Title

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Journal

Proceedings of UCLA Health, 21(1)

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Publication Date

2017-03-27

CLINICAL VIGNETTE

Hyponatremia and Syndrome of Inappropriate Antidiuretic Hormone after Orthopedic Surgery

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Case Report

An 87-year-old male with osteoporosis and severe osteoarthritis was hospitalized for right intertrochanteric fracture and underwent repair with femoral rod placement. The patient was transferred to a skilled nursing facility for rehabilitation and management of post-operative anemia and pain. Follow-up laboratory testing revealed worsening hyponatremia declining from 136 mEq/L to 121 mEq/L over a period of ten days. During this time, the patient remained asymptomatic and denied nausea, anorexia, headache, lethargy, thirst, or abdominal cramps. Renal and liver function tests were within normal limits.

The patient was subsequently re-hospitalized for evaluation and management of severe post-operative hyponatremia. On admission, serum sodium was 118 mEq/L. Workup of hyponatremia with serum and urine studies suggested syndrome of inappropriate antidiuretic hormone secretion (SIADH). Other lab results were unremarkable and infectious workup was negative.

As the patient remained asymptomatic, hypertonic saline was not initiated. He was placed on fluid restriction and sodium chloride tablet supplementation. Daily serum sodium trends showed correction from mid-120s to 130 on day of discharge. He was discharged back to the skilled nursing facility with continued fluid restriction and sodium chloride tablets, and his sodium levels eventually normalized.

Discussion

Increasing age is an independent risk factor for serum sodium abnormalities.[1] Older adults in outpatient setting had hyponatremia in up to 7% of those tested,[2] with prevalence increasing to over 20% in the inpatient setting,[3] 18 to 22% in long-term care facilities,[4] and 30% in the intensive care unit. Older adults are at risk for metabolic and volume derangements as age-related anatomic, hemodynamic, and hormonal changes affect homeostasis of fluids, electrolytes, volume status, and acid-base balance. Under normal conditions, the aging kidney maintains homeostasis. Under stressful conditions, the adaptive response to maintain homeostasis is disrupted. Disorders of serum sodium concentration are the most common electrolyte abnormalities observed in older adults, and the most common disorder of serum sodium concentration in older adults is hyponatremia, commonly defined as a serum sodium concentration below 135 meq/L.[5]

Early recognition and treatment of hyponatremia are essential for patient safety and prevention of complications and neurologic sequelae in older adults. Common symptoms can be vague and include headache, lethargy, thirst, anorexia, and abdominal cramps. Hyponatremia can result in a wide range of consequences involving multiple organ systems, but most severe cases affect the central nervous system (CNS). While mild chronic hyponatremia may be asymptomatic, acute severe hyponatremia can cause cerebral edema and irreversible neurologic damage. Mild and apparently asymptomatic hyponatremia is associated with abnormalities in gait and attention, falls, and increased fracture risk in older adults.[6,7] The risk of seizures increase with further decline in sodium levels and hyponatremia can also worsen the prognosis of heart and renal failure.

The most common cause of hyponatremia in older adults is SIADH.[8] Age-associated decreases in glomerular filtration rate and free water clearance, decreased activity of the renin-angiotensin-aldosterone system, and increased activity of natriuretic hormones contribute to the development of hyponatremia. SIADH can be diagnosed in older patients with euvolemic hyponatremia and elevated urine sodium concentrations (> 20 or 30 mEq/L) and urine osmolality. Evaluation of serum sodium abnormalities in the geriatric population involves careful history taking and physical examination. Ruling out central nervous system disease, neoplasms, and endocrinopathies such as hypoadrenalism and hypothyroidism is needed for older patients with euvolemic hyponatremia. Certain medications, especially diuretics including thiazides and loop diuretics, can exacerbate risks of hyponatremia through sodium and fluid losses. Other medications that can stimulate antidiuretic hormone (ADH) secretion include tricyclic antidepressants, selective serotonin reuptake inhibitors, antipsychotics, narcotics, and certain antineoplastic agents.

Hyponatremia can be found in postoperatively. Cause is oftentimes multifactorial and can be overlooked or missed. Ongoing pain after surgery and chronic pain syndromes can cause increased secretion of ADH. In these scenarios, ADH release is believed to be mediated by pain afferents.[9,10] In orthopedic patients, mortality can be two times higher in mild, and up to four fold higher in more severe cases of hyponatremia.[11] Surgical stress and post-operative pain increase the secretion of ADH promoting water retention.

Increased circulating ADH is common after surgery and generally returns to normal approximately five days later. Postoperative stress can last twelve hours after minor surgery and up to several days or longer after major surgery.[12] As previously mentioned, the risk of hyponatremia in the elderly is also affected by medications, especially diuretics, such as thiazides. Patients on diuretics preoperatively can develop hyponatremia with stress of surgery or fluid shifts. Hyponatremia becomes more evident if diuretics are continued postoperatively. Holding these medications if hyponatremia occurs and using them with caution can help reduce the risk of sodium deficiency.

Currently, there is no consensus on the optimal treatment of hyponatremia. If the patient is symptomatic, treatment should be prompt. The rate of correction should focus on reversing the manifestations of hypotonicity, while trying to minimize the risk for osmotic demyelination. Fluid infusions should be restricted to normal or hypertonic saline and sodium concentrations monitored closely. The aim is to raise serum sodium by 1-2 mmol/L per hour (depending on the severity of neurological symptoms) until symptoms resolve. If there are no symptoms, management can include fluid and free water restriction along with sodium supplementation and occasionally diuretic therapy. Although it may appear counterintuitive, loop diuretics can be used to enhance free water excretion and augment the recovery of sodium levels.[13]

Conclusion

Hyponatremia is a common electrolyte abnormality in clinical practice and can be the result of a myriad of illnesses. Normal aging impairs fluid homeostasis and can lead to greater sensitivity to sodium and water imbalance. SIADH is the most common cause in elderly, euvolemic patients. Postoperative hyponatremia can be caused by surgical stress, which causes SIADH secretion, resulting in water retention. The treatment should be prompt, but undertaken with care to avoid rapid increases in sodium levels that can cause CNS demyelination.

This case illustrates an example of a patient with hyponatremia in the postoperative state. Fortunately, this patient was not symptomatic and did not have neurologic sequelae of this condition. However, it is important to remain vigilant of these electrolyte derangements and respond promptly to avoid potential negative consequences or outcomes.

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Submitted March 27, 2017