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Incidental pheochromocytoma in a patient with nasopharyngeal carcinoma

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Because the adrenal glands are common locations for metastases, pheochromocytoma is frequently misdiagnosed as adrenal metastasis in patients with a history of cancer. An incidental adrenal mass was detected during an abdominal computed tomography (CT) scan performed to stage the nasopharyngeal carcinoma in a 35-year-old male patient. The features of an adrenal mass on the CT, magnetic resonance imaging (MRI), and fluorine-18 fluorodeoxyglucose positron emission tomography/computed tomography (^{18}F-FDG PET/CT) were thought to show adrenal metastasis. However, the patient did not complain about flushing, palpitation, headache or excessive sweating. His blood pressure was 132/74 mmHg, and his pulse rate was 82 bpm. A pheochromocytoma was found during a biochemical diagnosis that evaluated the catecholamine in urine collected over a 24-hour period. The urine had elevated urinary adrenaline, metanephrine, and vanillylmandelic. An I^{123} MIBG scan showed avid tracer uptake in the right adrenal mass with no evidence of abnormal uptake elsewhere. A right adrenalectomy operation was performed and a diagnosis of pheochromocytoma was confirmed histopathologically. Incidental adrenal masses detected in the presence history of cancer should always be subjected to hormonal evaluation. Although patients may be asymptomatic, the probability of incidental pheochromocytoma should not be ignored.

Key words: adrenal incidentaloma, history of cancer, pheochromocytoma

Because the adrenal glands are common locations for metastases, pheochromocytoma is frequently misdiagnosed as adrenal metastasis in patients with a history of cancer (Adler et al. 2007). Surgical intervention without ruling out pheochromocytoma can lead to hypertensive crisis in these patients (Weismann et al. 2006). This case report presents a case of incidental pheochromocytoma detected during imaging for disease staging in a patient with nasopharyngeal carcinoma.

Case presentation

A 35-year-old male patient presented with complaints of swelling in his neck. During an MRI of the patient's neck, multiple lymph nodes with metastatic properties and a mass approximately 17x23 mm in size localized to the right half of the nasopharynx at the torus tubarius level were observed. A punch biopsy of the mass was performed, and the histopathological ex-

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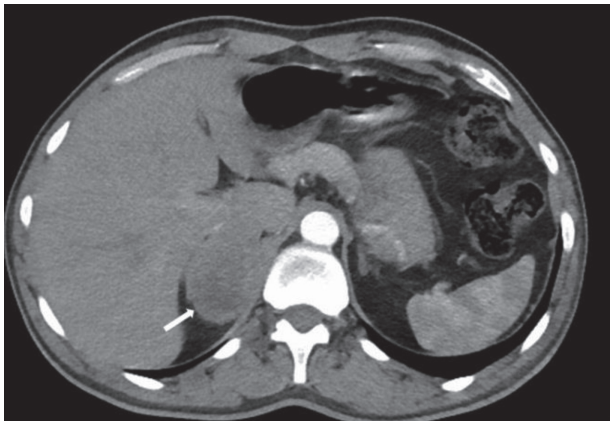

Fig. 1. Axial CT image revealed a heterogeneous lesion in right adrenal gland (arrow).

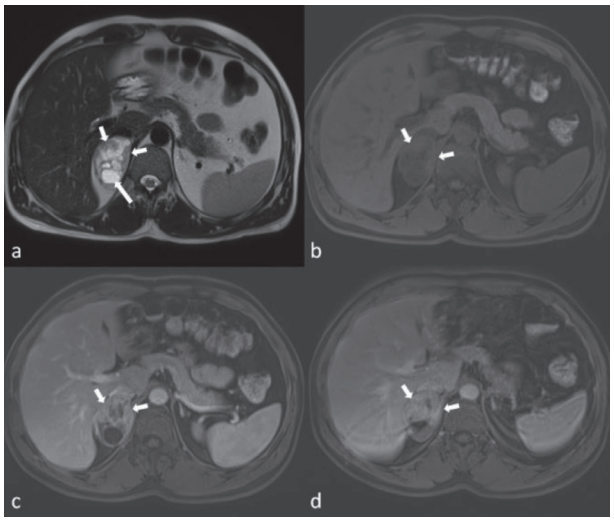

Fig. 2. (a) The lesion was heterogeneously hyperintense on axial T2-weighted MR image and contained cystic (long arrow) and solid components (short arrows). On dynamic contrast enhanced MRI examination (b) precontrast, (c) arterial phase, (d) delayed phase), contrast enhancement was detected in solid portions of the lesion (arrows) and wash-out was not detected in late phase images (arrows).

amination showed an undifferentiated nasopharyngeal carcinoma.

