

# Imaging Clues for Exophytic Liver Lesions

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## ABSTRACT

Preoperative diagnosis of the organ of origin in cases of exophytic lesions of liver is difficult and a challenge for the radiologist and clinicians. It needs careful examination and interpretation of radiological findings for correct diagnosis. We present our experience with exophytic liver lesions in four patients diagnosed with hepatocellular adenoma, hepatocellular carcinoma (HCC), cavernous hemangioma, and hydatid cyst, and highlighted these issues.

**Key words:** Adenoma; exophytic; hepatocellular carcinoma; liver

## Introduction

The extra hepatic component of hepatic masses is rare, but the abdominal mass in vicinity of liver always raises the suspicion. Diagnosis of the organ of origin in cases of exophytic lesions of liver is a challenge for the radiologists and clinicians. The preoperative diagnosis of pedunculated or exophytic liver lesions was difficult previously, but with the availability of magnetic resonance imaging (MRI) and multi-detector computed tomography (MDCT) scans, the diagnosis is not that difficult now, but still needs careful examination and interpretation of radiological findings for correct diagnosis of organ of origin. Various benign and malignant hepatic tumors may show exophytic growth. The computed tomography (CT) features of exophytic hepatic tumors are similar to those of their intrahepatic counterparts.<sup>[1-5]</sup> With the widespread use of MDCT, multi-planar reconstructions are possible in all the cases. Systematic review of coronal and sagittal reconstructions is helpful in deciding the organ of origin. We present our experience with exophytic liver lesions and highlight the above issues by describing four different cases, diagnosed and managed in our institute.

## Case Reports

### Case 1

A 60-year-old male presented with features of shock and upper abdominal pain. After clinical stabilization, ultrasound showed an exophytic solid heterogeneous mass involving right lobe of the liver with ascites. His serum albumin was low (2.1 gm %) with raised serum bilirubin (3.4 mg %), and liver enzymes (serum glutamic oxaloacetic transaminase/serum glutamic pyruvic transaminase: 436/512 U/L). Serum alpha-fetoprotein (AFP) was 4.1 IU/L. Dynamic contrast-enhanced MDCT of abdomen was done. A hyper vascular predominantly solid mass appears to be arising from segments V and VI of the liver [Figure 1a-c]. Observation of beak sign (arrow) helped to diagnose it confidently as an exophytic lesion arising from liver. Resection of the mass was done. Operative specimen [Figure 1d] revealed the same findings and histopathology was hepatocellular adenoma.

### Case 2

A 47-year-old male presented with right upper quadrant pain for the last 3 months. His serum albumin was 3.4 gm% and liver function test was almost normal with mildly raised liver enzymes. USG showed a large heterogeneous mass in relation to the inferior surface of right lobe of the liver. Multiphase MDCT revealed that the epicenter of the mass is outside the liver with infiltration into segments V and VI [Figure 2]. There was significant enhancement in the arterial phase seen along with enlargement of posterior branch of right hepatic artery (arrow) that was supplying this mass (feeding artery sign). No evidences suggestive of cirrhosis were seen. Tumor of extra hepatic origin especially from the hepatic

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flexure was kept as a possibility, but negative embedded organs sign [Figure 3] and the presence of feeding artery sign suggested that the lesion is arising from the liver. Biopsy from the mass proved it as hepatocellular carcinoma (HCC) with marked elevation of serum AFP.

### Case 3

A 40-year-old female presented with dyspepsia from the last 4 years. Her serum albumin and liver function test were almost normal. USG revealed a heterogeneous mass in relation to the left lobe of the liver. Multiphase MDCT of abdomen was done for characterization. The lesion showed characteristic centripetal pattern enhancement [Figure 4] in various phases; suggestive of hemangioma. Presence of beak sign (arrow) confirms its origin from the liver tissue.

### Case 4

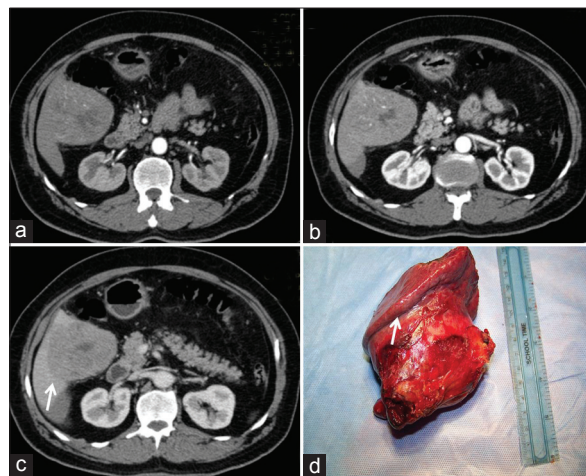
A 35-year-old female presented with complaints of fullness in

the epigastrium and recurrent upper abdominal pain. MDCT abdomen revealed multisystem exophytic mass lesions in relation to segment IV of the liver [Figure 5]. The septations were thick and enhancing with presence of daughter cysts suggestive of hydatid cyst. Note that the presence of beak sign (arrow) confirms the organ of origin. Although she was echinococcus ELISA (IgG) negative, but histopathology of resected specimen proved our preoperative radiological diagnosis of hydatid cyst.

