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Case Report

Retroperitoneal Solid Pseudopapillary Tumor Mimicking Adrenal Malignant Tumor in a 67-Year-Old Man

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Abstract

Solid pseudopapillary tumor (SPT) is a low-grade malignant tumor of the pancreas. SPT typically affects women and can occur in ectopic pancreatic region; however, it also occurs rarely in retroperitoneum. The tumor may be bulky at the time of diagnosis since there is no specific clinical manifestation. Here we present an older male case with retroperitoneal SPT. A 67-year-old man consulted for intermittent fever and lumbago. His basal hormonal profile screened out a functional tumor. Computed tomography (CT) showed a gigantic mass in his left adrenal region. A normal left adrenal gland was not identified, and the tumor's feeding artery was recognized as the left adrenal artery by the contrast-enhanced CT. Adrenal malignant tumor was suspected, and tumor resection was performed. The resected tumor size was 15 × 10 × 9 cm. Histologically, epithelial-like cells with round nuclei and a small amount of eosinophilic cytoplasm proliferated in papillary (around the blood vessels) or uniformly solid form. By immunostaining, tumor cells were vimentin, CD56, cytokeratin AE1/AE3, CD10, β-catenin in the nucleus, cyclin D1, and PgR positive. These findings led to the diagnosis of SPT. Although rare, SPT should be considered as a differential diagnosis in cases of a mass arising from the adrenal region.

Key Words: solid pseudopapillary tumor, adrenal incidentaloma, adrenocortical carcinoma, metastatic tumor, adrenal artery

Abbreviations: ACTH, adrenocorticotropic hormone; ALP, alkaline phosphatase; CRP, C-reactive protein; CT, computed tomography; γ-GTP, γ-glutamyl transpeptidase; LDH, lactate dehydrogenase; MRI, magnetic resonance imaging; PAC, plasma aldosterone concentration; PRA, plasma renin activity; SPT, solid pseudopapillary tumor.

Introduction

Adrenal incidentaloma is a commonly encountered feature when abdominal diagnostic imaging (CT, magnetic resonance imaging [MRI] and ultrasound) is performed (5% of these CT scans performed find adrenal incidentaloma), although since the numbers are from a selected population, this may be under- or overestimating some diagnoses. The vast majority of adrenal masses are adenoma (80%), and asymptomatic non-functioning adrenal adenoma is most likely (75%), followed by autonomously cortisol secreting (12%) and aldosterone-secreting (2.5%) [1]. Additionally, 7% of adrenal incidentalomas are pheochromocytoma, 8% adrenal carcinoma, and 5% metastasis [1]. In a previous study run by Italian Society of Endocrinology, the mass size of adrenal tumor is predictive of malignancy and the cutoff size of 4 cm was indicated as 93% sensitivity and 42% specificity for cancer. Other types of mass, such as myelolipoma, cyst, and ganglioneuroma, are sometimes diagnosed in the adrenal region [1].

Here we present the rare case masquerading as the adrenal artery feeding a gigantic adrenal tumor (15 × 10 × 9 cm), which was pathologically diagnosed as a solid pseudopapillary tumor (SPT) in a 67-year-old male patient.

Case Presentation

A 67-year-old man with impaired glucose tolerance and hypertension consulted a primary care physician for intermittent fever and lumbago for 1 month. He did not have the headaches, sweating, and palpitations that indicate catecholamine elevation. After imaging study with CT and MRI, he was suspected to have a left adrenal malignant tumor and was referred to our hospital.

Diagnostic Assessment

A contrast-enhanced CT showed a 118 × 102 × 130 mm mass in the left adrenal region, which was heterogeneously enhanced due to necrotic areas. A normal left adrenal gland was not identified, and the tumor's main feeding artery was considered as the left middle adrenal artery by the contrast-enhanced CT; therefore, the tumor was considered to be arising from the adrenal. There were no findings suggesting metastasis to other organs. On MRI, the inner area was heterogeneous, containing T1WI high-intensity areas and T2WI low-intensity areas (Fig. 1) [1–3]. I-metaiodobenzylguanidine (MIBG) scintigraphy showed no uptake in the mass. Blood testing showed increased levels of alkaline phosphatase (ALP; 369 IU/L), γ-glutamyl transpeptidase

