Case Report

Pituitary Metastasis of Pulmonary Adenocarcinoma Presenting with Polyuria Masked by Poor Glycemic Control: A Case Report

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Abstract

Hyperglycemia may present with polyuria and polydipsia, which are also the main clinical features of diabetes insipidus (DI). Diabetic patients with polyuria and polydipsia may be mistaken as poor glycemic control, which will delay the diagnosis and treatment of DI and related underlying disease. Herein, we present a 54-year-old man who had polyuria and polydipsia for three months. Initial laboratory data showed HbA1C 7.9%, and urine glucose 1000 mg/dL. Diabetes mellitus was the initial diagnosis and treated with metformin. However, polyuria and polydipsia persisted even though hyperglycemia had been kept under control. Low urine osmolality and high urine output led to the diagnosis of DI. A desmopressin test confirmed the presence of central DI. After a series of study, pituitary metastasis of lung cancer (adenocarcinoma) was the final diagnosis. The patient’s polyuria and polydipsia improved after treatment with intranasal desmopressin; while multiple brain metastases were treated with CyberKnife® radiosurgery. In conclusion, the development of DI with polyuria and polydipsia in diabetic patients with poor glycemic control could be overlooked, which will delay the diagnosis and treatment of underlying disease such as malignancy. Monitoring urine osmolality or specific gravity for diabetic patients with significant polyuria and polydipsia is helpful. (Acta Nephrologica 2011; 25: 137-140)

KEY WORDS: central diabetes insipidus, pulmonary adenocarcinoma, pituitary metastasis, polyuria

Introduction

Although diabetes mellitus (DM) is widely known as the most common cause of polyuria and polydipsia, the possibility of diabetes insipidus (DI) should be considered by physicians. DI is a clinical syndrome with hypotonic polyuria and polydipsia and classified into four types: (i) primary polydipsic DI, (ii) nephrogenic DI, (iii) central DI, and (iv) gestagenic DI. Water deprivation test and/or vasopressin challenge test is useful in differentiating among the major forms of DI. Central DI is a rare hypothalamus-pituitary disease. It occurs in both genders equally, and affects all ages with the most frequent age of onset between 10 and 20 years (1). Most cases of central DI are acquired (2), and pituitary metastasis is found in 10% to 20% of patients with DI (3). Various types of neoplasms have been reported (4, 5) and the most common lesions that metastasis to the pituitary gland are pulmonary carcinoma in men and breast carcinoma in women (6). Generally, pituitary metastasis involves patients with the most frequent age being between 50 and 60 years but shows no clear sex predominance (7, 8). The important principal finding in diagnosing metastatic
disease to the pituitary is DI (3, 6, 9). Herein, we report a diabetic patient with poor glycemic control presenting with polyuria finally related to central DI caused by pituitary metastasis from pulmonary adenocarcinoma. His symptoms resolved after treatment with intranasal desmopressin. In view of the rarity of this manifestation in patients with pulmonary adenocarcinoma, we report this case along with a brief review of the relevant literature.

Case Report

A 54-year-old man had been suffering from polydipsia and polyuria without weight loss for three months. Initial laboratory data showed postprandial plasma glucose 274 mg/dL, HbA1C 7.9%, and urine glucose 1000 mg/dL. DM was the initial diagnosis and was treated with metformin 500 mg twice daily. However, polyuria and polydipsia persisted even though hyperglycemia had been kept under control. He was admitted due to low urine osmolality of 94 mOsm/kg with serum sodium 149 mmol/L and osmolality 306 mOsm/kg, the other electrolytes and creatinine were all within their normal range. His urine volume was approximately 12 liters per day. Physical examination was found to be unremarkable. Vasopressin test was performed with a baseline serum osmolality of 295 mOsm/kg, urine osmolality and urine specific gravity were 112 mOsm/kg and < 1.005, respectively. Central DI was confirmed in view of increase in urine osmolality to 503 mOsm/kg following vasopressin 2.5 U administered subcutaneously. Pituitary function including serum follicle stimulating hormone, luteinizing hormone, adrenocorticotropic hormone, growth hormone and prolactin levels were all within normal ranges.

Brain magnetic resonance imaging (MRI) showed multiple brain tumors at left cerebellum, right thalamus, and right frontal and left temporal lobes. Moreover, absence of hyperintensity at posterior lobe of pituitary gland suggested pituitary metastasis (Fig. 1). Chest X-ray and computed tomography (Fig. 2) revealed left upper lung tumor with multiple lung and bone metastases, and mediastinal lymphadenopathy. CT-guided biopsy of lung tumor was performed and the pathological diagnosis was adenocarcinoma. According to the above findings, pulmonary adenocarcinoma with multiple metastases including pituitary gland complicated with central DI was diagnosed.