An abdominal CT that was performed for staging purposes revealed a mass approximately 5.5x3.5x5.5 cm in size with a density of 45 Hounsfield units (HU) in the right adrenal gland (Fig. 1). An abdominal MRI showed a hypointense mass in the T1-weighted scans that was heterogeneously hyperintense in the T2-weighted scans. The mass had cystic components; its solid component showed marked contrast uptake following contrast administration that did not display washout in late-phase scans (Fig. 2). During the ^{18}F-FDG PET/CT examination, a mass with a clear border in the right adrenal gland showed increased FDG uptake (SUVmax: 9.14) (Fig. 3).

The patient had a 5-year history of hypertension for which he received a 100 mg/day losartan treatment. He did not complain about flushing, palpitation, headache or excessive sweating. His blood pressure was 132/74 mmHg, and his pulse rate was 82 bpm. During the physical examination, no signs of Cushing syndrome were observed.

The patient's losartan treatment was changed to verapamil. Two weeks after this treatment change, his blood and urine were tested to identify whether or not the mass in his right adrenal gland was hormone-active. There were no abnormal results at basal cortisol level in the morning, dexamethasone suppression test with 1 mg, free cortisol level in 24-h urine sample, serum potassium level, and serum aldosterone level and plasma renin activity at standing.

A biochemical diagnosis of pheochromocytoma was made based on the catecholamine in a 24-h urine collection sample. The urine showed elevated urinary adrenaline of 574.08 μg/l (normal range: 4-200 μg/dl), metanephrine 1256 μg/day (normal range: 0-320 μg/day), and vanillylmandelic acid of 18.9 mg/day (normal range: 1.4-6.5 mg/day). The I^{123} MIBG scan showed avid tracer uptake in the right adrenal mass with no evidence of any abnormal uptake elsewhere, confirming the adrenal lesion as a pheochromocytoma (Fig. 4).

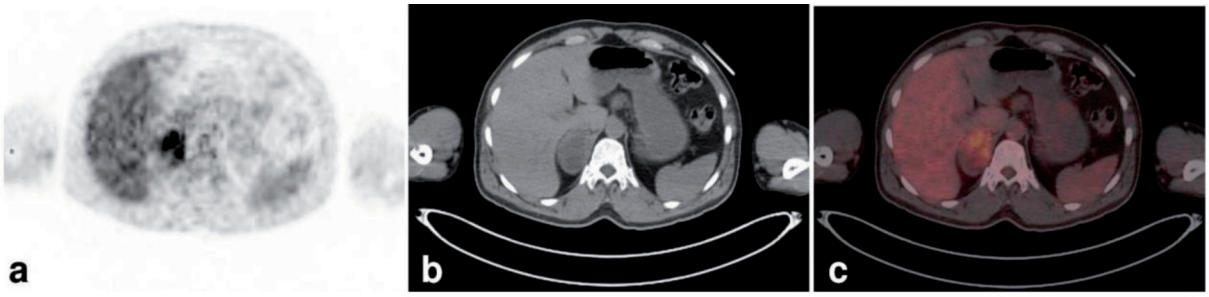

Fig. 3. ^{18}F-FDG PET/CT scans. Axial (a) PET, (b) unenhanced CT, (c) fused images illustrate an adrenal lesion with increased FDG uptake localized on right adrenal gland.

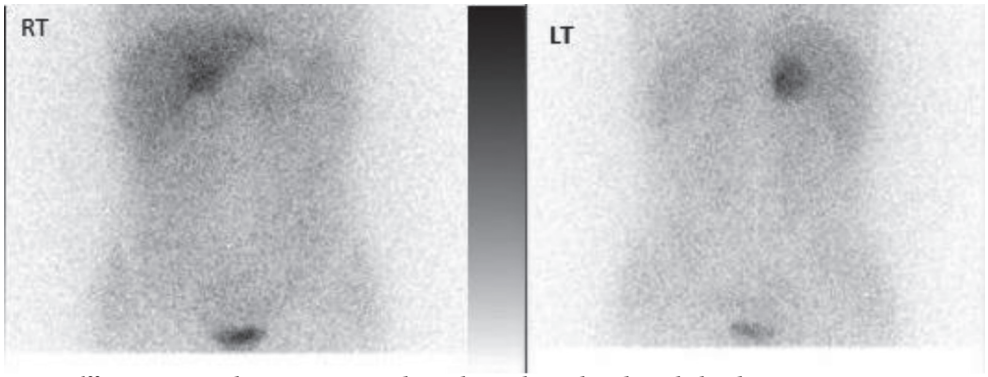

Fig. 4. I^{123} MIBG scan showing increased uptake in the right adrenal gland.

