

Adrenal Medullary Hyperplasia with Coexisting Adrenal Cortical Adenoma

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Adrenal medullary hyperplasia is an increase in the mass of the adrenal medullary cells. We report a case of a 38-year-old man presenting with pheochromocytoma-like symptoms who was preoperatively misdiagnosed with pheochromocytoma. Hypertension was associated with an intracranial hemorrhage evident in a brain computed tomography scan, in which no obvious pituitary gland enlargement was detected. An abdominopelvic CT revealed a solitary tumor in the right adrenal gland with no obvious enlargement of the contralateral adrenal gland or sympathetic chains. Lab results showed increased levels of urinary metanephrines. Based on clinical data, the patient underwent a laparoscopic right adrenalectomy bases on a diagnosis of pheochromocytoma. The patient was finally diagnosed with adrenal medullary hyperplasia with coexisting ipsilateral non-functioning adrenal cortical adenoma. Postoperatively, blood pressure and lab results were maintained in the normal range and the patient was symptomatically free during the follow-up period. (*Korean J Endocrine Surg* 2011;11: 182-185)

Key Words: Adrenal cortical adenoma, Adrenal medullary hyperplasia, Pheochromocytoma

INTRODUCTION

The normal adrenal gland is composed of two types of tissue, the adrenal cortex and the adrenal medulla. The cortex is subdivided microscopically into three distinct regions, the outermost "zona glomerulosa", the middle "zona fasciculata", the innermost "zona reticularis" that are responsible for production of mineralocorticoids, glucocorticoids, and sex steroids, respectively. The

adrenal medulla is derived from the neuroectoderm in which catecholamines are produced. Diseases arising from each part of the adrenal gland show unique features according to involved hormones. Pheochromocytoma, which is often a disease of adrenal medulla, is a potentially hazardous tumor due to its excessive catecholamine secretion. Adrenal medullary hyperplasia is a infrequent disease entity involving the adrenal gland that mimicks mass-like features of pheochromocytoma.

We report a case of a patient with combined adrenal medullary hyperplasia and non-functional adrenal cortical adenoma which was clinically suspected as pheochromocytoma in preoperative evaluation.

CASE REPORT

A 38-year-old male with a 5 year history of untreated hypertension was referred to Seoul Paik Hospital for intracranial hemorrhage involving left basal ganglia with right sided weakness. His past medical history was significant for intermittent episodes of headache, diaphoresis, palpitation. His family member stated that he had never experienced severe headaches like this before and he was undergoing stressful period in his carrier.

His initial blood pressure was 190/110 mmHg and pulse rate was 110 beats per minute at our emergency department. His mental status was drowsy with significant right sided motor weakness. Physical examination of his abdomen failed to reveal any striae of skin, palpable mass or any audible bruit.

After successful initial resuscitation, he regained clear consciousness and his vital signs were maintained in stable range with calcium channel blocker administration. As a result of several biochemical and imaging study, secondary hypertension was suspected as his causative disease.

Twenty-four hour urine collection reported increased level of metanephrine as 2.3 mg/day (normal range 0~0.8 mg/day) and upper normal range of VMA 7.9 mg/day (normal range 0~8 mg/day). His serum levels of cortisol was 11.46 ug/dl (at 6 AM, nor-

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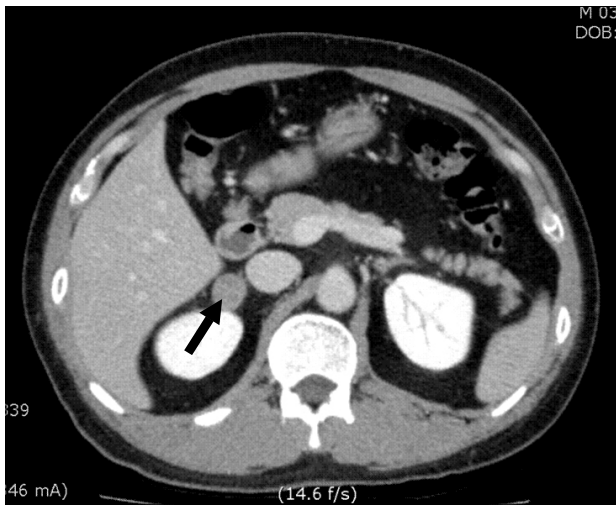