CyberKnife® radiosurgery for pituitary metastasis and intranasal desmopressin for central DI were performed. The patient’s urine volume returned to normal range without polydipsia.

Discussion

Patients with poor glycemic control would suffer from polyuria and polydipsia if glucosuria occurs. However, polyuria in diabetic patients can be contributed by other causes and must be distinguished from hypotonic disorders associated with water diuresis. In patients with water diuresis, clinicians must verify whether DI exists or not. In our patient, urinary analysis and urine osmolality revealed water diuresis, and central DI was confirmed by vasopressin test. We investigated the cause of central DI by imaging study and lung
biopsy confirmed the diagnosis of pituitary metastasis of pulmonary adenocarcinoma.

The incidence of pituitary metastasis in patients with systemic cancer varies from 1% to 27% and is higher in autopsy series (3-5). Breast and lung cancers account for 65%-75% of pituitary metastasis (10). Pituitary metastasis of pulmonary adenocarcinoma is very rare, and only a few cases have been reported. Most pituitary metastases are asymptomatic and are found accidentally or at autopsy (3, 7, 10). Only 6.8% were symptomatic (6). The most common symptom of pituitary metastases is DI. Other symptoms include visual loss, oculomotor palsies and hypopituitarism (11). The clinical symptoms in patients with pituitary metastasis of pulmonary adenocarcinoma are the same as those of other neoplasms (12-15). The clinical features presented in our patient were related to DI only, no other symptoms or signs were found.

There are two possible reasons why symptomatic pituitary metastasis is so rare. First, most patients died of multiple systemic metastasis before DI was diagnosed (16); and second, invasion of massive cancer to the pituitary gland is necessary to cause pituitary dysfunction. Metastatic neoplasms may influence the pituitary gland via direct local invasion, spread through the cerebrospinal fluid, or hematogenously. More than half of pituitary metastases involve primarily the posterior lobe, with only 10% to 20% affecting the anterior lobe (3). The predominant pituitary metastasis to the posterior lobe can be explained by the fact that arterial blood enters the posterior lobe, in contrast to the lack of direct arterial blood supply to the anterior lobe, and a larger contact area with the adjacent dura for the posterior lobe (4).

The most important principal finding in diagnosis of metastatic disease to the pituitary gland is DI. Schubiger and Haller suggested that DI is the most important criterion for distinguishing tumor metastasis from pituitary adenoma (17, 18). In an image study, Koshimoto et al. suggested that posterior pituitary is identified on MRI by its hyperintensity, and lack of this hyperintensity on sagittal T1-weighted images could be the hallmark of hypothalamic-posterior pituitary disorders (19). Differentiation between pituitary adenoma and pituitary metastasis by radiological evaluation is difficult. DI is reported in only 1% of patients with adenoma (20); hence, DI as the presenting feature, age more than 50 years, cranial nerve palsy or abnormality, rapid onset or progression of symptoms and history of malignancy are helpful in distinguishing pituitary metastasis from pituitary adenoma (8, 21). As noted in our case, pituitary metastasis was highly suspected on the basis of concurrent metastasis to other areas in brain parenchyma, age of more than 50 years, and presence of DI. In patients with tumor of pituitary metastasis, age over 65 years at presentation, metastasis from small cell lung carcinoma, and short period (< 1 year) between initial diagnosis of cancer and pituitary invasion have been related to a poorer outcome (22). The mean life span is 6-7 months and most patients died a few months after initial diagnosis (5, 9, 23). Local radiation and chemotherapy are recommended for tumors with pituitary metastasis at the present time (22). Our patient received CyberKnife® for his pituitary metastasis and the patient still survived for more than ten months.

In conclusion, although DM is the most common cause of polyuria and polydipsia, development of DI with polyuria and polydipsia in diabetic patients with poor glycemic control could be overlooked, which will delay the diagnosis and treatment of underlying diseases such as malignancy. Monitoring urine osmolarity or specific gravity for diabetic patients with significant polyuria and polydipsia would be helpful. In addition, DI may occur in the course of systemic cancer even without any other clinical symptoms. Clinicians should be aware of the possibility of pituitary metastasis to provide their patients with early and appropriate management, especially for patients with lung cancer who develop polyuria and polydipsia.

References

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