Pheochromocytoma arising in the setting of adrenal–renal fusion

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Adrenal–renal fusion is an anomaly misclassified as a renal tumor due to the absence of pathognomonic radiographic features. Herein, we report a case of a 61-year-old male who underwent a right radical nephrectomy for a presumed renal malignancy. Pathologic evaluation demonstrated a pheochromocytoma in the context of adrenal–renal fusion. Neoplastic transformation of fused adrenal tissue is rare but not unheard of and is typically adrenal cortical in origin. To our knowledge, this is the first description of a pheochromocytoma originating from an adrenal–renal fusion. The clinical presentation did not raise a high index of suspicion for the ultimate diagnosis rendered.

Key Words: pheochromocytoma, nephrectomy, adrenal–renal fusion

Introduction

Adrenal–renal fusion (ARF) is a rare anomaly misdiagnosed radiographically as a renal mass. The true incidence remains unknown, as most reports are based on autopsy studies. ARF results from the incomplete formation of the mesenchymal capsule around the adrenal gland and the kidney. Preoperative diagnosis is challenging, if possible, and can lead to unnecessary procedures.[1]

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Pheochromocytomas are uncommon chromaffin cell tumors that may also be challenging to diagnose in the absence of a classical constellation of symptoms, such as paroxysmal hypertension, episodic headaches, palpitations, diaphoresis, anxiety, and hyperglycemia.[2] Approximately 10% of cases are malignant, a diagnosis rendered only in the presence of distant metastasis.

In this case report, we describe the unusual presentation of a pheochromocytoma originating from an ARF with clinical and radiographic resemblance to a renal cortical neoplasm.

Case report

A 61-year-old male presented to clinic with intermittent fevers, night sweats, 18 lbs. weight loss, and right upper quadrant (RUQ) discomfort for 3 weeks. His past medical history was significant for longstanding hypertension, controlled on losartan 50 mg daily. He denied a history of tobacco use or occupational exposure.

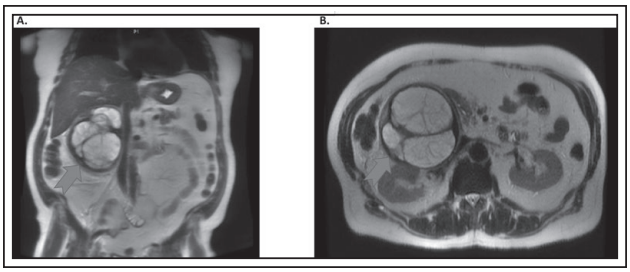

Figure 1. MRI images demonstrating the right upper quadrant mass (arrow). **A)** Coronal view, **B)** Transverse view.

Abdominal ultrasound and magnetic resonance imaging (MRI) of the abdomen and pelvis demonstrated a 10.9 cm x 10 cm x 12.0 cm hemorrhagic, septated, and lobulated RUQ mass involving and compressing the renal hilum, inferior vena cava (IVC), and right adrenal gland, Figure 1. The lesion was presumed to be malignant and originating from the right kidney. The patient underwent an open right radical nephrectomy with a transperitoneal approach through a right subcostal incision. The tumor was densely adherent to the IVC, right adrenal gland, and duodenum with extensive neovascularity. The mass was inseparable from the anterior right kidney, and there was suspicion for perinephric tissue invasion. A right radical nephrectomy, adrenalectomy and pre- and para- caval lymphadenectomy were performed without complications.

The postoperative course was significant for dyspnea, sinus tachycardia and fever up to 38.9°C on day 1 with negative workup for pulmonary embolism. The patient remained normotensive and was discharged home on day 3 once the sinus tachycardia resolved.

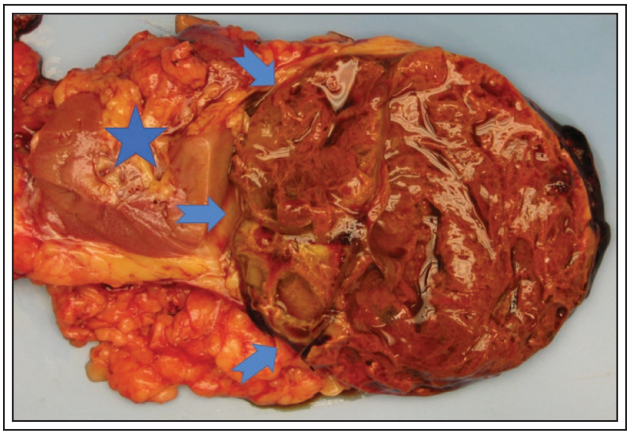

Figure 2. Necrotic, well-circumscribed mass (right side – arrows) compressing the adjacent kidney (left side – star). A thin rim of golden-yellow adrenal cortical tissue is focally present at the periphery of the mass (far right) and along the adjacent renal capsule (not pictured).