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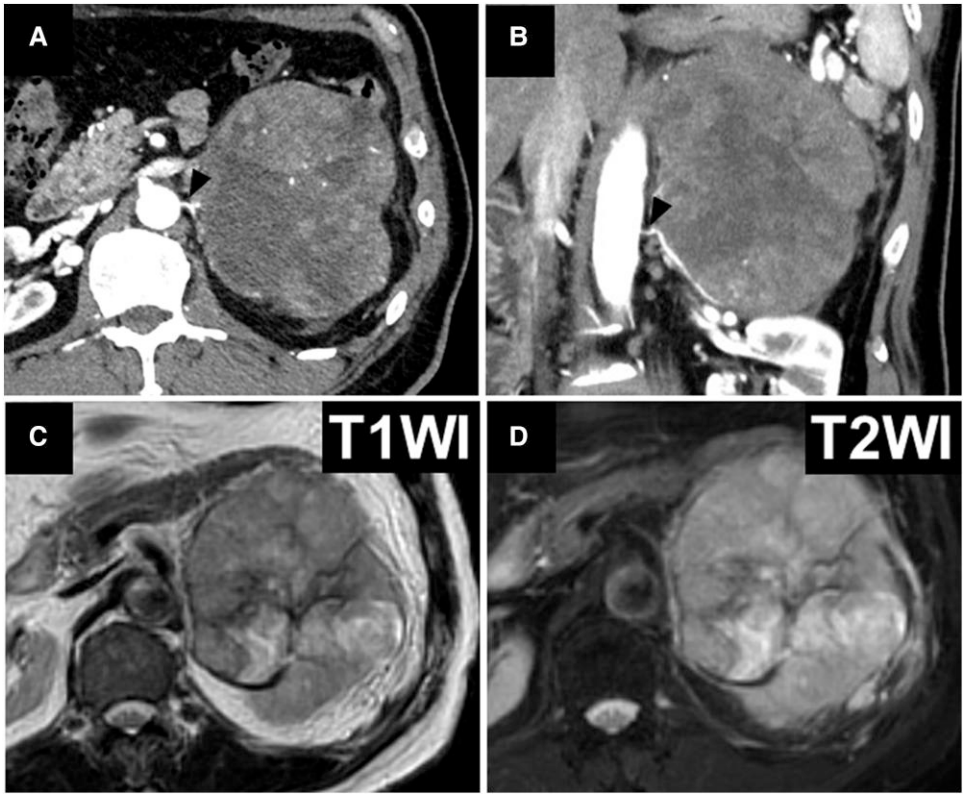

Figure 1. A, B, Contrast-enhanced CT of the tumor. A 118 × 102 × 130 mm mass in the left adrenal region, which was heterogeneously enhanced due to necrotic areas. The tumor's main feeding artery was the left middle adrenal artery (black arrow). C, D, MRI showed the inner area of the tumor was heterogeneous. T1WI high-intensity areas indicated hemorrhage and T2WI low-intensity areas indicated fibrosis.

(γ-GTP; 141 IU/L), lactate dehydrogenase (LDH; 423 IU/L) and C-reactive protein (CRP; 5.15×10^4 μg/L: 5.15 mg/dL) without hypokalemia. Plasma renin activity, aldosterone, adrenocorticotropic hormone (ACTH), cortisol, dehydroepiandrosterone sulfate, and serum catecholamines and metanephrines were within normal limits (Table 1). In the analysis of 24-hour urine, fractions of catecholamine and metanephrine levels did not show significant elevation. He had not previously experienced any malignant tumor. An adrenal malignant tumor, such as adrenocortical carcinoma or metastatic tumor of unknown origin, was initially suspected based on the adrenal artery feeding and the gigantic size of the tumor.

Treatment

An open left retroperitoneal tumor resection was performed. A 15 × 10 × 9 cm tumor was resected. The cut surface was solid, and most of it was whitish, but some hemorrhages and necrotic foci were observed (Fig. 2A). Histologically, the tumor was composed of poorly cohesive cells with round nuclei and eosinophilic cytoplasm, forming pseudopapillary or uniformly solid structure (Fig. 2C and D). Some tumor cells showed pleomorphism. There were about 5 meioses per 10 high power fields. By immunostaining, tumor cells were positive for vimentin, CD56. Cytokeratin AE1/AE3, CD10, cyclin D1, and progesterone receptor were partially positive (Fig. 2E, 2F, and 2H). Some tumor cells showed nuclear/cytoplasmic expression of β-catenin (Fig. 2G). These findings led to the diagnosis of solid pseudopapillary tumor (SPT).

