

CASE REPORT

Unexpected uptake of gadoxetic acid in a hepatic metastasis from T-cell lymphoma*

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Date accepted for publication 1 March 2012

Abstract

We report a case of unexpected heterogeneous uptake of gadoxetic acid into a hepatic metastasis in a patient with T-cell lymphoblastic lymphoma that also lacked hypermetabolic characteristics on positron emission (PET)/computed tomography (CT) with [¹⁸F]fluorodeoxyglucose (FDG). Therefore, in cases of heterogeneous uptake of gadoxetic acid, infiltrative lesions must be considered.

Keywords: Magnetic resonance imaging; gadoxetic acid; T-cell lymphoma; metastases; liver.

Introduction

Detection of extranodal lymphoma continues to be a diagnostic challenge as metastatic disease can occur in nearly any organ system and have a widely variable appearance^[1,2]. There may be overlap in the imaging characteristics of benign and other neoplastic entities, thus sometimes resulting in a diagnostic conundrum.

Gadoxetic acid (gadolinium ethoxybenzyl diethylenetriamine pentaacetic acid; gadolinium-EOB-DTPA, gadoxetate disodium; Eovist[®], Bayer HealthCare Pharmaceuticals Inc., USA) is a new hepatocyte-specific magnetic resonance imaging (MRI) contrast agent. This contrast agent is actively transported from the extracellular space into hepatocytes by the same mechanism responsible for bilirubin transport, with subsequent excretion into the biliary system^[3]. In a patient with normal liver function, hepatocyte uptake is usually reached within 20 min, which is called the hepatocyte or hepatobiliary phase^[3,4]. The reported value of the pharmacodynamics of gadoxetic acid is to assist in both the detection and characterization of focal hepatic lesions^[3–6]. Ideally during the hepatobiliary phase, this agent demonstrates

increased uptake in lesions that contain functional hepatocytes, such as focal nodular hyperplasia (FNH), and does not show uptake in lesions that have few functioning hepatocytes (e.g. hepatocellular carcinoma) or are not of hepatocellular origin, such as cholangiocarcinoma or metastases^[3–7]. By increasing the contrast between the enhanced normal hepatic parenchyma and hypoenhancing masses, this contrast agent is ideal for the detection of small metastatic lesions^[7].

Recent studies have demonstrated uptake of gadoxetic acid into some well-differentiated hepatocellular carcinomas (HCC) and hepatic adenomas due to functioning hepatocytes and biliary transporters^[3,4,8]. However, there are no reports of uptake in metastatic lesions in the literature to our knowledge. We present a case of unexpected gadoxetic acid uptake into a metastatic hepatic lesion from T-cell lymphoma.

Case report

A 23-year-old male was transferred to our facility after experiencing 2 months of sharp upper back pain. He

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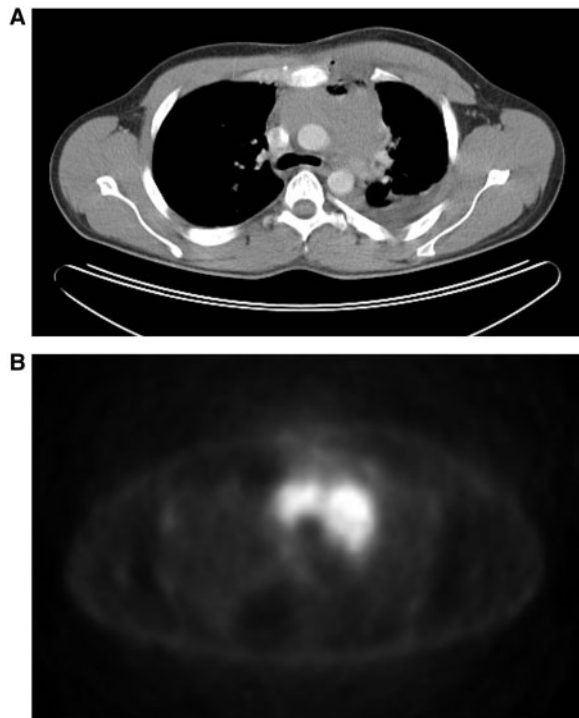


