



Extrapulmonary tuberculosis with predominantly hepatic and splenic masquerading as malignancy

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A 42-year-old man with a history of chronic inactive hepatitis B virus (HBV) infection presented with mild left abdominal pain that occurred for 2 weeks. The patient had no fever, cough, diarrhea, vomiting, or weight loss. Physical examination revealed pain in the left upper quadrant of the abdomen upon applying pressure. No other abnormalities, such as palmar erythema or spider angiomas, were observed. Laboratory tests revealed the following: normal complete blood cell count and chemistry panel findings; alpha fetoprotein (AFP) 2.51 ng/mL; carcinoembryonic antigen (CEA) 1.28 ng/mL; carbohydrate antigen (CA)-199 <0.80 U/mL; CA-125 28.90 U/mL; prostate-specific antigen (PSA) 0.37 ng/mL. Abdominal ultrasonography revealed multiple splenic low-echo nodules, with the largest measuring 6.2 cm × 4.8 cm. Single-phase computed tomography (CT) of the abdomen revealed (I) multiple low-density, patchy, and nodular lesions in the spleen, some of which were fused, with mild-to-moderate enhancement on contrast-enhanced scanning, suggestive of a neoplastic process; (II) a nodular lesion in the left lateral lobe of the liver with possible metastasis; and (III) multiple enlarged lymph nodes in the mediastinum, bilateral hilar regions, abdomen, and retroperitoneum. Positron emission tomography with 2-deoxy-2-(fluorine-18) fluoro-D-glucose integrated with computed tomography (¹⁸F-FDG PET/CT) revealed increased FDG metabolism in the splenic parenchyma [Figure S1A (red arrows)], segments 2 and 8 of the liver [Figure S1A,S1B (black arrows)], pancreatic head region, ileocecal region (Figure S1C), lungs, mediastinum (Figure S1D), retroperitoneum, and mesenteric root lymph nodes, which indicates a malignant tumor in the liver and spleen with lymph node metastases (Figure 1). Superficial

ultrasound scans did not detect abnormally enlarged lymph nodes.

In this case, the patient had multiple splenic masses with a nearby lesion on the edge of the liver and multiple enlarged lymph nodes, accompanied by left abdominal pain without any other symptoms. ¹⁸F-FDG PET/CT revealed the possibility of multiple malignant tumors in the liver and spleen with lymph node metastasis. In most cases, liver tumors are located at the edge of the left liver, and percutaneous biopsy is associated with a high risk of stomach injury. In addition, multiple puncture biopsy of the spleen also carries potential risks of bleeding and metastasis. However, normal tissues, local inflammation, and surgical wounds can also concentrate ¹⁸F-FDG (1,2). Therefore, we need to consider the possibility of other confounding diagnoses when ¹⁸F-FDG PET/CT imaging suggests malignant tumors with metastasis, even when patients lack clear evidence of a malignant tumor. After multidisciplinary discussion, we chose to perform robot-assisted laparoscopic exploration. We observed that the peritoneum had no metastatic lesions, resected the left hepatic lesion (Figure 1), and finally performed an intraoperative rapid biopsy, which revealed no tumor cells and was considered an infectious lesion. Subsequently, robot-assisted laparoscopic splenectomy was performed. Gross examination of the spleen revealed numerous necrotic nodules with purulent discharge. Pathological examination of the mass in the left liver and spleen suggested granulomatous inflammation with caseous necrosis, indicating tuberculosis (Figure S1E); however, the tuberculosis Bacillus acid-fast staining test was negative. After surgery, the patient underwent two negative sputum smear tests for tuberculosis bacteria, and the interferon-

