



Imaging of 2 Enlarging Perirenal Hibernomas

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Introduction

Hibernoma is a rare benign tumor arising from vestigial remnants of brown fat, which develops in the second and third trimesters of fetal life to provide thermogenesis. Brown fat accounts for 2%-5% of a newborn's total body weight but gradually regresses to about 0.1% in adults, in whom white fat cells form the bulk of subcutaneous and visceral adipose tissue [1,2]. Small collections of brown fat may persist in various anatomical locations, although most hibernomas occur in the thigh, trunk, and shoulder areas [3,4]. About 10% of these tumors involve the retroperitoneal and intra-abdominal regions, but only a few isolated cases of perinephric hibernomas have been reported [5,6].

This article presents 2 patients with enlarging perirenal hibernomas. Their CT and MRI features are illustrated, and the pertinent clinical data and pathological findings of this rare tumor are briefly reviewed.

Case 1

A 64-year-old woman presented with pain in the right lower abdomen and in the lumbar region. CT of the abdomen with IV contrast was performed at a local hospital. It demonstrated a 5

Abstract

Adipose tissue in the human fetus is composed of brown fat cells that are polygonal and multivacuolated, filled with many tiny lipid droplets and mitochondria. After birth, mature white fat cells replace brown fat; these cells are larger and contain a single lipid droplet in their cytoplasm. Some remnants of brown fat may remain scattered throughout the body and lead to a rare benign tumor called hibernoma. This lesion should be distinguished from white fat tumors, namely lipoma, liposarcoma, and Angiomyolipoma.

This article reports 2 adult patients who had developed an enlarging fatty mass in their perirenal region that proved to be a hibernoma at surgery or by biopsy. This rare benign tumor originates from the congenital remnants of brown fat in the human body. These lesions often resemble other lipomatous tumors on Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) but have very distinct histopathology. This paper briefly reviews the imaging features, pertinent clinical data, and previously published cases of this unusual tumor.

cm right ovarian cyst and a degenerated disc at L5-S1. An incidental fatty mass in the right renal hilum measured 1.7×3.5 cm on axial section (Figure 1A and B).

She was evaluated at our hospital 6 years later because of abdominal pain and weight loss. CT of the abdomen showed that the right perirenal mass had enlarged to 3.2×5.2 cm on axial and 2.6×6.7 cm on coronal images, extending between the right psoas muscle and the lower pole of the kidney (Figure 2A and B). The tumor showed only slight enhancement, as its pre-contrast attenuation of -80 HU (compared with -99 HU for subcutaneous fat) increased to -41 HU on post-contrast images. The radiological diagnosis of this tumor was reported to represent either a hypo-vascular angiomyolipoma or hibernoma.

The consulting urologist was concerned that the growing lesion may be a malignant tumor, most likely a liposarcoma, and performed a laparotomy for its removal (Figure 3A). Histopathology showed that the mass was composed of clusters of brown fat cells which have a distinct polygonal shape and eosinophilic cytoplasm filled with multiple tiny lipid droplets and mitochondria, interspersed with a network of capillaries and fibrotic septa, consistent with a hibernoma (Figure 3B). The patient's postoperative recovery was uneventful, and the tumor



has not recurred during 6 years of follow-up.

Case 2

A 68-year-old woman underwent a CT of the abdomen after suffering syncope and falling. Her study showed degenerative disc disease of the spine and arteriosclerosis of the aorta. Incidentally detected were a 1.3 cm right renal cyst and a 2.9×3.8 cm fatty mass indenting the lateral aspect of the left kidney (Figure 4A). It had an attenuation of -62 HU during the arterial phase and -69 HU on delayed images. The radiological diagnosis of this tumor was a probable hibernoma or angiomyolipoma.

She had another CT of the abdomen 4 years later because of general malaise and early satiety. The left renal mass had enlarged, measuring 4.4×4.9 cm on the axial section and protruding further into the kidney (Figure 4B). Therefore, an ultrasound-guided biopsy was done, and the histopathological features of the specimen revealed a hibernoma.

An MRI of the abdomen was performed recently when she presented at the age of 84 years with epigastric pain, nausea, and fever. The study showed small gallstones and pericholecystic fluid, uterine fibroids, and multiple hepatic and renal cysts. The left perirenal hibernoma measured 3.0×4.5 cm on axial images and 4.0×5.6 cm on coronal images and appeared as a well-circumscribed adipose mass with slightly lobulated borders and some internal septations (Figure 5A and B). The tumor was slightly hyperintense compared to the subcutaneous fat but hypointense relative to muscle and renal parenchyma on the fat-suppressed T2-weighted sequence.