Fig. 1. Adrenal gland tumor (arrow). Single solid nodule with well demarcating margin measuring 1.8 cm was detected at right adrenal gland which shows high enhancement (22HU) and slightly high attenuation peripheral rim at contrast enhanced scan.

mal range 4.30~22.40 ug/dl), ACTH 33.22 pg/ml (7.2~63.3 pg/ml) and aldosterone level was 24.1 pg/ml (supine, 10~105 pg/ml). Serum levels of epinephrine 19.6 pg/ml (supine 0~110 pg/ml), norepinephrine 428.6 pg/ml (supine, 70~750) were detected.

Abdominopelvic CT scan with contrast enhancement revealed a solitary right adrenal gland tumor of high attenuation, measuring 1.8 cm in its diameter (Fig. 1). The adrenal gland on the left and sympathetic ganglions were not enlarged. Considering his laboratory data and radiologic findings, pheochromocytoma was clinically suspected. He was first given an oral alpha-blocking agent (Phenoxibenzamine HCl) with 2 L of normal saline administered intravenously but his systolic blood pressure was maintained in the range between 150~160 mmHg. Beta-blocker was added to his medication, and his systolic blood pressure decreased to 120~130 mmHg with no hypotensive episode preoperatively.

After 14 days of preoperative preparation with alpha- and beta-blockade, he underwent laparoscopic right adrenalectomy. Intraoperative findings revealed no evidence of tumor extension beyond the affected adrenal gland to adjacent structures. Pathology reports adrenal medullary hyperplasia without evidence of pheochromocytoma (Fig. 2). The specimen was grossly normal appearing adrenal medulla with focal presence of nodularity (Fig. 3). Some portions of adrenal medulla was thicker than other parts of the gland. The exact ratio of medulla and cortex was unable to be measured because of focal location of the lesion without diffuse enlargement of the medulla. A high resolution microscope



Fig. 2. Gross appearance of surgically removed tissue. An ovoid, bright yellowish solid tumor was found at the adrenal cortex which was suggestive of typical adrenal cortical adenoma.

on the nodularity revealed focal presence of nodule-like architecture without evidence of the characteristic nest of cells ("Zellballen"). There was absence of cellular pleomorphism and atypical mitosis. A clinically non-functioning cortical adenoma was identified at the right adrenal gland. 7 days after the operation, his follow-up laboratory data showed metanephrine 0.3 mg/day (preoperative data 2.3 mg/day), VMA 3.7 mg/day (preoperative data 7.9 mg/day) on 24 hour urine collection. His serum levels of norepinephrine was at 173.7 pg/ml (pre-operative value 428.6 pg/ml) and epinephrine 35.5 (pre-operative value 19.6 pg/ml).

His average blood pressure during recovery period was 140/80 mmHg. Otherwise the patient had an uneventful recovery and was sent home normotensive. Follow-up for 3 months has revealed that he has remained normotensive and free of any headache, flushing, diaphoresis and palpitation that he experienced prior to the operation.

DISCUSSION

Adrenal medullary hyperplasia has recently been recognized as a clinical entity in which exerts symptoms that resemble features of pheochromocytoma. But distinguishment between these two diseases clinically is very difficult. Rudy et al. reported a diagnostic criteria of adrenal medullary hyperplasia that clinical signs and symptoms mimicking pheochromocytoma be present at the time of episodes, hyperplasia of medullary cells, increased medulla/cortex ratio (more than 1 : 4) and weight of the adrenal medulla.(1) In our case, there were hypertensive episodes with end organ damage in conjunction with increased serum and urine levels of catecholamines and radiologic evidence of adrenal tu-