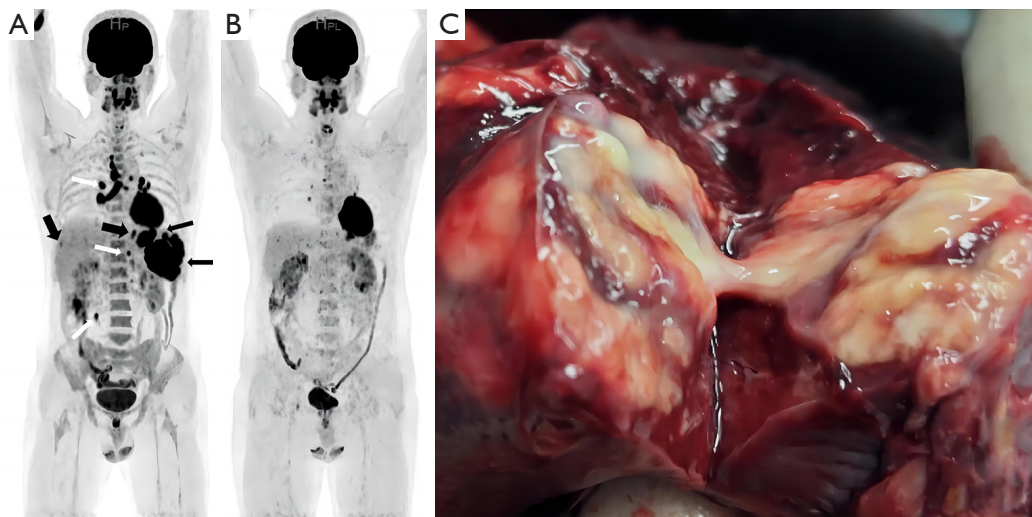


Figure 1 The MIP images and gross examination of the excised hepatic lesion. (A) The MIP image revealed intense activity in the regions of the liver (thick black arrows), spleen (thin black arrows), and thoracoabdominal lymph nodes (white arrows). (B) The MIP revealed that abnormally elevated metabolic lesions in the patient's body had disappeared after 9 months of the standard four-drug anti-tuberculosis treatment. (C) Numerous necrotic nodules with purulent discharge in the liver lesion during surgery. MIP, maximum intensity projection.

gamma release assay (IGRA) was positive. The final diagnosis was extrapulmonary tuberculosis (EPTB) with predominantly hepatic and splenic.

The patient recovered favorably postoperatively, without obvious complications, and was discharged 6 days postoperatively. After 9 months of the standard four-drug anti-tuberculosis treatment, namely isoniazid (300 mg/day), rifampicin (450 mg/day), ethambutol (800 mg/day), and pyrazinamide (750 mg/day), we confirmed that all of the areas with abnormally increased FDG metabolism (*Figure 1*, *Figure S1F-S1I*) were significantly reduced, as evidenced by further ^{18}F -FDG PET/CT examination. Finally, the patient's treatment ended, and no recurrence was found during the follow-up after 18 months postoperatively.

At present, diagnosis of EPTB is highly challenging. EPTB is defined as tuberculosis that affects organs other than the lungs (lymph nodes, pleura, urogenital tract, bones and joints, meninges, central nervous system, bowel and/or peritoneum, pericardium, and skin), accounting for approximately 15–20% of all tuberculosis cases (3). Clinical symptoms and radiological features of EPTB are not specific (4). Previously published case reports show that EPTB affects almost all organs, resulting in diverse clinical manifestations that ultimately lead to difficulties and delays in diagnosis (5,6).

We believe that the decision to perform the surgery was correct in this case. Surgical removal of the spleen

can achieve good results in the treatment of multiple tuberculous lesions in the spleen (7). Although there have been reports of hepatosplenic tuberculosis being cured by anti-tuberculosis therapy (8), in clinical practice, being totally dependent on anti-tuberculosis treatment to cure massive tuberculous lesions in the spleen may exhibit poor efficacy and requires a long course of treatment. However, obtaining complete specimens of the liver lesion and whole spleen has great diagnostic value for excluding metastatic carcinoma, and evaluating the nature of other unresected lesions. If we had to perform multiple fine needle puncture biopsies, including the lesions in the liver and spleen separately, it may further extend the time to obtain the correct diagnosis.

The results of the initial ^{18}F -FDG PET/CT, although misleading, did not diminish the importance in the evaluation of the treatment effect. We utilized the characteristics of ^{18}F -FDG concentration in tuberculosis lesions, discovering small tuberculosis lesions that were not initially detected by the CT scan (9), located in segment 8 of the liver and ileocecal region. Neither of these lesions was detected on CT, and intraoperative ultrasonic scan did not reveal lesions in the S8 segment. The patient refused the colonoscopy because the results of his previous colonoscopy three months earlier were normal. However, through the analysis of the ^{18}F -FDG concentration of those two lesions, as well as the multiple enlarged lymph nodes, we found these

lesions were consistent with liver and spleen lesions, and were identified as tuberculosis lesions. Therefore, ¹⁸F-FDG PET/CT before the end of treatment is necessary.

In summary, we herein reported one rare case of EPTB with predominantly hepatic and splenic masquerading as malignancy. After performing robotic-assisted splenectomy with partial hepatectomy and four-drug anti-tuberculosis treatment, all of the lesions had been completely removed, and no recurrence was found during the postoperative follow up. For such patients with symptomatic EPTB with predominantly hepatic and splenic masquerading as malignancy, curative-intent surgery and ¹⁸F-FDG PET/CT after treatment can be considered.

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Footnote

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