Gastric Diverticulum Simulating Left Adrenal Incidentaloma in a Hypertensive Patient

RYO KODERA, FUMIO OTSUKA, KENICHI INAGAKI, TOMOKO MIYOSHI, TOSHIO OGURA, YASUSHI TANIMOTO*, TETSURO SEI** AND HIROFUMI MAKINO

Department of Medicine and Clinical Sciences, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, 2-5-1 Shikata-cho, Okayama 700-8558, Japan
*Department of Respiratory Medicine, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, 2-5-1 Shikata-cho, Okayama 700-8558, Japan
**Department of Radiology, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, 2-5-1 Shikata-cho, Okayama 700-8558, Japan

Abstract. A 46-year-old Japanese male with hypertension was referred for examination of left adrenal tumor incidentally detected by computed tomography (CT) scan. The patient had a 4-month history of hypertension. Abdominal CT demonstrated a low-density mass 2.5 cm in diameter in the left adrenal region that was observed as a high-intense lesion with T2-weighted magnetic resonance imaging. ¹³¹I-adosterol scintigraphy showed normal uptake of bilateral adrenals. The adrenocortical hormone levels were within normal ranges; however, urinary noradrenaline excretion was slightly elevated, likely due to concurrent sleep apnea syndrome. Based on the observation of a very tiny bubble in the ventral portion of the adrenal mass by careful review of CT images examined at a previous hospital, a restudy of abdominal CT with oral contrast was performed. In this restudy abdominal CT we observed positive enhancement of the left adrenal mass, indicating that the adrenal mass was a diverticulum derived from posterior gastric fornix. The present case study reinforces that preoperative differentiation from mimic adrenal tumors is necessary in cases of cystic adrenal mass in the left adrenal region.

Key words: Adrenal incidentaloma, Gastric diverticulum, Left adrenal tumor, Pseudoadrenal tumor, Sleep apnea syndrome

(RECENT increases in the availability and capability of radiological diagnostic technologies have increased the number of adrenal tumors that are incidentally discovered in patients who underwent medical examinations by ultrasonography (US), computed tomography (CT) and magnetic resonance imaging (MRI). Diagnostic evaluation of identified adrenal masses, (often called “incidentalomas”), is required for determining whether the lesions are hormonally functioning or non-functioning and malignant or benign [1].

The CT attenuation value enables the differentiation between benign and malignant lesions in the adrenal gland [2]. A homogeneous mass with a smooth border and low attenuation value of less than 10 hounsfield units (HU) on unenhanced CT indicates a benign adenoma [3, 4]; except in cases with lipid-poor adenomas [5, 6]. The presence of rapid washout of enhancement is also useful to distinguish benign adenomas from metastasis. On MRI study, adrenal metastasis are usually hypointense in T1-weighted images but hyperintense in T2-weighted images [7, 8]. Moreover, benign adenomas exhibit clear fat suppression of the signals on chemical-shift imaging [9].

Nevertheless, radiological examination occasionally uncovers various lesions that originated from extra-adrenal tissues in the adrenal region, which rarely mislead into diagnosing adrenal tumors. Several cases of
adrenal pseudotumor have been demonstrated [10–17]. Pseudotumors were approximately found in 0.7% of adrenal incidentalomas and preoperative discovery was only 0.1% of those.

We here report a case of gastric diverticulum with features that mimic a left adrenal tumor. Careful elimination of pseudotumors in the adrenal region is very important to avoid unnecessary surgery.

Case Presentation

A 46-year-old Japanese man with 4-month history of hypertension (160–165/90–100 mmHg) was referred to our hospital for examination of a left adrenal tumor incidentally discovered by abdominal CT. The adrenal tumor was 2.5 cm in diameter located at the left adrenal region observable with homogeneously low (15HU) CT density (Fig. 1A). On coronal scans of T1-weighted MRI (repetition time (TR)/echo time (TE) = 130/4.1 ms), the tumor was clearly isolated from other tissues in the suprarenal region (Fig. 1B). The left adrenal tumor exhibited a high-intensity area by T2-weighted image (TR/TE = 4560/138 ms) (Fig. 2). Fat suppression MR imaging (in-phase image, TR/TE = 128/5.3 ms; out-of-phase image, TR/TE = 128/2.7 ms) showed no lipid inclusion in the tumor (Fig. 2), suggesting that the left adrenal lesion is cystic and/or degenerated adrenal mass.

The basal endocrine levels of adrenal-related hormones in the patient were as follows: plasma adrenocorticotropicin, 24.5 pg/ml (normal: 7–56); serum cortisol, 11.3 µg/dl (5–21) with normal circadian fluctuation and significant suppression (0.5 µg/dl) after 1 mg oral dexamethasone administration; plasma renin activity, 0.9 ng/ml/h (0.1–2.0); serum aldosterone, 10.5 ng/dl (3.6–24); dehydroepiandrosterone sulfate (DHEAS), 2470 ng/ml (660–3240); plasma adrenaline, 0.01 ng/
ml (<0.1); noradrenaline, 0.48 ng/ml (0.1–0.5); and dopamine 0.01 ng/ml (<0.03). Moderate elevation in the urinary excretion of catecholamine was detected as follows: urinary adrenaline, 6.3 µg/day (3–41); urinary noradrenaline, 182 µg/day (31–160); urinary dopamine, 701 µg/day (280–1100); urinary metanephrine, 0.88 mg/day (0.04–0.18); urinary normetanephrine, 1.14 (0.1–0.28) mg/day; and urinary vanillyl mandelic acid, 4.8 mg/day (1.5–4.3).