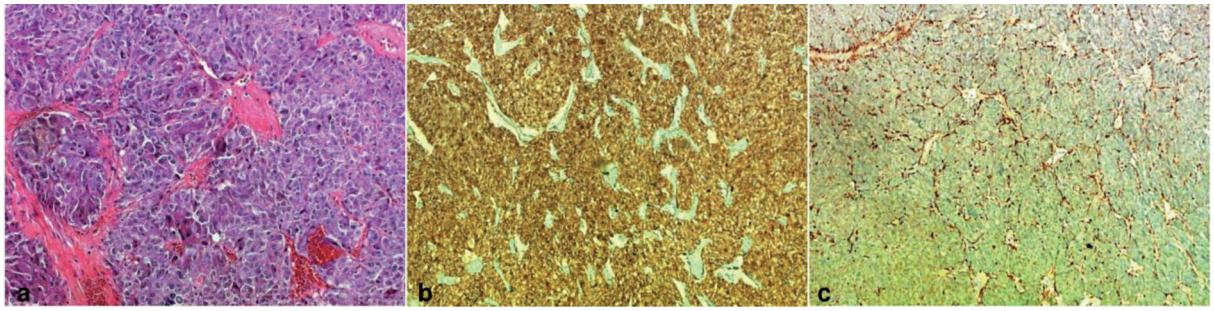

Fig. 5. (a) Tumor ıslands that consisted of oval cells with round nuclei and large granular cytoplasm separated by fibrovascular septas (HEX200), (b) diffuse staining with synaptophysin in the tumor cells (x100), (c) S100 staining in the sustentacular cells (x100).

Following the appropriate adrenergic blockade and fluid load, a right adrenalectomy operation was performed without complication. A histopathological examination revealed tumor islands that consisted of oval cells with round nuclei and large granular cytoplasm separated by fibrovascular septa. Diffuse staining with synaptophysin in the tumor cells and S100 staining in the sustentacular cells were found during the immunohistochemical evaluation (Fig. 5). Therefore, the diagnosis of pheochromocytoma was confirmed histopathologically.

The characteristic facial and skeletal signs of MEN II syndrome were absent and serum parathormone, calcium, and calcitonin levels were normal during the physical examination. No nodule was found during thyroid ultrasonography.

Discussion

Nearly 8% of incidental adrenal masses are pheochromocytoma (Weismann et al. 2006). Pheochromocytoma prevalence in patients with a cancer history is unknown; however, Adler et al. (2007) have reported that incidental pheochromocytoma can be detected in eight from 33 patients in their study of cancer patients who had undergone an adrenalectomy. However, the pheochromocytoma may be asymptomatic, and hypertensive crisis can occur during surgery. Weismann et al. (2006) have reported the development of hypertensive crisis in three cancer cases with adrenal masses that were operated on without ruling out pheochromocytoma. Both reports demonstrate the significance of ruling out pheochromocytoma when an adrenal mass is detected in patients with a history of cancer.

Imaging techniques are essential for the characterization of adrenal masses. An attenuation value of ≤ 10 HU on an unenhanced CT is highly specific to a lipid-rich adenoma (Blake et al. 2010). However, up to 30% of adenomas exhibit attenuation values > 10 HU (lipid-poor adenomas) and these adenomas cannot be accurately characterized on an unenhanced CT (Blake et al. 2010).

Several CT washout percentage methods have been reported to have high diagnostic accuracy when used for differentiating adenoma and non-adenoma (Boland

et al. 2008). Pheochromocytomas may not only show a low loss of CT contrast enhancement when compared with adenomas (Szolar et al. 2005), but they may also show adenoma-like patterns of enhancement loss (Park et al. 2007). Chemical shift MRI imaging is useful for adenoma/non-adenoma differentiation; however, some lipid-poor adenomas cannot be distinguished from other adrenal masses using this method (Fujiyoshi et al. 2003).

An ^{18}F-FDG PET enables the examination of the primary lesion as well as metastases. Therefore, this examination could prove cost-effective and may be preferred for the characterization of adrenal masses, especially those found in patients with a history of cancer. The integrated ^{18}F-FDG PET/CT technique combines functional ^{18}F-FDG PET and anatomical CT scans in a single session. ^{18}F-FDG PET/CT has been shown to be superior to ^{18}F-FDG PET alone for differentiation of benign and malignant adrenal masses in cancer patients. In their study examining 175 adrenal masses in 150 patients, Metser et al. (2006) find that specificity, sensitivity, and accuracy rates were 99%, 92%, and 94%, respectively, using an ^{18}F-FDG PET (SUVmax: 3.1) alone and 100%, 98%, and 99%, respectively, using an ^{18}F-FDG PET/CT.

An ^{18}F-FDG PET/CT may show false positive results in approximately 5% of adrenal adenomas (Chong et al. 2006). The primary reasons for the false positivity are adrenal adenoma and benign pheochromocytoma (Chong et al. 2006). The majority of pheochromocytomas, regardless of benignity or intraadrenal localization, show avid FDG uptake (Blake et al. 2004). Additionally, since pheochromocytomas cannot be distinguished clearly based on their CT features, pheochromocytomas may be confused with adrenal metastases under combined PET and CT criteria (Blake et al. 2004).

In conclusion, pheochromocytoma can mimic the features of other benign and malignant adrenal tumors during imaging techniques. Therefore, incidental adrenal masses detected in the presence history of cancer should always be subjected to hormonal evaluation. Although patients may be asymptomatic, the probability of incidental pheochromocytoma should not be ignored.

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