Hyponatremia and SIADH

A case study for nursing consideration

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Hyponatremia is an electrolyte abnormality commonly encountered in oncology practice and is usually defined by a serum sodium level less than 135 meq/L (Castillo, Vincent, & Justice, 2012). Syndrome of inappropriate antidiuretic hormone (SIADH) is the leading cause of hyponatremia in patients with cancer, occurring in as many as 30% of all cases (Raftopoulos, 2007). The cardinal symptoms of SIADH are presented in Table 1. The crucial signs of SIADH are hyponatremia, serum hypo-osmolality, and less than maximally diluted urine. Common symptoms include weakness, lethargy, headache, anorexia, and weight gain (Castillo et al., 2012). SIADH is an oncologic emergency that needs prompt evaluation and management. Hyponatremia in patients with cancer is associated with significant morbidity and mortality. Patients with malignancy-associated SIADH have considerably worse outcomes than patients with cancer and SIADH because of other etiologies (Goldvasser et al., 2016).

Case Study

D.J., a 55-year-old married Caucasian man, father of two, and recreational volleyball coach, presented to a clinic with an enlarged nodule in his right groin, initially thought to be an infection related to a recent bee sting. He was originally evaluated by his primary care provider after the bee sting to evaluate the lump that remained on his leg several weeks after the injury. His vital signs were stable, he was alert and oriented, he had no labored breathing, his abdomen was flat and non-distended, he had right lower quadrant tenderness with deep palpation, and he had no rashes or lower extremity edema. The primary care provider felt the surgical scar tissue under the previous lymph node but did not detect any swelling or lymphadenopathy. His past medical history was positive for an arrhythmia and bee sting. His psychosocial status was negative for alcohol, smoking, and illicit drug use. D.J. had stopped coaching but was still attending the games as tolerated. His family history showed that his mother, paternal aunt, and paternal grandfather had lymphoma. He underwent an ultrasound of the right groin, which revealed a group of abnormal lymph nodes, the largest measuring 3.2 cm. D.J. had an excisional tissue biopsy of the right inguinal lymph node but did not detect any swelling or lymphadenopathy. He was clinically diagnosed with DLBCL (National Guideline Alliance, 2016). He was clinically diagnosed with DLBCL, which was identified in 95% of the tissue with 3% high-grade lymphoma. A Ki-67 proliferation index was not conducted. A positron-emission tomography (PET) scan revealed stage IV DLBCL with involvement of multifocal nodule soft tissue. There was skeletal involvement throughout the chest, abdomen, and pelvis with a superficial sternal soft tissue lesion, as well as increased uptake and thickening of the gastric wall near the fundus with multiple axial skeletal lesions at the 10th thoracic vertebra. The

The leading cause of hyponatremia in patients with cancer is syndrome of inappropriate antidiuretic hormone secretion (SIADH); this oncologic emergency requires immediate intervention. Left untreated, it can result in increased mortality and morbidity. A sodium level less than 135 meq/L is an electrolyte irregularity and defined as hyponatremia. It is extremely critical that oncology nurses are knowledgeable and able to evaluate and determine when patients are in fluid and electrolyte crisis. Nurses should be aware of the specific cancers and treatments that put patients at risk for developing hyponatremia. This article presents a case study for nursing consideration.

AT A GLANCE

- Continue to assess patients for oncologic emergencies like SIADH.
- Be aware of specific cancers and regimens that may predispose patients to hyponatremia.
- Educate patients and caregivers about the side effects of their treatment regimens.

KEYWORDS

SIADH; hyponatremia; arginine vasopressin; sodium; mortality

DIGITAL OBJECT IDENTIFIER

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diagnosis of DLBCL was based on morphology and immunophenotyping.

Firstline treatment for D.J. consisted of a standard of care regimen with R-CHOP chemotherapy (rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone) for a total of six cycles every 21 days (National Comprehensive Cancer Network, 2017). The plan was to restage the patient with a PET/computed tomography scan after four cycles of R-CHOP, then continue with the remaining two cycles of chemotherapy.

After the first cycle of R-CHOP, the patient presented with tremors, confusion, weakness, fatigue, and restlessness. His vital signs were stable. A complete blood count with differential (CBCD) and complete metabolic panel (CMP) were drawn, and the CBCD results were remarkable. The CMP had to be sent out because no chemistry analyzer was available in the office. Meanwhile, 2 L of normal saline were administered to D.J. in the clinic. It was suspected that the patient was experiencing tumor lysis syndrome because of his diagnosis and symptoms. D.J.’s symptoms did not resolve with IV hydration, and after 70 minutes, his sodium level returned to 120 meq/L, indicating profound hyponatremia. He was transported to the local emergency department, where he was admitted to the intensive care unit with SIADH. His sodium level upon admission to the intensive care unit was 113 meq/L.

### Pathophysiology

SIADH consists of hyponatremia, inappropriately elevated urine osmolality (greater than 100 mosm/kg), and decreased serum osmolality in an euvolemic patient (no clinical signs of volume depletion of extracellular fluids). Hyponatremia severity is based on the following levels:

- Mild: 130–134 meq/L
- Moderate: 125–129 meq/L
- Profound: less than 125 meq/L (Onitilo, Kio, & Doi, 2007)

SIADH should be considered when these findings occur in the setting of normal cardiac, renal, hepatic, adrenal, and thyroid function, as well as in the absence of diuretic therapy and other factors known to stimulate antidiuretic hormone vasopressin (AVP) release (Thomas, 2017).