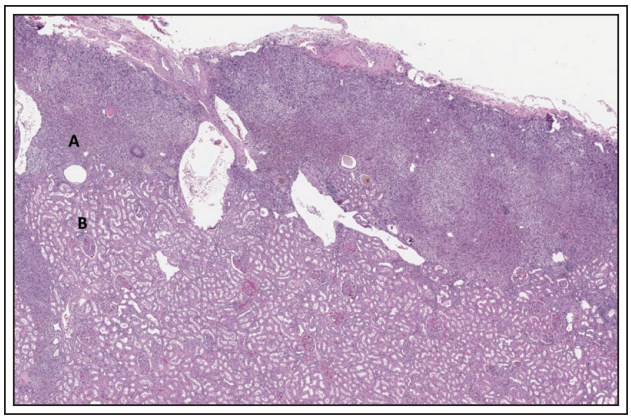

Figure 3-1. Subcapsular adrenal cortical tissue **(A)** intimately associated with the renal parenchyma **(B)** and bound by a common connective tissue capsule.

Gross and microscopic examination revealed a pheochromocytoma arising from the right adrenal gland, a portion of which displayed fusion to the renal parenchyma (i.e. adrenal–renal fusion), Figures 2

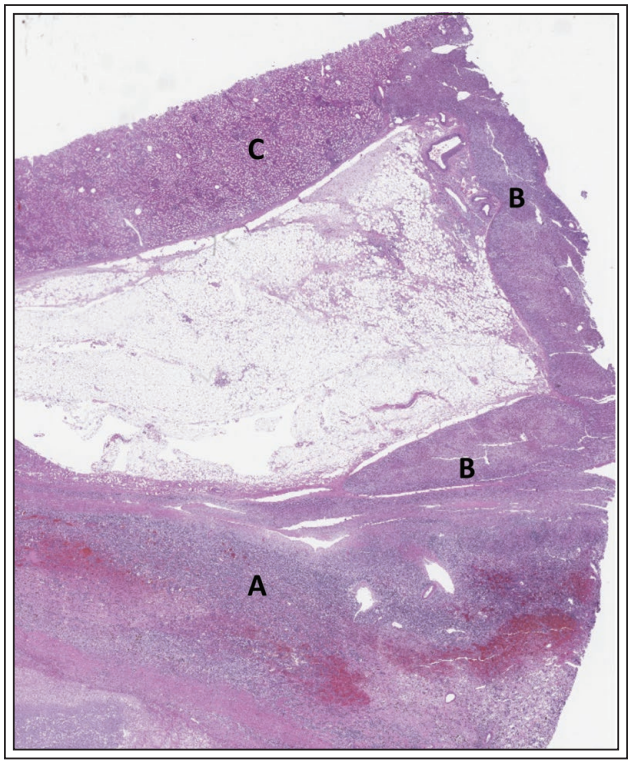

Figure 3-2. Tumor **(A)** with adjacent adrenal cortical tissue **(B)** plunging into renal parenchyma **(C)**.

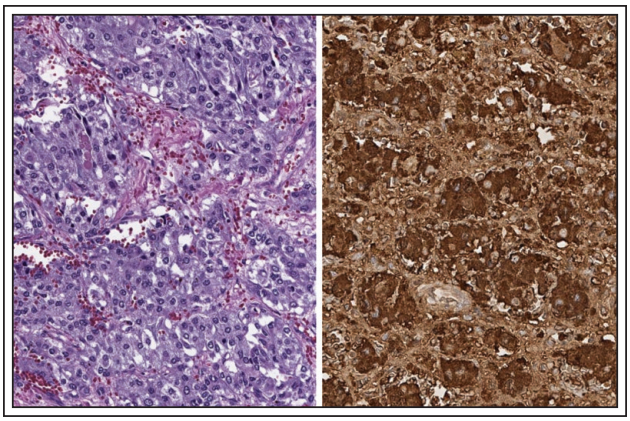

Figure 3-3. Tumor **(left)** displaying strong immunoreactivity to chromogranin A **(right)**.

and 3-1, 3-2. The tumor demonstrated strong immunoreactivity to chromogranin A, Figure 3-3, and was assigned a pheochromocytoma of the adrenal gland scaled score (PASS) score of 5, suggestive of potentially aggressive biological behavior.