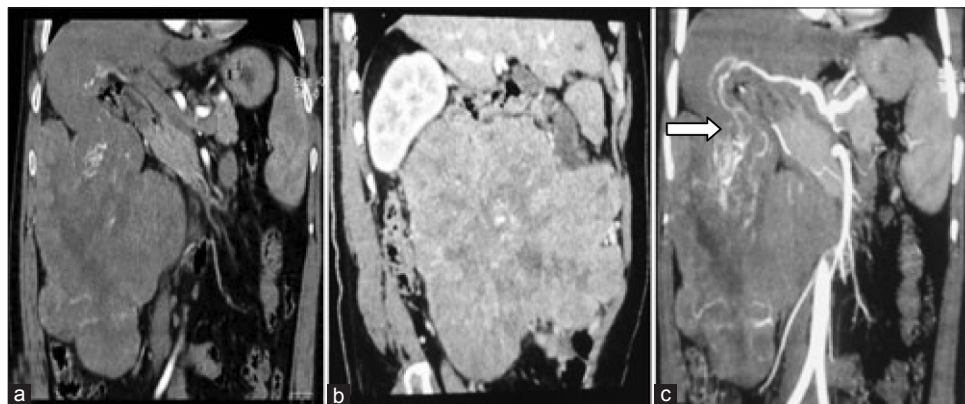
## Discussion

When the center of a tumor lies beyond the confines of the liver and the tumor originates from the liver, it can be defined as an exophytic hepatic tumor.<sup>[1]</sup> Various benign and malignant tumors such as a hepatic cyst, hemangioma, HCC, metastases etc., may show exophytic growth.<sup>[1-9]</sup> Morphological features and enhancement pattern of exophytic lesions are almost always similar to their intra-parenchymal counterparts even if the pedicle is not visualized.<sup>[2-5]</sup> Some radiological signs that are helpful in determining tumor origin include the “beak sign,” the “phantom (invisible) organ sign,” the “embedded organ sign,” and the “prominent feeding artery sign.”<sup>[2,3]</sup> In addition to these, observing imaging appearances and dynamic enhancement pattern characteristic of particular pathologies is also useful in making a correct diagnosis, or at least narrows down the differential diagnosis.<sup>[2-7]</sup>

When a mass deforms the edge of an adjacent organ into a “beak” shape, it is likely that the mass arises from that organ (beak sign). On the other hand, an adjacent organ with dull edges suggests that the tumor compresses the organ but does not arise from it.<sup>[2,3]</sup> When a large mass arises from a small organ, the organ sometimes becomes undetectable. This is known as the phantom (invisible) organ sign. However, false-positive findings do exist, as in cases of huge retroperitoneal sarcomas that involve other small organs such as the adrenal gland.<sup>[2,3]</sup> When a tumor compresses an adjacent plastic organ (e.g., gastrointestinal tract, inferior vena cava) that is not the organ of origin, the

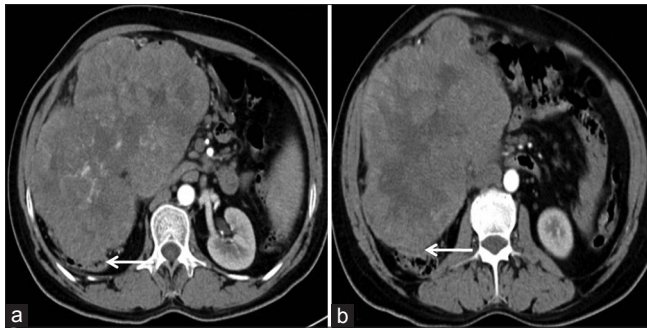


**Figure 1:** Axial sections at the level of lower part of liver in (a) arterial; (b) portal; and (c) venous phases showing an exophytic heterogeneously enhancing mass in relation to the inferior surface of right lobe of the liver. Presence of beak sign (arrow) suggests that the lesion is arising from liver. (d) Photograph of the resected tumor confirms the same. Histology from this lesion proved it as hepatocellular adenoma