Outcome and Follow-up

Although the tumor was adjacent to the parenchyma of adrenal gland, there was no definitive evidence of adrenal origin (Fig. 2B). A postoperative blood test showed a decreasing trend in ALP (216 IU/L), γ-GTP (119 IU/L), LDH (127 IU/L), and CRP (1.00×10^4 μg/L: 1.00 mg/dL). SPT can recur and older age, male sex, and large tumor size are poor factors for recurrence; thus, we are planning to follow up. After the 6-month follow-up, there is currently no evidence of recurrence in this patient.

Discussion

Solid pseudopapillary tumor (SPT), first described by Frantz in 1959, is a low-grade tumor of the pancreas. SPT accounts for about 0.9% to 2.7% of pancreatic tumors and 5% of cystic pancreatic tumors [2]. The male to female ratio of SPT incidence is 1:9 and SPT mainly occurs in young women [2].

In adrenal incidentalomas, hormone-producing adrenal tumor can be screened for by the measurement of adrenal hormones and their upper-level hormones (such as ACTH, cortisol, plasma renin activity [PRA], and plasma aldosterone concentration [PAC]). Cushing syndrome patients autonomously produce cortisol and the upper-level ACTH is suppressed (usually <10 pg/mL). Similarly, primary aldosteronism patients autonomously produce aldosterone and the upper-level PRA is suppressed, that is, the aldosterone to renin ratio (PAC/PRA ratio) > 200 is the screening marker. Catecholamine fractions (adrenaline, noradrenaline, and dopamine) and metanephrine fractions (metanephrine and normetanephrine) are measured for screening adrenal pheochromocytoma. In this patient, no

Table 1. Adrenal hormone profile in this case

Hormone	Values	Normal range
ACTH	49 pg/mL (10.78 pmol/L)	7.2-63.3 pg/mL (1.58-13.93 pmol/L)
Cortisol	15.4 μg/dL (424.8 nmol/L)	7.1-19.6 μg/dL (195.9-540.7 nmol/L)
DHEA-S	105 μg/dL (2.8 μmol/L)	– μg/dL (– μmol/L)[a]
PRA	0.7 ng/mL・hr (0.7 μg/L・hr)	0.3-2.9 ng/mL・hr (0.3-2.9 μg/L・hr)
PAC	35.3 pg/mL (97.8 pmol/L)	4-82.1 pg/mL (11.1-227.4 pmol/L)
Free metanephrine	21 pg/mL (110.5 pmol/L)	0-130 pg/mL (0-683.8 pmol/L)
Free normetanephrine	82 pg/mL (447.7 pmol/L)	0-506 pg/mL (0-2762.8 pmol/L)
Adrenaline	<=0.01 ng/mL (<=54.6 pmol/L)	0-0.1 ng/mL (0-545.9 pmol/L)
Noradrenaline	0.48 ng/mL (2837.3 pmol/L)	0.1-0.5 ng/mL (591.1-2955.5 pmol/L)
Dopamine	0.02 ng/mL (130.6 pmol/L)	0-0.03 ng/mL (0-195.8 pmol/L)

Abbreviations: ACTH, adrenocorticotropic hormone; DHEA-S, dehydroepiandrosterone sulfate; PAC, plasma aldosterone concentration; PRA, plasma renin activity;
[a]No reference range due to patient's age (above 60)