Figure 1 Images from PET/CT through the mid thorax. (a) CT image demonstrating a large lobulated anterior mediastinal mass measuring 6.6×9.8 cm. There is no associated lymphadenopathy. (b) Corresponding PET images demonstrating hypermetabolic activity in the tumor.

developed an acute increase in pain with radiation of the pain to the upper anterior chest which eventually led to a computed tomography (CT) scan of the chest. A large lobulated anterior mediastinal mass measuring 6.6×9.8 cm without associated lymphadenopathy was detected. Initial laboratory values for aspartate aminotransferase (AST), alanine aminotransferase (ALT), total bilirubin, alkaline phosphatase, and alpha fetoprotein were normal. After transfer to our facility, additional evaluation with contrast-enhanced positron emission tomography (PET)/CT (Biograph 2, Siemens Medical Solutions USA, Hoffman Estates, IL, USA) utilizing 633 MBq of [^{18}F]FDG demonstrated increased metabolic activity in the mediastinal mass with a standardized uptake value (SUV_{max}) of 12.5 (Fig. 1), suggestive of lymphoma or teratoma. An additional heterogeneous, lobulated 4.5×5.5 cm mass in the right lobe of the liver was also detected but did not demonstrate FDG avidity above normal hepatic background suggestive of benign etiology (Fig. 2). The spleen was normal size and without evidence of splenic involvement.

MRI (Magnetom Verio 3T, Siemens Medical Solutions, USA, Hoffman Estates, IL, USA) with gadoxetic acid (0.025 mmol/kg) was performed to further characterize this hepatic lesion (Fig. 3). The liver was non-

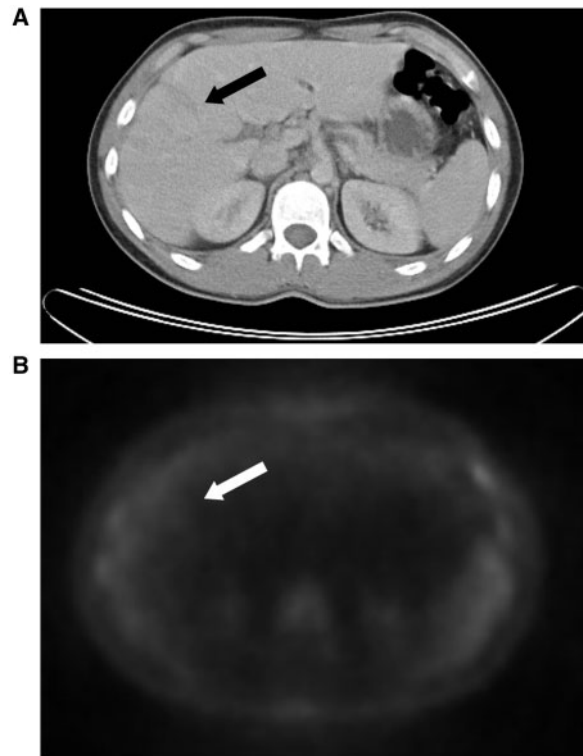


Figure 2 Images from PET/CT at the level of the liver. (a) CT image demonstrating a heterogeneous, lobulated 4.5×5.5 cm mass (black arrow) in the right lobe of the liver. (b) Corresponding PET image shows no significant FDG uptake (white arrow) within the right hepatic mass.

cirrhotic in morphology. The right hepatic lesion was mildly hypointense on T1-weighted sequences and mildly hyperintense on T2-weighted sequences, compared with surrounding hepatic parenchyma. After the administration of intravenous gadoxetic acid, the lesion demonstrated heterogeneous mild arterial enhancement, did not wash out on delayed images, and was heterogeneously iso- to hyperintense with scattered areas of hypointensity on hepatobiliary phase imaging. Considering these MRI findings, possible causes included atypical FNH, HCC, and hepatic adenoma; metastasis was considered but felt to be less likely.