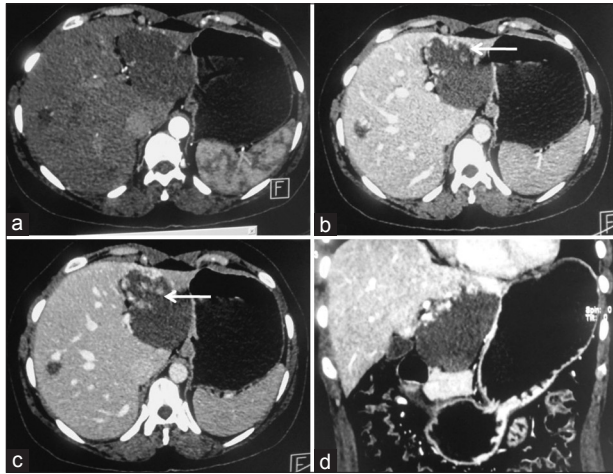


**Figure 2:** (a) Coronal; and (b) sagittal; images of abdominal CT scan showing the continuity of the mass with the inferior surface of the liver. (c) Coronal; image demonstrates the enlarged posterior branch of right hepatic artery; supplying the mass (arrow; feeding artery sign) which confirms the organ of origin

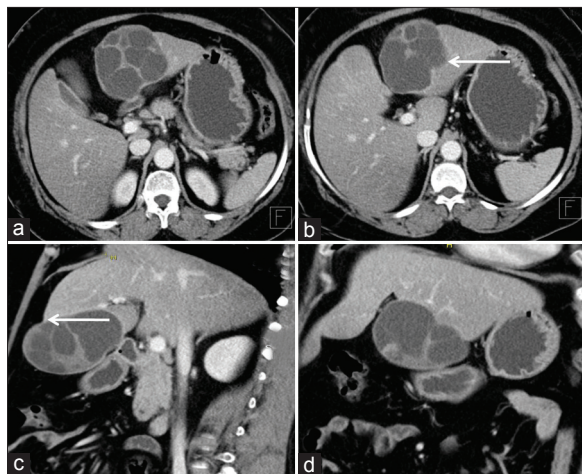




**Figure 3:** Axial sections of the same patient showed that the mass is displacing the ascending colon with negative embedded organ sign (arrows); suggested that the mass is not arising from the colon



**Figure 4:** Axial sections of multiphase MDCT of abdomen showing a heterogeneous exophytic lesion in relation to the left lobe of liver. (a) In arterial phase; the lesion is showing minimal peripheral enhancement. There is progressive centripetal pattern of enhancement (arrow in c) seen in (b) portal; and (c) venous phase axial images. This characteristic enhancement pattern is highly suggestive of cavernous hemangioma. Presence of beak sign (arrow in b) confirms that it arises from liver



**Figure 5:** Contrast-enhanced MDCT of abdomen is showing a heterogeneous predominantly hypo attenuating lesion arising from left lobe of the liver. Multiple enhancing septations and few daughter cysts are seen. Cytology of the aspirated fluid confirmed it as hydatid cyst. Demonstration of beak sign (arrows) in axial and sagittal images helps diagnose the organ of origin confidently

organ is deformed into a crescent shape (negative embedded organ sign). In contrast, when part of an organ appears to be embedded in the tumor, the tumor is in close contact with the organ and the contact surface is typically sclerotic with desmoplastic reaction. Occasionally, the contact surface becomes ulcerative. When the embedded organ sign is present, it is likely that the tumor originates from the involved organ.<sup>[2,3]</sup> Hyper vascular masses are often supplied by feeding arteries that are prominent enough to be visualized at CT or MR imaging, findings that provide an important key to understanding the origin of the mass (prominent feeding artery sign).<sup>[2,3]</sup> In addition, vascular networks between these structures also develop. Tumors arising from posterior liver surface may mimic as right adrenal mass and also the right adrenal mass may mimic as liver lesion especially if there is significant adreno-hepatic fusion. The right adrenal gland is intimately related to the inferior surface of the right lobe of the liver. The close association between these two structures increases with age,<sup>[4,6]</sup> especially in cirrhotic livers,<sup>[4,6,8]</sup> and is termed as adreno-hepatic fusion.

In our patient, we diagnosed accurately the organ of origin before surgery using the above-mentioned typical CT-findings. Final diagnoses in our patients were hepatic adenoma, HCC, cavernous hemangioma, and hydatid cyst. A hepatocellular adenoma is a rare benign tumor that is usually encountered in young women, who use oral contraceptives, but our patient was a 60-year-old male and before surgery it was thought to be HCC. Exophytic growth or distortion of the hepatic contour was present in 25% of cases of hepatocellular adenoma.<sup>[7,8]</sup> Identification of the feeding artery and the heterogeneous attenuation on CT may provide clues for the diagnosis of an exophytic hepatic adenoma. The exophytic HCCs constitute 0.2-4.2% of all HCCs.<sup>[7,8]</sup> It is well known that HCC may show retroperitoneal extension, and thus mimic a right adrenal tumor.<sup>[7,8,9]</sup> However, exophytic growth of HCCs may be seen in any lobe or segment of the liver. This tumor may invade the duodenum and mimic a duodenal gastrointestinal stromal tumor. In our patient, the mass displaced the ascending colon and looked like a colonic mass, but actually it was a hepatic mass.