In order to investigate time-course changes in the adrenal cystic mass, we carefully compared all the adrenal CT films including those performed earlier. Interestingly, only in a single slice of a CT scan that was performed at a former outpatient clinic a very tiny bubble shadow was observed in the ventral aspect of the left adrenal tumor (Fig. 3). Consecutive views of repeated thin-sliced CT scan did not detect such an air-like inclusion in the tumor (Fig. 4). In addition, direct connection of the tumor into gastrointestinal tracts was not distinctly exhibited even under the consecutive CT scans (Fig. 4). To test the possibility that the tumor originated from gastrointestinal tracts, oral contrast
gastrographin was utilized in a restudy of abdominal CT scan. As a result, the adrenal mass was enhanced by oral contrast material shortly after staining the stomach and duodenum (Fig. 5). The existence of diverticulum arisen from the posterior wall of gastric fornix was eventually established by upper gastrointestinal barium studies (Fig. 6). Furthermore, $^{131}$I-adosterol scintigraphy demonstrated normal uptake in bilateral adrenal glands without uptake defects in the left adrenal region (Fig. 7).

Since the patient had typical symptoms of sleep apnea syndrome (SAS), we also performed sleep-disordered breathing tests, resulting in the diagnosis of severe SAS with elevated apnea hypopnea index (AHI), 46.4/h (normal: <5). After introducing nasal continuous posi-
tive airway pressure (CPAP) therapy, urinary excretion of noradrenaline and normetanephrine fractions was decreased to 170 µg/day and 0.36 mg/day, respectively, and systemic blood pressure was well controlled with 5 mg of oral amlodipine, suggesting functional hypersecretion of catecholamines due to SAS as previously reported by Makino and colleagues [18].

Discussion

Extraadrenal masses mimicking adrenal tumors appear more frequently on the left side due to the close proximity of the left adrenal to organs such as the gastric fundus, the first loops of the jejunum, the spleen, pancreas, and left kidney. Mimicking adrenal tumors also exhibit various abnormal conditions of extra-adrenal tissues, such as gastric atrasis, gastric diverticulum, duplicated bowel loop, accessory spleen, splenic lobulation, tortuous splenic vessels, aneurysm of the splenic artery, large portosystemic venous collaterals in portal hypertension, left renal and pancreatic tumors, and submucosal gastric tumor [19, 20]. With regard to the causes misleading right suprarenal masses, interposition of the small bowel or the colon, dilated inferior vena cava, extrahepatic extension of hepatic tumor, and tumors originating in the upper pole of the right kidney are possibly included.

Gastric diverticulum is, in general, a rare condition with the prevalence of 0.1 to 2.6% in autopsy series [21, 22] in contrast to the high prevalence of diverticular diseases of the colon. No treatment is usually needed for gastric diverticulosis; however, they may become symptomatic, presenting with epigastric pain or discomfort, and rarely with gastric bleeding or perforation. They are largely classified into congenital and acquired types, with congenital types being more common. Congenital diverticulum is located on the posterior wall of the stomach just below the esogastric junction and containing all three layers of the stomach while acquired one lacks the muscular layer [23].

Reasons underlying why gastric diverticulum can be located within the retroperitoneal space is still uncertain. In the embryonic stages of gastrointestinal development, rotation of the stomach leads to forming the duodenal loop, the pancreas, and the mobile dorsal mesentery. When the posterior-body wall and dorsal mesentery fuse, the pancreas is encapsulated within the retroperitoneal region, wherein a diverticulum of the posterior wall of the gastric cardia may be herniated through an area of dorsal mesentery [24, 25]. If the migration of diverticulum occurs before renal ascent, the diverticulum could indent Gerota’s fascia and stay between the left kidney and the left adrenal gland [10].

Radiologically, gastric diverticulum appears as a thin-walled cystic mass in the left adrenal lesion. CT scans at prone positioning of the patient may be helpful for its diagnosis by forcing gastric air into the diverticulum cavity, leading to formation of an air-fluid level [20]. A gas shadow in a cystic mass suggests infection, necrosis, or some communication with the gastrointestinal tract [10]. Abscess and necrotic tumor commonly have a thick or shaggy wall while a thin-walled cystic retroperitoneal mass may occur with pancreatitis or gastric ulcer disease.

Araki et al. reported an interesting case with a left adrenal adenoma causing primary aldosteronism as well as gastric diverticulum in the same adrenal side [26]. In their case, $^{131}$I-adosterol uptake in the aldosteronoma side was rather suppressed due to coexisting gastric diverticulum [26]. In our case, left adrenal uptake of $^{131}$I-adosterol was found to be normal, suggesting that the occupancy of gastric diverticulum had no adverse effects on the left adrenal function.

Collectively, clinical hallmarks used as indicators for surgical intervention of adrenal incidentalomas are the size, growth rate and the imaging characteristics of the tumor as well as the endocrine behavior [7]. Moreover, in order to prevent false diagnosis of adrenal tumor, CT studies should be programmed to provide contiguous scans including detailed studies of the upper abdomen possibly with non-axial reconstructions or thin slices. Enhancement with oral contrast is helpful to differentiate adrenal mass from gastrointestinal abnormalities. In particular, in cases with hypertension, diabetes and obesity, which recall functioning adrenal tumors, these preoperative workup would prevent from misleading to more extensive and invasive examinations including biopsy or laparoscopic surgery.
References