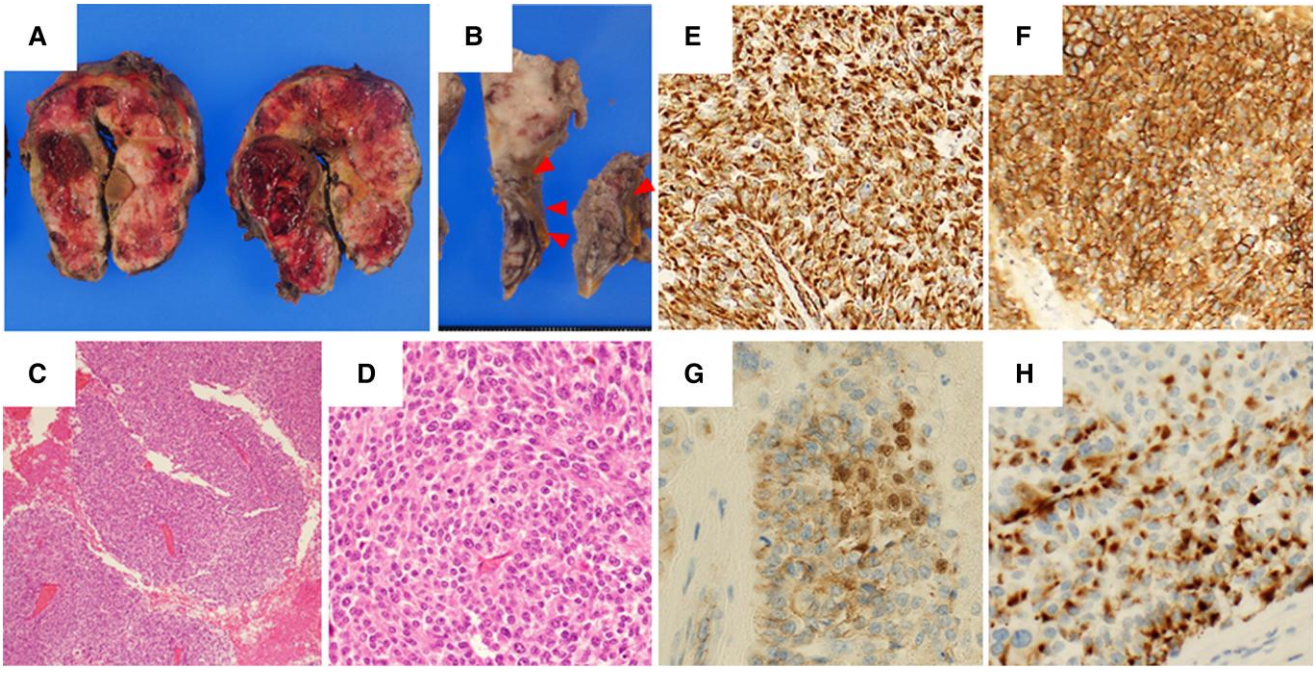

Figure 2. A, B, Gross appearance. A, The cut surface was solid, and most of it was whitish. Some hemorrhages and necrotic foci were observed. B, The shrunken adrenal (arrows) was detected attached to the tumor surface. C, D, Histopathologic appearance (hematoxylin and eosin staining). C, Pseudopapillae were formed when tumor cells detach from the vascular stalk. D, Tumor was composed of poorly cohesive monomorphic cells with round nuclei and eosinophilic cytoplasm. Mitoses were seen. E-H, Immunohistochemical staining. E, Vimentin positive. F, CD56 positive. G, Some tumor cells were nuclear and cytoplasmic β-catenin staining. H, Cytokeratin AE1/AE3 partially positive.

particular hormonal findings were detected for the adrenal functional analysis.

SPT can occur in extra-pancreatic regions, such as the omentum, mesentery, retroperitoneum, ovary, stomach, and duodenum. There have been 5 (including this case) reports of SPT occurring in the retroperitoneal adrenal region (Table 2). Although contrast-enhanced CT preoperatively revealed that the tumor was considered to be fed from adrenal artery and resected adrenal tissue was observed adjacent to the tumor in this case, there were no findings that could be determined that the tumor was originated from the adrenal gland. The original cell type of SPT is unknown; however, the majority of SPT cases are found in the pancreas region. So far, only a single case out of 5 reported cases of SPTs in the adrenal region (Table 2) was reported to arise from ectopic pancreas; however, the others did not contain ectopic pancreas [3]. As a possible explanation for this discrepancy, some similarities between SPT and ovarian surface cells are reported, and the proximity between germinal ridges and pancreatic primordia during early embryogenesis led to the hypothesis that SPT may be derived from genital ridge anlage-related cells that were incorporated into the pancreas during organogenesis [5, 7]. This hypothesis may explain why most cases of retroperitoneal SPTs, including our present case, occur without ectopic pancreas.

