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CASE REPORT

# Computed tomography of adrenocortical carcinoma containing macroscopic fat

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**Abstract**

The presence of macroscopic fat in an adrenal mass has classically been associated with myelolipoma. Adrenocortical carcinoma is typically an aggressive malignancy with a poor prognosis. The presence of macroscopic fat is not a characteristic finding in adreocortical carcinoma or other adrenal malignancies. We report a case of a newly discovered large adrenal mass containing multiple areas of macroscopic fat, which was pathologically proven to represent an adrenocortical carcinoma.

**Keywords:** *Adrenocortical carcinoma; computed tomography (CT); macroscopic fat.*

## Introduction

The presence of macroscopic fat in an adrenal mass has classically been associated with a myelolipoma. Adrenal myelolipoma is a benign neoplasm that usually precludes the need for further diagnostic imaging or clinical evaluation, especially if asymptomatic. Adrenocortical carcinoma is typically an aggressive malignancy with a poor prognosis. Typically, adrenocortical carcinoma is large at presentation; usually measuring more than 6 cm. Heterogeneous texture on computed tomography (CT) and magnetic resonance imaging (MRI) is usually noted because of the presence of internal hemorrhage, necrosis and calcification. The presence of macroscopic fat is not a characteristic finding in adrenocortical carcinoma or other adrenal malignancies. We report a case of a newly discovered large adrenal mass containing multiple areas of macroscopic fat, which was pathologically proven to represent an adrenocortical carcinoma.

## Case report

A 41-year-old man with weight loss, nausea, vomiting, and abdominal pain was referred for an abdominal CT scan to rule out intraabdominal pathology. A dedicated CT of the abdomen was performed at our institution according to our standard venous phase protocol. Following ingestion of positive oral contrast material (barium sulfate suspension 2.1% w/v, Mallinckrodt) and injection of 125 ml of iopromide, 300 mg I/mL (Ultravist, Bayer HealthCare), helical CT was obtained with a 65-s delays using a 64-slice GE Lightspeed VCT scanner (GE Medical Systems; Milwaukee, WI). Axial sections of the abdomen showed a large ($18\times22\times22$ cm) heterogeneous retroperitoneal mass probably arising from the left adrenal gland containing multiple areas of macroscopic fat (Fig. 1). The patient had no documented clinical or laboratory evidence of adrenal hormonal excess. On the basis of the clinical history and CT findings, the patient underwent surgical resection of the left adrenal mass, which was found on pathologic examination to represent a low-grade adrenocortical carcinoma.

## Discussion

Around 5% of patients who undergo cross-sectional imaging are found to have an adrenal mass, and of these 5% are malignant[1]. CT is a widely accepted modality for the

