / L, serum osmolality being lower than 275mOsm / kg, urine sodium being above 40mEq / L, urine osmolality being above 100mOsm / kg, absence of dehydration findings, other causes of hyponatremia (hypothyroidism, adrenal insufficiency, cardiac failure, renal failure, pituitary insufficiency), fluid restriction, hypouricemia, the presence of normal acid base and potassium (Yasir, M., & Mechanic, O. J. 2019).

The first step in the treatment of inappropriate ADH syndrome is the treatment of the underlying disease. In addition, fluid restriction, oral sodium chloride preparations, severe oral demoxycycline, 3% hypertonic saline infusion and furosemide are recommended. In patients with inappropriate ADH syndrome, fluid restriction should be performed first. 0.5-1 liters of fluid per day can be given to such patients. If urine osmolality <500mOsm / kg is 500ml / day, urine osmolality > 500mOsm / kg 1lt, fluid restriction is performed. In addition to fluid restriction, 3% hypertonic saline solution should be given by intravenous infusion at a dose of 1-2 mL / kg / h in order to eliminate the serious signs and symptoms caused by hyponatremia. In patients with urine osmolality <500 mOsm/kg H₂O of fluid 0.9% sodium

chloride solution should be used. In those with urine osmolality > 500 mOsm/kg H₂O of fluid 3% sodium chloride solution should be used. In addition, loop diuretics are recommended to increase diuresis in water with a high sodium diet in patients who do not respond to fluid restriction. Tolvaptan and conivaptan, which are vasopressin receptor antagonists, are recommended in eugolemic and hypervolemic hyponatremia (Yıldız, G. *et al.*, 2011; Fukagawa, M. *et al.*, 2017; Spasovski, G. *et al.*, 2014; Hauptman, P. J. *et al.*, 2013; & Eren, Z. 2018). In our case, fluid restriction was treated with 3% sodium chloride and furosemide.

As a result, hyponatremia has many pulmonary causes. Pneumatocele-induced hyponatremia was not previously detected in the literature. In our patient, sertraline use was present, and pneumatocele was detected on thoracic tomography after the recurrence of hyponatremia two weeks after the discontinuation of sertraline. It was detected that after the questioning of the patient, that she had history of falling from a height; and a thoracic tomography revealed pneumatocele as a result of trauma.

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