Table 2. Previous SPT in adrenal region case reports

Author	Pub. year	Age	Sex	Tumor region	Size	Presentation	Ectopic pancreas	Procedure	Recurrence	(Ref.)
Miyazaki et al	2012	22	F	Left adrenal	7 cm	Abdominal discomfort	—	TLESS	—	[4]
Junzu et al	2012	37	F	Right adrenal	8.5*8.3* 7.9 cm	Regular ultrasound exam	—	Open surgery	—	[5]
Zhu et al	2013	22	F	Left Adrenal	6*6*5 cm	Regular ultrasound exam	+	Laparoscopic surgery	—	[3]
Guo et al	2016	47	F	Between left kidney, spleen, and intestine	16*14 cm	Slight pain in her upper left abdomen, 5 kg weight loss	—	Open surgery	—	[6]
This case		67	M	Left adrenal	11.8*10.2* 13 cm	Intermittent fever and lumbago	—	Open surgery	—	

Abbreviation: TLESS, transumbilical laparo-endoscopic single-site adrenalectomy.

The size of SPT may be large at the time of discovery, since there is no specific clinical manifestation, and it may be discovered incidentally. Zalatnai et al reviewed in the Pathol Oncol Res. [8], the average size is 6 to 8 cm, and the diameter may reach a maximum of 15 to 22 cm. Significantly, SPT is a round mass with a fibrous pseudo-capsule and shows various cystic degeneration. Necrosis and hemorrhage are detected in the cross section [2]. Pathologically, SPT is composed of poorly cohesive, uniform epithelial cells forming solid and pseudopapillary structures [2]. Immunostaining features include nuclear and cytoplasmic immunoreactivity to β-catenin, positivity for CD10, progesterone receptor, cyclin D1, and vimentin and aberrant expression of E-cadherin. Cytokeratins, synaptophysin, and CD56 are positive in 30% to 70% of cases [9]. This patient had the above pathological findings (immunologically β-catenin, CD10, progesterone receptor, cyclinD1, vimentin, cytokeratin and CD56 positivity) and was diagnosed with SPT postoperatively.

SPT generally has a good prognosis, with a 5-year survival rate of approximately 97%, including those with metastases. Recurrence after radical surgery occurs in 2% to 10% of cases [10]. Factors that have been suggested to predict recurrence and patient outcome include gender, age, tumor size, resection margins, perineural invasion, vascular invasion, deep invasion into surrounding structures, and Ki-67 proliferation index, but no consensus has been reached. The meta-analysis in patients with SPT shows that men with SPTs may have a poorer prognosis, suggesting that this case requires careful follow-up in the future [10].

In conclusion, we experienced a case of retroperitoneal SPT in an older male. The preoperative diagnosis was malignant adrenal tumor because the tumor was large and considered to be fed by the left middle adrenal artery. Surgery was performed, and postoperative pathology revealed the diagnosis of SPT, which is a low-grade tumor with a generally good prognosis, although careful follow-up is needed. Although rare, SPT should be considered as a differential diagnosis in cases of a mass arising in the adrenal region.

Learning Points

- We reported a case of retroperitoneal SPT in a 67-year-old man, which was preoperatively diagnosed as malignant adrenal tumor.
- SPT generally has a good prognosis, with a 5-year survival rate of approximately 97%, including those with metastases.
- Although rare, SPT is one of the differential diagnoses in adrenal incidentalomas.

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Contributors

Individual contribution of each author is as follows: T.I., T.T., and J.W. made decisions on the patient's examinations and therapies. T.I., T.T., and J.W. reviewed previous publications and wrote the whole manuscript. K.N. is a pathologist and performed the immunohistologic examinations of the SPT. T.I., T.T., and J.W. contributed to the interpretation of the etiology and discussion. All authors read and approved the final manuscript.

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Disclosures

The authors declare that they have no competing interests.

Informed Patient Consent for Publication

Signed informed consent obtained directly from patient.

Data Availability Statement

Original data generated and analyzed for this case report are included in this published article.

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