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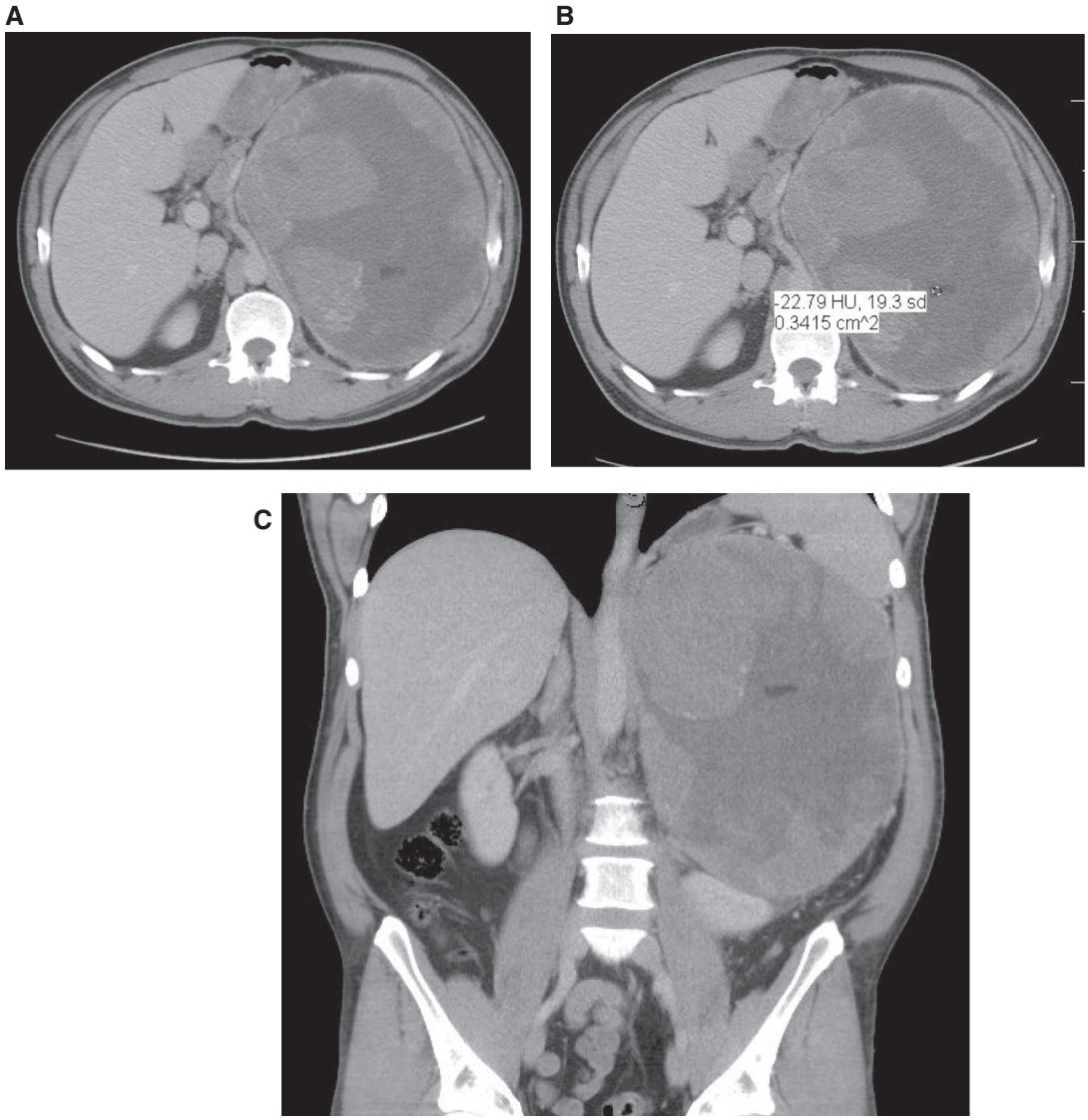


***Figure 1*** **Axial sections of contrast-enhanced CT (A, B), and coronal reformatted (C), demonstrating a large heterogeneous mass in the left upper quadrant with a heterogeneous predominantly peripheral nodular enhancement, central low attenuation representing necrosis, and a small focus of fat density (−23 HU) representative of macroscopic fat. The overall size of this mass was 18 × 18 × 22 cm with a considerable mass effect displacing the left kidney inferiorly.**

evaluation and characterization of adrenal lesions. In the evaluation of an adrenal mass using CT, the following features are important to consider: size of the lesion, local extent of the lesion, degree of enhancement on various imaging phases, attenuation of lesion prior to contrast administration, and attenuation of the various components of the lesion[2]. Many of these features have been extensively discussed in the literature. Features commonly associated with adrenocortical carcinoma include large size, extra-adrenal extension, heterogeneous enhancement, areas of low attenuation indicative of necrosis, and relative slow washout of contrast[3]. Although many of these features are quite useful in distinguishing benign adrenal adenomas from adrenocortical carcinomas (particularly lesion size and washout), they have not been established as adequate markers for the distinction between adrenocortical carcinomas and other benign adrenal lesions such as myelolipoma. Myelolipomas are benign tumors usually arising from the adrenal gland that contain a combination of hematopoietic tissue and mature adipose tissue[4]. Myelolipomas are not rare adrenal lesions as they have been shown to comprise 6% of all adrenal lesions identified in patients with no known malignancy[13]. Although other rare macroscopic fat-containing lesions have been shown to occur in the adrenal gland (including primary adrenal lipomas, liposarcomas, collision tumors, teratomas, and potentially pheochromocytomas)[5,12], the