Ultrasound-guided biopsy of the hepatic lesion was performed which yielded a diagnosis of T-cell lymphoblastic lymphoma which corresponded to the histologic and immunohistochemical findings from the mediastinal mass. The liver biopsy specimen showed architecturally normal liver surrounded by neoplastic T-cells within sinusoids (Fig. 4).

Discussion

Lymphoblastic lymphoma accounts for about 2% of all lymphomas, usually affecting males in their teens to

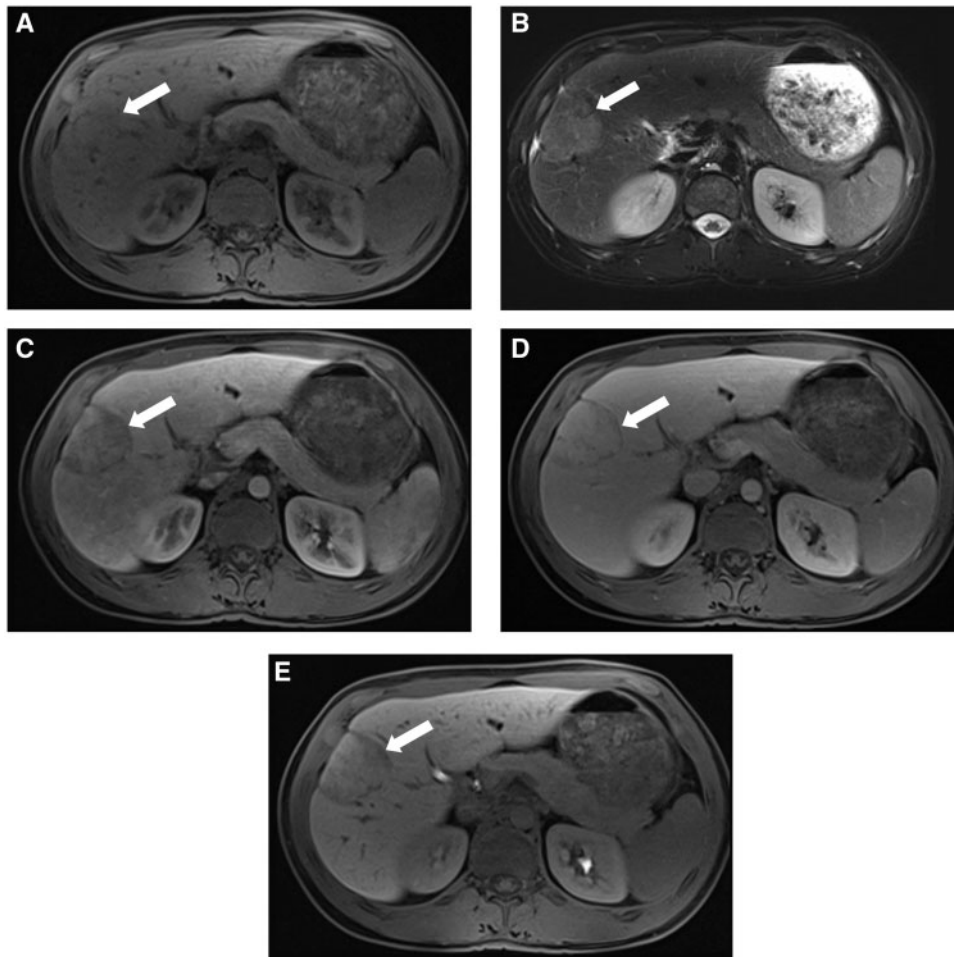


Figure 3 MRI of the liver. The right hepatic lesion is mildly hypointense on axial T1-weighted images with fat saturation without intravenous contrast (white arrow, a), and mildly hyperintense on corresponding axial T2 weighted images with fat saturation (white arrow, b). Axial dynamic post-contrast T1-weighted images with fat saturation utilizing gadoxetic acid for intravenous contrast demonstrate mild heterogeneous arterial enhancement within the right hepatic lesion after 20 s (white arrow, c). The liver lesion does not wash out at 1 min (white arrow, d). During hepatobiliary phase imaging (white arrow, e), the right hepatic lesion is heterogeneously iso- to hyperintense with respect to hepatic parenchyma and contains scattered areas of hypointensity.