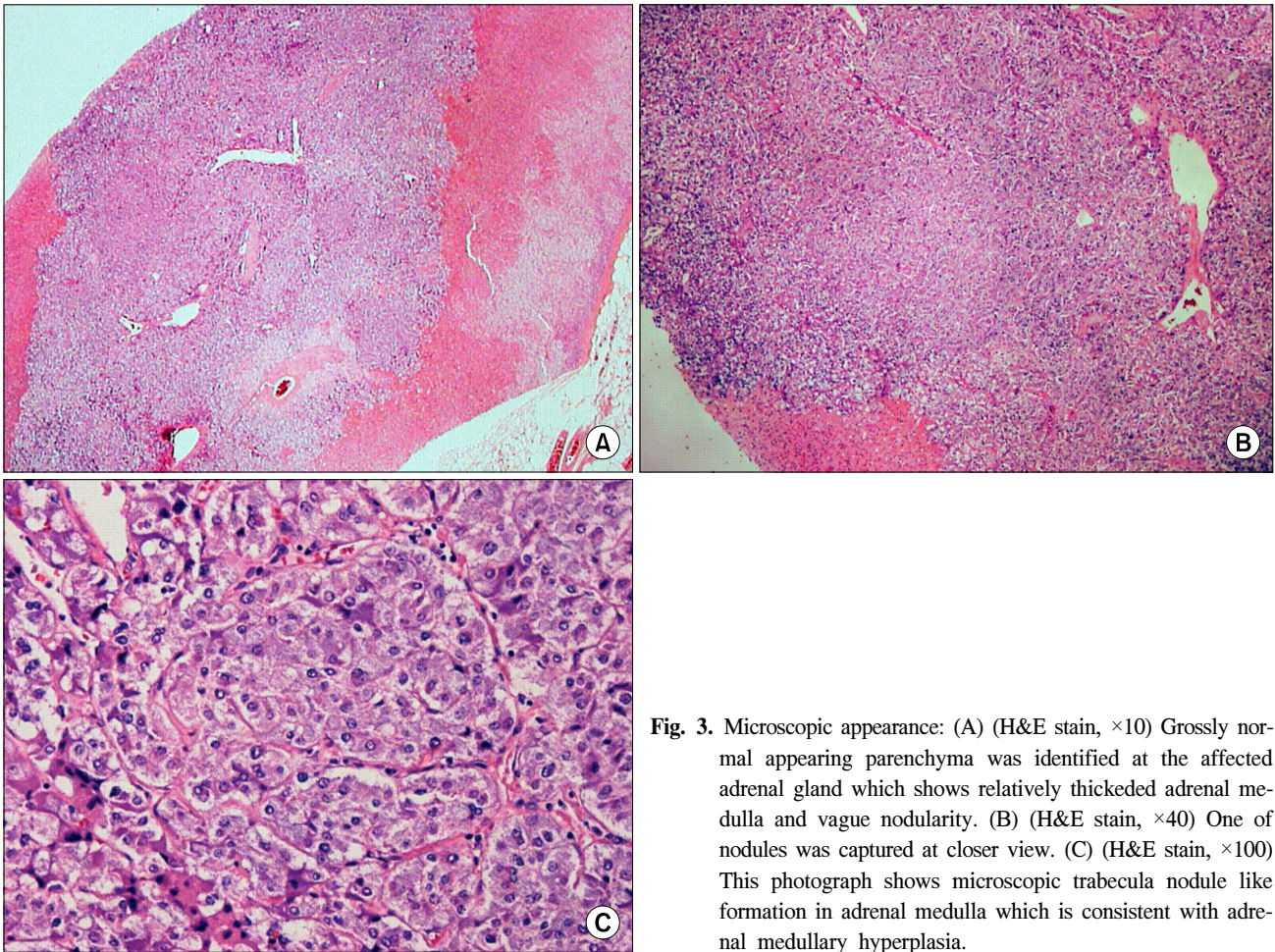


Fig. 3. Microscopic appearance: (A) (H&E stain, $\times 10$) Grossly normal appearing parenchyma was identified at the affected adrenal gland which shows relatively thickened adrenal medulla and vague nodularity. (B) (H&E stain, $\times 40$) One of nodules was captured at closer view. (C) (H&E stain, $\times 100$) This photograph shows microscopic trabecula nodule like formation in adrenal medulla which is consistent with adrenal medullary hyperplasia.