On postoperative follow up, the patient remained asymptomatic. Urine and plasma catecholamines were within normal limits. As expected, GFR decreased from 102 to 65 mL/min/1.73m^2 post radical nephrectomy. No adjuvant chemotherapy was planned and repeat CT scan of chest, abdomen, and pelvis was planned for 3 months after initial presentation.

Discussion

First described in 1855, ARF remains difficult to diagnose even today.[3] Rokitanksy subdivided ARF into congenital and post-inflammatory etiologies. The congenital form stems from incomplete formation of mesenchymal capsule around the adrenal gland and kidney, whereas the post-inflammatory form results from perirenal fat fibrosis. Isolated ARF is asymptomatic and benign. ARF may be identified radiographically by the non-specific absence of a discrete fat plane between the kidney and the adrenal gland.[3] However, co-existence with renal or adrenal pathology may confound radiographic diagnosis. Therefore, diagnosis is typically rendered on histologic evaluation and requires the presence of a shared connective tissue capsule, as seen in this case, Figure 3-1. Adrenal adenomas arising in the setting of adrenal–renal fusion were previously misdiagnosed as either benign renal masses or renal cell carcinomas.[3] Similarly, adrenal cortical carcinomas have been described as arising from both ectopic intra-renal and extra-renal adrenal rests.[4] In this case, the adrenal medulla (and therefore pheochromocytoma) does not show direct fusion with the kidney although the fused component of the adrenal gland is composed exclusively of adrenal cortical tissue and bound by a common capsule. A rim of adrenal cortical tissue at the periphery of the mass speaks to the tumor arising from the adrenal medulla and remaining bound to the kidney by fused portions of the adrenal cortex.

Pheochromocytomas are neuroendocrine tumors that typically originate from the adrenal medulla. Ten to fifty percent of pheochromocytomas are found incidentally on imaging without associated symptoms, such as hypertension, palpitations, diaphoresis, anxiety and episodic headaches.[2] Biochemical diagnosis hinges on detection of urine catecholamines or plasma-free metanephrines. Radiologically, pheochromocytomas may have a characteristic high signal intensity on T2-weighted MRI ("light bulb" sign).[2] The presence of an undiagnosed catecholamine-productive pheochromocytoma results in perioperative hemodynamic instability, which can be avoided if patients are pre-treated with α-blockers or calcium channel blockers.[2] Challenges in preoperative diagnosis are compounded by difficulty with histological distinction between benign and malignant pheochromocytoma. A PASS score < 4 predicts benign behavior while a score ≥ 4 is suggestive of biologically aggressive behavior.[5] Only the presence of lymphadenopathy or distant metastasis is a clear diagnostic criterion for malignancy.

Our case is the first report of a pheochromocytoma arising in the setting of ARF. Located in the retroperitoneum, pheochromocytomas can grow over time without clinical manifestations. Early-onset hypertension was the only related symptom, though it was neither paroxysmal nor difficult to control. Sinus tachycardia observed postoperatively suggested that the tumor may have secreted vasoactive substances, although the patient remained normotensive throughout. Follow up surveillance imaging and biochemical testing were unremarkable and clinical genetics evaluation did not raise suspicion for a familial syndrome. There is no effective adjuvant systemic therapy to offer the patient at this time.

Conclusion

Adrenal–renal fusion is a rare entity that leads to misclassification of primary renal neoplasms. High clinical suspicion preoperatively may prevent unpredictable events in the perioperative period. Histologic features of adrenal cortical adenoma or carcinoma are commonly associated with neoplastic transformation of ARF. The likelihood of an adrenal

medullary-based neoplasm arising in this setting should not be disregarded. Fusion of purely adrenal cortical tissue, as in this case, may closely approximate the adrenal gland to the kidney and development of a pheochromocytoma may arise independently, mimicking a renal neoplasm. □

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