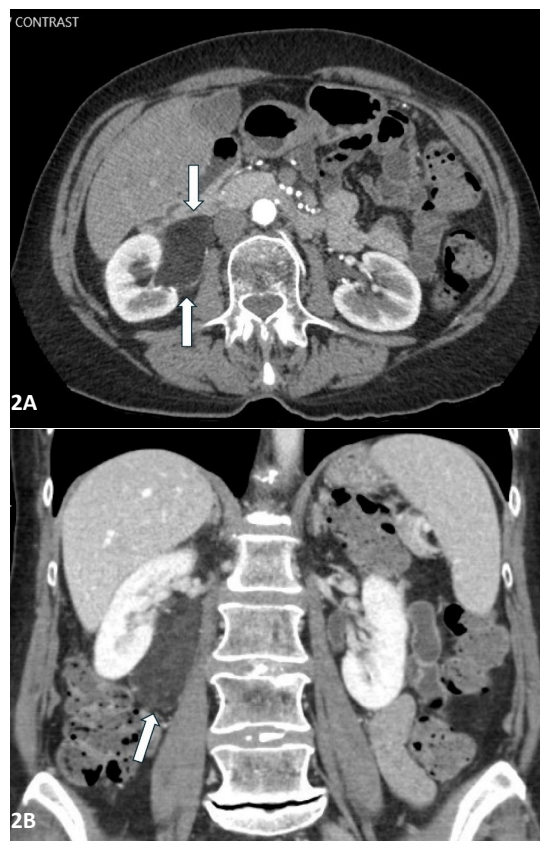


Figure 2: (A and B) CT performed 6 years later demonstrates the enlarging tumor, causing lateral displacement of the right kidney (arrows).



Figure 1: (Case 1A and B) Axial and coronal sections of the contrast-enhanced abdominal CT show a 3 cm fatty mass in the right renal hilum (arrows).

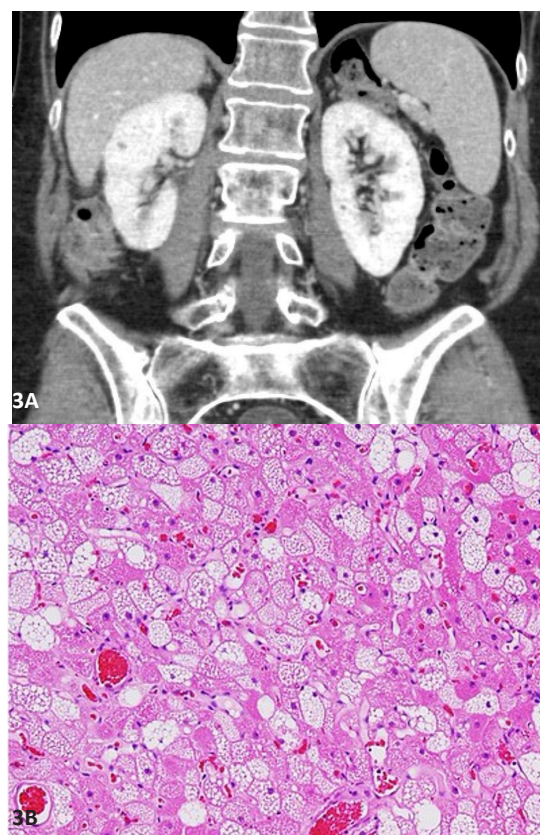


Figure 3: (A) Postoperative CT shows that the right kidney has returned to its normal position and no residual tumor is present. (B) Histopathologic section of the resected hibernoma (H&E stain, 400). The tumor is composed of brown fat cells, which are polygonal and filled with microdroplets of lipid and mitochondria, producing the characteristic bubbly or mulberry-like appearance of these cells.

