Abstract  We report the case of inappropriate anti-diuretic hormone secretion (SIADH) following transurethral resection of bladder tumor (TURBT) surgery. An 88-year-old man was admitted to our hospital for TURBT. The clinical course after surgery was good; however, he began to feel nausea on post-operative day 8. His serum sodium level was 105 mEq/L, and other clinical findings satisfied all criteria for SIADH. Pathological findings of the TURBT specimen showed no evidence of an endocrine-producing tumour. We assume that the combination of advanced age, TUR surgery stress and vomiting ultimately led to SIADH in this patient. This case is a very rare phenomenon as it involves both SIADH with bladder cancer and SIADH following TURBT. SIADH should be taken into consideration when elderly patients are undergoing any type of surgery.

Key words: syndrome of inappropriate anti-diuretic hormone, transurethral resection of bladder tumor

Introduction

Hyponatremia is one of the most common paraneoplastic syndromes in patients with malignant disease. The syndrome of inappropriate anti-diuretic hormone (SIADH) is a leading cause of hyponatremia in patients with cancer, accounting for approximately 30% of all hyponatremia cases. SIADH was initially reported in two patients with lung cancer by Schwartz et al in 1957. SIADH is associated with numerous conditions, including cancer, pulmonary disease, central nervous system disorders, drugs exposure. SIADH occurs in a wide range of cancers but is most common with small-cell lung cancer, ranging in frequency from 11% to 46%. Other malignancies are shown in only a few case reports.

We experienced a patient with SIADH accompanying urothelial carcinoma of the bladder after transurethral resection of bladder tumor (TURBT). SIADH with bladder tumour is rare, as is SIADH following TURBT. We report on this case in the context of a relevant review of the literature.

Case Report

An 88-year-old man was admitted to our hospital for TURBT surgery. He had undergone TURBT repeatedly with this being the 14th such surgery. During the surgery, a recurrent bladder tumour located on the anterior wall of the bladder was safely resected. On the post-operative day 1, the urethral catheter was removed. Pathological findings of the TURBT specimen showed normal urothelial carcinoma Ta, low grade, with no evidence of endocrine production (Fig. 1). The patient planned to leave the hospital on the post-operative day 8; however, the plan was postponed because he began to feel nauseous. He had no other symptoms with no disturbance of consciousness or neurologic manifestations. Head and body computed tomography (CT) demonstrated no abnormality. However, blood examination revealed a serum sodium level of 105 mEq/L, which we supposed was the cause of nausea. Investigations at that stage showed the following ADH level, 7.8 pg/mL (<4.2 pg/mL; plasma osmolality, 225 mOsm/kg; urine osmolality, 393 mOsm/L; serum creatinine, 0.7 mg/dL; and serum cortisol, 21.3 MCG/DL (4.5-21.1 μg/dL). During the first 24 h, the total urine output was 2000 mL. His blood pressure was 118/58 mmHg, with a heart rate of 78 beats/min and SpO2 of 97%. He had no clinical evidence of hypovolemia.

The patient was diagnosed with SIADH after satisfying all criteria for the same. Treatment was started with fluid restriction to a maximum of 500 mL daily. Over the course of 16 days, his nausea improved, and his serum sodium level rose to 128 mEq/L. After discharge from
hospital on the post-operative day 25, he continued to improve. Two weeks after his discharge, his serum sodium level was 138 mEq/L (Fig. 2). At 2 months after discharge, his serum sodium level was 139 mEq/L and serum ADH level was 5.6 pg/mL. The patient did well, without subsequent recurrence, for 3 months.

Discussion

SIADH is a disorder of impaired water excretion caused by the inability to suppress the secretion of antidiuretic hormone (ADH). The symptoms of SIADH differ between patients. In more severe cases, patients may experience fatigue, coma, seizures, nausea and vomiting. Well-known causes of SIADH include pulmonary disease and central nervous system disorders, such as head injury, neurological tumours and infections. Certain drugs (i.e. barbiturates, anticonvulsants, cyclophosphamide, and chlorpromazine) that stimulate ADH secretion can also induce this syndrome. SIADH commonly appears in patients with malignant tumours, including small-cell carcinoma of the lung, that produce ADH-like substances. SIADH cases secondary to cancers of the pancreas, colon, stomach and prostate have been reported. SIADH with bladder tumour have been reported in 1977 by Kaye. To our knowledge, the present case is the second reported to involve SIADH associated with bladder cancer (Table 1). However, this case is the first case of SIADH following TUR surgery.

Characteristic laboratory findings of SIADH are high urinary sodium levels, despite hyponatraemia and normal renal and adrenal functions. A tumour is generally regarded producing ectopic ADH when ADH is found in the tumour tissue. However, the diagnosis of ectopic ADH production by a tumour is relatively difficult. Shimizu et al reported that of the gynaecological ADH-producing cancers, only 2 of 9 patients were proved to produce ADH by immunohistological examination. In the present case, we cannot immediately conclude that ectopic ADH production from the bladder tumour caused hyponatraemia because the pathological findings of the TURBT specimen showed low-grade urothelial carcinoma with no evidence of endocrine- production. ADH-producing tumours are often high-grade or small-cell carcinoma. So what was the cause of the hyponatraemia?

Table 1 Reported cases of SIADH with bladder tumour

<table>
<thead>
<tr>
<th>Author</th>
<th>Publication year</th>
<th>Age, gender</th>
<th>Histological subtype</th>
<th>Treatment</th>
<th>Day of SIADH diagnosis</th>
<th>Minimum value of serum sodium</th>
<th>Presumed cases of SIADH</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.B. Kaye</td>
<td>1977</td>
<td>77F</td>
<td>Squamous carcinoma</td>
<td>Radiotherapy</td>
<td>2 days later</td>
<td>104 mEq/L</td>
<td>ectopic production of ADH by the bladder tumour</td>
</tr>
<tr>
<td>Present case</td>
<td>2015</td>
<td>88M</td>
<td>Urothelial carcinoma</td>
<td>TURBT</td>
<td>9 days later</td>
<td>105 mEq/L</td>
<td>surgical stress, advanced age</td>
</tr>
</tbody>
</table>

Fig. 1 Pathological findings of the TURBT specimen show urothelial carcinoma Ta, low grade with no evidence of endocrine production.

Fig. 2 Clinical course and serum sodium levels.
tion, pain, physical and emotional stress, and advanced age. In this case, we believe that the combination of these factors led to SIADH.

The main treatment strategy for hyponatremia due to SIADH is water restriction to restore urine osmolality and normal serum sodium concentrations. Appropriate supportive management of symptoms is also essential. Any identified cause of hyponatremia is treated concurrently. It is vital that even in patients with severe hyponatremia, increase in serum sodium level should not exceed 10 mEq/L over the first 24 h to avoid the risk of central pontine myelinolysis. In this patient, after adequate sodium supplementation and fluid restriction, the serum sodium level gradually returned to normal within 4 weeks.

In urology practice, we occasionally encounter cases of hyponatremia that require particular attention including TUR syndrome after TUR-P, renal salt-wasting syndrome during cisplatin based chemotherapy, neuroendocrine carcinoma of the prostate, and the use of morphine to treat cancer pain. So-called minimally-invasive surgeries such as laparoscopic surgery, endoscopic surgery and short-stay surgery have become more common. However, we should be aware that these procedures can lead to severe SIADH symptoms. We need to take SIADH into consideration when elderly patients undergo any type of surgery.

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Conflict of interest
There are no conflicts of interest.

References