mor, which was happened in a relatively young aged patient. Histologically, adrenal medullary hyperplasia was observed in the remaining parenchyma but unfortunately the medulla/cortex ratio and weight of the adrenal medulla could not be accurately measured. Removal of the affected adrenal gland resulted in remission of clinical signs and symptoms and in serum, urinary levels of preoperatively increased catecholamine returned into normal range. The most unique characteristic of our case was adrenal medullary hyperplasia with a coexisting adrenal cortical non-functioning tumor.

We could find one similar case reported in Korea and several cases in abroad. In one case, described by Hoon Sik Kim et al.,⁽²⁾ bilateral adrenal medullary hyperplasia and a ganglioneuroma near the left adrenal gland initially presented with clinical signs and symptoms of oversecretion of catecholamines. They could find the lesion on ^{131}I MIBG scan but could not detect it on a CT scan. Metabolic acidosis involving lactic acidosis which was found in their case was thought to be happened as a result of vasoconstriction during hypertensive episodes.⁽³⁾ In our pres-

ent case, we couldn't find any evidence of enlarged paraganglion the contralateral adrenal gland hyperplasia which is also supported by normal pituitary gland found on the CT scan of brain taken during cerebrovascular accident and by normal serum ACTH level.

In another case, reported by Yoshioka et al.,⁽⁴⁾ adrenal medullary hyperplasia was associated with cortisol producing adenoma which resembles our case most but was distinguished by its functioning adrenal tumor with increased serum levels of cortisol preoperatively. Their case also had predominant pheochromocytoma-like symptoms but didn't show characteristic features of Cushing's syndrome. The mechanism is thought to be partly due to increased serum concentration of dopamin for typical symptoms of adrenal medullary hyperplasia and insufficient levels of cortisol to provoke Cushingoid signs.

Pathological examination revealed cortical adenoma and atrophied remaining adrenal cortex. In our case, adrenal cortex other than cortical adenoma showed relatively normal thickness and contour.

In the third case, Nomikos et al.(5) introduced an oversized, non-functioning adrenal cortical adenoma expressing pheochromocytoma-like neurosecretory features. In their case on oversized and overweight adrenal tumor exerted direct physical pressure on the medulla and resulted in clinically detectable increased adrenomedullary function. In our case, biochemical causes of catecholamine oversecretion was thought to be more appropriate for symptoms and signs rather than direct physical stimulation of adrenal medulla by its size of the tumor.

In the fourth case, Yotsuyanagi et al.(6) reported a case of adrenal pheochromocytoma with contralateral nonfunctioning adrenocortical adenoma. The disease was incidentally found on ultrasonography. In their case, diagnosis of bilateral pheochromocytoma was made based on venous sampling of both adrenal glands. However one of the two lesions was found to be a cortical adenoma biochemically mimicking pheochromocytoma. In addition radiologic findings showed that the intensity of each tumor was different on T2-weighted MRI and unilateral increased uptake of pheochromocytoma on ^{131}I -MIBG scan.

Three months have passed since the operation, and the patient is free from pheochromocytoma-mimicking symptoms that he previously experienced. His family history and thyroid sonography showed no evidence of type 2 multiple endocrine neoplasia.

On the basis of clinical data, we report this case as a sporadic unilateral adrenal medullary hyperplasia with coexisting non-functioning adrenocortical adenoma. Recent improvement and better accessibility of imaging procedures made possible that the number of incidentally found adrenal tumor is increasing and the diagnosis of pheochromocytoma reaches up to 30% of study

population.(7) In case of a patient who is suspected to have pheochromocytoma-mimicking symptoms with evidence of biochemical laboratory results, Adrenal medullary hyperplasia could be considered as a part of a differential diagnosis.

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