presence of macroscopic fat in an adrenal lesion has classically been described as virtually diagnostic of an adrenal myelolipoma. However, we present a case in which multiple small areas of macroscopic fat are identified within a large adrenal mass, which was subsequently shown to represent adrenocortical carcinoma on pathologic evaluation. Only two additional cases with similar findings have been reported in the literature, one of which demonstrated macroscopic fat on both CT and MRI[5] and the other on MRI only[6]. Comparing these previously reported cases with our case, it appears that there are several common imaging features of the lesions including large size of the lesion, heterogeneous peripheral enhancement, and relative small amount of macroscopic fat in relation to soft tissue. The overall size of an adrenal lesion has been shown to have predictive value in differentiating between benignity and malignancy. Adrenocortical carcinomas are often quite large at the time of diagnosis, with a high correlation between adrenocortical carcinoma and a size equal to or greater than 4 cm[7]. However, the use of size criteria does not truly apply to the distinction of myelolipoma and adrenocortical carcinoma as it has been shown that myelolipomas can often be quite large, measuring an average of 10 cm[3]. The presence of calcifications is also not likely to be helpful in differentiating adrenocortical carcinomas from myelolipomas, because calcifications are seen in 30% of adrenocortical carcinomas[8] and 24–52% of myelolipomas[9]. Although each of the described cases of macroscopic fat-containing adrenocortical carcinoma have contained only a small amount of fat compared with overall lesion size, this may not be a reliable distinguishing feature, as it is well known that myelolipomas contain widely varying amounts of fat, with some containing very little fatty tissue[10]. Therefore. it is important to consider additional features of the lesion in distinguishing between myelolipoma and this rare entity of adrenocortical carcinoma containing macroscopic fat, including the presence of hypertension or clinical/biochemical stigmata of adrenal hormonal excess, which would favor the presence of adrenocortical carcinoma rather than myelolipoma, and the amount of enhancement after intravenous contrast administration. Although myelolipomas can demonstrate some enhancement and bizarre washout due to the combination of both fat and myeloid tissue, the presence of a large heterogeneous mass with significant peripheral enhancement is more likely to represent adrenocortical carcinoma than a benign lesion such as myelolipoma. Although the presence of macroscopic fat within an adrenal lesion is much more likely to represent a benign adrenal lesion such as a myelolipoma, adrenocortical carcinoma should be included in the differential diagnosis when additional features suggesting malignancy are noted, particularly in the presence of a large heterogeneous mass with a heterogeneous predominantly peripheral enhancement.

## References


[1] Yip L, Tublin ME, Falcone JA, *et al.* The adrenal mass: correlation of histopathology with imaging. Ann Surg Oncol 2010; 17: 846–52.

[2] Johnson PT, Horton KM, Fishman EK. Adrenal imaging with multidetector CT: evidence-based protocol optimization and interpretative practice. Radiographics 2009; 29: 1319–31.

[3] Johnson PT, Horton KM, Fishman EK. Adrenal mass imaging with multidetector CT: pathologic conditions, pearls, and pitfalls. Radiographics 2009; 29: 1333–51.

[4] Patel VG, Babalola OA, Fortson JK, Weaver WL. Adrenal myelolipoma: report of a case and review of the literature. Am Surg 2006; 72: 649–54.

[5] Ferrozzi F, Bova D. CT and MR demonstration of fat within an adrenal cortical carcinoma. Abdom Imaging 1995; 20: 272–4.

[6] Heye S, Woestenborghs H, Van Kerkhove F, Oyen R. Adrenocortical carcinoma with fat inclusion: case report. Abdom Imaging 2005; 30: 641–3.

[7] Sturgeon C, Shen WT, Clark OH, Duh QY, Kebebew E. Risk assessment in 457 adrenal cortical carcinomas: how much does tumor size predict the likelihood of malignancy? J Am Coll Surg 2006; 202: 423–30.

[8] Dunnick NR, Heaston D, Halvorsen R, Moore AV, Korobkin M. CT appearance of adrenal cortical carcinoma. J Comput Assist Tomogr 1982; 6: 978–82.

[9] Kenney PJ, Wagner BJ, Rao P, Heffess CS. Myelolipoma: CT and pathologic features. Radiology 1998; 208: 87–95.

[10] Rao P, Kenney PJ, Wagner BJ, Davidson AJ. Imaging and pathologic features of myelolipoma. Radiographics 1997; 17: 1373–85.

[11] Slattery JM, Blake MA, Kalra MK, *et al.* Adrenocortical carcinoma: washout characteristics on CT. Am J Roentgenol 2006; 187: W21–4.

[12] Ramsay JA, Asa SL, van Nostrand AW, Hassaram ST, de Harven EP. Lipid degeneration in pheochromocytomas mimicking adrenal cortical tumors. Am J Surg Pathol 1987; 11: 480–6.

[13] Song JH, Chaudhry FS, Mayo-Smith WW. The incidental adrenal mass on CT: prevalence of adrenal disease in 1049 consecutive adrenal masses in patients with no known malignancy. Am J Roentgenol 2008; 190: 1163–8.