twenties. It is a rapidly growing neoplasm that develops from immature lymphocytes, which in turn can differentiate into either T-cell or B-cell lineage, more commonly T-cell lineage. Patients with T-cell lymphoblastic lymphoma usually present with mediastinal mass and bone marrow involvement, with abdominal disease unusual. Secondary lymphomatous hepatic involvement can present variably from discrete nodules and masses to diffuse infiltration^[9]. When infiltrative, there can be confusion in the imaging diagnosis as the secondary tumor can be masked by the invaded organ.

Differentiation of benign and malignant causes is often a diagnostic challenge as distinguishing imaging features can overlap. As noted in this case, the [¹⁸F]FDG uptake by the metastatic hepatic lesion was different from the anterior mediastinal mass. The hepatic lesion

demonstrated [¹⁸F]FDG avidity equal to the level of surrounding liver parenchyma, decreasing its conspicuity.

As a newer MRI contrast agent, the value of gadoxetic acid exists in its ability to differentiate various benign and malignant hepatic lesions. As mentioned earlier, metastases have been described as uniformly hypoenhancing, and FNHs typically as homogeneously isointense to hyperintense compared with hepatic parenchyma during hepatobiliary phase imaging^[10]. However, up to 26% of FNHs demonstrate atypical heterogeneous uptake with gadobenate dimeglumine, another hepatocyte-specific agent^[11]. This heterogeneous uptake can overlap with some HCCs and hepatic adenomas^[3,4,8].

The liver lesion in this case report demonstrated heterogeneous iso- to hyperenhancement on gadoxetic acid-enhanced MRI consistent with functioning

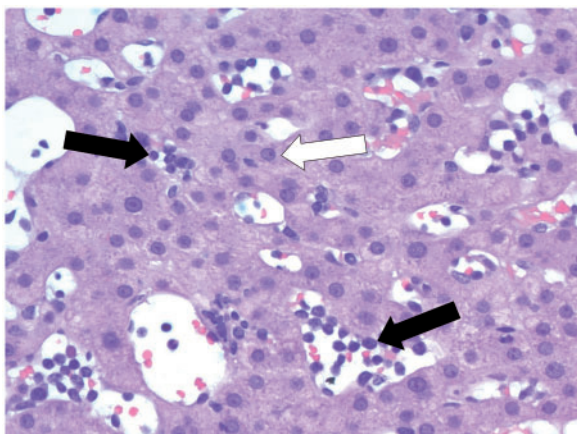


Figure 4 Hematoxylin and eosin stain (magnification $\times 40$) from ultrasound-guided core biopsy of the liver lesion shows benign hepatocytes (white arrow) with diffuse infiltration of the sinusoids by neoplastic T cells (black arrows), which demonstrated histomorphology and an immunohistochemical staining profile consistent with T-cell lymphoblastic lymphoma.

hepatocytes. The apparent uptake of gadoxetic acid by this metastatic hepatic lesion in this case is likely accounted for by the preserved enhancing hepatic parenchyma intermixed with the relatively hypoenhancing infiltrative lymphoblastic lymphoma. We assert that the normal hepatic parenchyma enhanced during the hepatobiliary phase and not the interspersed diffuse or mottled tumor foci.

Conclusion

Radiologists should be aware that tumors with known infiltrative properties may have atypical or confusing appearances to include uptake on hepatobiliary phase

gadoxetic acid or differing PET avidity between primary and metastatic lesions.

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