The reported incidence of exophytic hemangioma was about 12% in cirrhotic patients.<sup>[7]</sup> However, pedunculated hemangiomas are very rare. Pedunculated hemangioma can be asymptomatic or can be complicated by torsion and infarction. If a hepatic cyst demonstrates exophytic growth, it may be misinterpreted as a pancreatic or omental cystic mass but in our case, we diagnosed hydatid cyst accurately because of the typical septations and presence of daughter cysts.

If a malignant liver tumor such as HCC with exophytic growth and invasion adjacent organs, without the above-mentioned characteristic radiological finding, then it may be difficult to ascertain the organ of origin of the mass. In such a scenario, certain tumor markers and biochemical tests such as AFP,

fucosylated AFP, serum albumin, and liver enzymes may be useful to confirm hepatic origin of the mass. AFP is a well-established tumor marker for diagnosing HCC with sensitivity of 80-70% and specificity 90%.<sup>[10]</sup> However, determination of the AFP level is of limited value for the diagnosis of HCC because of its no specificity and is often elevated in chronic liver diseases, such as chronic hepatitis and liver cirrhosis.<sup>[11]</sup> Fucosylated AFP (AFP-L3 fraction) is a more specific biomarker than AFP for the diagnosis of HCC. It increases in patients with HCC, but not in chronic hepatitis and liver cirrhosis.<sup>[11,12]</sup> We did not perform this test in any of our patients. Elevated serum liver enzymes levels, total bilirubin, gamma globulin, and lowered serum albumin levels are nonspecific markers of liver pathology.

In conclusion, the extra hepatic growth of a hepatic tumor is rare, but the abdominal mass between the liver, kidney, and colon should be differentiated from exophytic or pedunculated hepatic tumor. Ultrasound is the first imaging modality in many of these cases. It gives good morphological assessment, but because of the exophytic nature of these lesions, defining tissue of origin is very difficult. Pattern of contrast enhancement in various vascular phases and multi-planar reconstruction are highly useful in characterizing these lesions and determining the tissue of origin. Multiphase contrast-enhanced MDCT or MRI is the imaging of choice in these cases.

## References

1. Bader TR, Braga L, Semelka RC. Exophytic benign tumors of the liver: Appearance on MRI. *Magn Reson Imaging* 2001;19:623-8.
2. Minami M, Ohmoto K, Charnsangavej C, Kawauchi N, Itai Y, Sasaki S. Origin of abdominal tumors: Useful findings and signs on tomographic imaging. *Radiology* 1996;20:491-9.
3. Nishino M, Hayakawa K, Minami M, Yamamoto A, Ueda H, Takasu K. Primary retroperitoneal neoplasms: CT and MR imaging findings with anatomic and pathologic diagnostic clues. *Radiographics* 2003;23:45-57.
4. Honma K. Adreno-hepatic fusion. An autopsy study. *Zentralbl Pathol* 1991;137:117-22.
5. Okuda K. Hepatocellular carcinoma: Clinicopathological aspects. *J Gastroenterol Hepatol* 1997;12:S314-8.
6. Woo HS, Lee KH, Park SY, Han HS, Yoon CJ, Kim YH. Adrenal cortical adenoma in adrenohepatic fusion tissue: A mimic of malignant hepatic tumor at CT. *AJR Am J Roentgenol* 2007;188:W246-8.
7. Kim HJ, Lee DH, Lim JW, Ko YT, Kim KW. Exophytic benign and malignant hepatic tumors: CT imaging features. *Korean J Radiol* 2008;9:67-75.
8. M Mashfiqul AS, Tan YM, Thng CH, Cheow PC, Chung YF, Chow PK, *et al.* Pedunculated HCC or adrenal metastasis: A diagnostic conundrum. *Singapore Med J* 2007;48:e50-2.
9. Ichikawa T, Federle MP, Grazioli L, Nalesnik M. Hepatocellular adenoma: Multiphasic CT and histopathologic findings in 25 patients. *Radiology* 2000;214:861-8.
10. Szklaruk J, Silverman PM, Charnsangavej C. Imaging in the diagnosis, staging, treatment, and surveillance of hepatocellular carcinoma. *AJR Am J Roentgenol* 2003;180:441-54.
11. Moriwaki K, Miyoshi E. Fucosylation and gastrointestinal cancer. *World J Hepatol* 2010;2:151-61.
12. Nakagawa T, Moriwaki K, Terao N, Nakagawa T, Miyamoto Y, Kamada Y, *et al.* Analysis of polarized secretion of fucosylated alpha-fetoprotein in HepG2 cells. *J Proteome Res* 2012;11:2798-806.

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