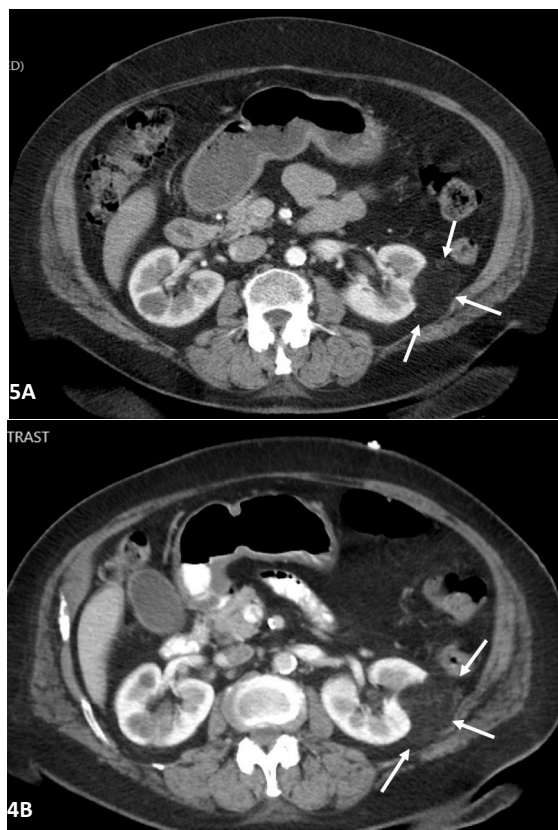


Figure 4: (Case 2A) The initial abdominal CT shows a 3×4 cm fatty tumor indenting the lateral aspect of the left kidney (arrows). **(B)** Repeat study 4 years later reveals an enlarging tumor that further protrudes into the renal parenchyma (arrows).



Figure 5: (A and B) Axial and coronal views of fat-suppressed T2-weighted MRI demonstrate this hibernoma as an encapsulated fatty lesion with some internal septations (arrows). The tumor is moderately hyperintense compared to subcutaneous fat, but hypointense relative to the muscles and renal parenchyma.

Discussion

Brown fat is a vital source of energy and thermogenesis in hibernating animals, and the tumors arising from this tissue in human adults are termed hibernomas. Since its initial description in 1914, about 500 cases have been reported, and the most common sites of its development have been the thighs and shoulders in 25% of patients [3,4,7]. Abdominal location accounts for 10%-15% of these tumors, but there have been only a few cases of hibernoma involving the perirenal regions. These tumors were seen as a round fatty mass in the renal pelvis or hilum and in the lower pole of the kidney [5,6].

The resected hibernoma is usually an encapsulated and lobulated fatty tumor with a tan or brownish color on its transected surface [3-6]. Histopathology shows that it is composed of clusters of brown fat cells that are polygonal and multivacuolated, filled with numerous tiny lipid droplets and mitochondria within eosinophilic cytoplasm that produce a characteristic bubbly or mulberry-like appearance (Figure 3B). These features differentiate it from other lipomatous tumors that originate from white fat cells that are larger and filled with a single lipid collection, associated with more prominent vessels and smooth muscle fibers, as in angiomyolipoma and liposarcoma.

Hibernomas are reported to occur predominantly in patients aged 30-50 years, slightly more prevalent in males and extremely rare in children [3,4]. Both of the herein presented cases were elderly women, in whom the tumor had probably existed for several decades before being detected incidentally.

The majority of hibernomas have been reported in surgical and pathological publications. However, its CT and MRI features have also been described in radiology journals [8,9].

CT of the abdomen demonstrates hibernoma as a well-demarcated fatty tumor that shows only slight to moderate enhancement with contrast (Figures 2 and 4). The MRI appearance of hibernoma on fat-suppressed T2-weighted sequence is a heterogeneous lipid-containing mass that is moderately hyperintense compared to subcutaneous fat and hypointense relative to muscles and kidney (Figure 5).

Hibernoma can closely resemble and be difficult to differentiate from a benign lipoma, liposarcoma, or angiomyolipoma on imaging studies [4,7-9]. However, its documented enlargement may raise concern about a possible malignancy and prompt surgical removal or biopsy for definitive diagnosis, as performed in these 2 patients.

It should be noted that the brown fat cells are metabolically active, and some hibernomas can be detected by FDG uptake on PET scans. However, several studies have found that this examination is not always a reliable method for the diagnosis of hibernoma or its differentiation from liposarcoma [10,11].

In summary, hibernoma is a rare tumor of the brown fat cell remnants that can occur in the perinephric region or various other anatomical locations in adult patients. Its gradual enlargement on clinical or radiological examination can be mistaken for a liposarcoma or angiomyolipoma. Therefore, accurate diagnosis would require biopsy or surgical resection for histopathological confirmation. These tumors are always benign and slow-growing, and a recurrence or malignant transformation has not been reported.

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