In people with SIADH, the secretion of AVP leads to enhanced water reabsorption, which results in hyponatremia because of hemodilution. Excessive water intake is the key to the development of SIADH. Patients with inappropriate AVP secretion may have increased thirst leading to excess water intake, which exceeds the water excreted. This increase in fluid intake may contribute to hyponatremia.

### Signs and Symptoms

Signs and symptoms of SIADH include low urine output without hypovolemia, low sodium levels (less than 135 meq/L), decreased serum osmolality (less than 235 mosm/L), increased urine-specific gravity (greater than 1.02), nausea, vomiting, and mental status changes. Seizures, cerebral edema, cerebral hemorrhage, and pulmonary edema also may occur (Thomas, 2017).

In addition to chemotherapy itself, the vigorous hydration administered to prevent cisplatin nephrotoxicity, hemorrhagic cystitis, and tumor lysis syndrome can exacerbate hyponatremia (Iyer, Krasnow, Dufour, & Arcenas, 2003).

### Tumor Board Clinical Recommendations

This case was presented at a weekly tumor board meeting. The recommendation was made to hold the vincristine for cycle 2 because chemotherapy is known to stimulate AVP secretion. Despite holding the vincristine, D.J. remained mildly hyponatremic. Medical personnel monitored his sodium levels, restricted his free fluids, and instructed him to take sodium supplements. Given their findings indicating

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**TABLE 1. CARDINAL SYMPTOMS OF SIADH**

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>NORMAL LABORATORY VALUE</th>
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<tbody>
<tr>
<td>Hyponatremia with serum hypo-osmolality</td>
<td>135–145 meq/L, 280–295 mosm/L</td>
</tr>
<tr>
<td>Urine osmolality inappropriately high for serum osmolality</td>
<td>50 meq/kg</td>
</tr>
<tr>
<td>Urine less than maximally dilute</td>
<td>500–800 mosm/kg</td>
</tr>
</tbody>
</table>
| Normal renal and adrenal function (reflected in cortisol level) | [0.6–1.2 mcg/dl]
|                                              | [10–20 mcg/dl in the morning]                 |
|                                              | [3–10 mcg/dl at 4 pm]                         |
|                                              | [Less than 5 mcg/dl at bedtime]               |

SIADH—syndrome of inappropriate antidiuretic hormone


"Hyponatremia in patients with cancer is associated with significant morbidity and mortality."
that SIADH may actually be related to the tumor secreting ADH, Hirata et al. (2009) recommended that vincristine be added back to cycle 3. With each cycle of chemotherapy, there is a decreased tumor load causing SIADH symptoms to regress. Clinical recommendations advised monitoring the patient’s sodium level at 24 and 48 hours (postchemotherapy) along with symptoms assessment. D.J. was on a fluid restriction of 1 L per day for one week after chemotherapy, then he resumed his normal intake. The patient continued treatment with no recurrent symptoms, and D.J.’s sodium normalized to 138 meq/L. He completed six cycles of R-CHOP and continues to do well.

**Implications for Nursing**

Diagnosing SIADH and knowing what to look for are critical in caring for patients. A physical and neurologic examination are crucial. Assessing for changes in mental status, irritability, headache, confusion, tremors, restlessness, nausea and vomiting, fatigue, and weakness reveals key findings. Laboratory tests will show low sodium levels and decreased serum osmolality (less than 235 mosm/L). Patients may present with a low urine output without hypovolemia.

Clinical management of SIADH involves slowly normalizing patients’ sodium level during 24–48 hours. Replacing fluid restriction too quickly can result in death. Severely symptomatic hyponatremic patients require hypertonic 3% saline. Fluid should be restricted to about 500 ml less than the daily output. With fluid restriction, it usually takes several days to see an increase in sodium levels.

Patients will require hospitalization for intensive monitoring and treatment. Patients’ serum osmolality should be normalized, and correction of excess extracellular fluid volume is necessary. Many patients with SIADH will need loop diuretics, such as bumetanide, ethacrynic acid, furosemide, or torsemide. Clinical management by nursing requires close monitoring of intake and output, maintaining fluid restriction, hemodynamic monitoring, and conducting frequent neurologic checks. Nurses also need to monitor serum laboratory values, including electrolytes, serum osmolality, and urine-specific gravity.

**Conclusion**

Oncology nurses must continually assess patients for oncologic emergencies such as SIADH. These professionals are critical in recognizing early signs of such emergencies. Nurses also need to educate patients and caregivers on the side effects of their treatment regimens, and should be aware of specific cancers and regimens that may predispose patients to hyponatremia. Nurses must remember that the problem with hyponatremia is excess water intake rather than decreased sodium. Hyponatremia in patients with cancer is associated with significant morbidity and mortality. Therefore, it is critical to monitor patients as they undergo chemotherapy, immunotherapy, and other treatments so that they can be ready for any emergency that may occur.

**References**


Zomp, A., & Alexander, E. (2012). Syndrome of inappropriate antidiuretic hormone and cerebral salt wasting in critically ill patients. AACN Advanced Critical Care, 23, 233–239. [https://doi.org/10.1097/NCI.0b013e31824ebd1b](https://doi.org/10.1097/NCI.0b013e31824ebd1b)