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CASE REPORT

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Gallbladder and liver miliary nodules: a surprising diagnosis of disseminated tuberculosis during emergency laparoscopic cholecystectomy

Tianyu Li[1†], Liang Zhu[2†], Bo Chen[3], Mengyi Wang[1], Di Shi[4], Chen Lin[1*], Weibin Wang[1*] and Xuan Wang[2*]

Abstract

Background Disseminated tuberculosis (TB) presenting as miliary nodules on the gallbladder and liver is extremely rare and poses significant diagnostic challenges. This report describes a case of disseminated TB discovered during emergency laparoscopic cholecystectomy for acute cholecystitis.

Case presentation A 77-year-old male presented with decreased appetite, weight loss, and fever. Preoperative imaging suggested gallstones and cholecystitis. During surgery, multiple miliary nodules were found on the surfaces of the gallbladder and liver, raising suspicion of metastatic cancer. Intraoperative frozen pathology revealed epithelioid granulomas with necrosis, and postoperative molecular testing confirmed Mycobacterium tuberculosis.

Conclusions This case highlights the importance of considering TB in the differential diagnosis of intra-abdominal nodules, especially in TB-endemic regions. Intraoperative frozen pathology and molecular diagnostics are crucial for timely and accurate diagnosis.

Keywords Disseminated tuberculosis, Miliary nodules, Gallbladder, Liver, Laparoscopic cholecystectomy

[†]Tianyu Li and Liang Zhu contributed equally to this work.

*Correspondence:
Chen Lin
linchen0818@sina.com
Weibin Wang
wwb_xh@163.com
Xuan Wang
wxpumc@163.com
[1]Department of General Surgery, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing, China
[2]Department of Radiology, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing, China
[3]Department of Pathology, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing, China
[4]Department of Emergency, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing, China

Background

Disseminated tuberculosis (TB) remains a significant global health challenge, particularly in TB-endemic regions [1]. While pulmonary TB is the most common manifestation, extrapulmonary TB (EPTB) can involve multiple organs, including the abdomen, and often presents with nonspecific symptoms that complicate diagnosis [2]. Abdominal TB, a form of EPTB, can affect the gastrointestinal tract, peritoneum, lymph nodes, and solid organs such as the liver and gallbladder. However, TB presenting as miliary nodules on the gallbladder and liver is exceedingly rare and poses a diagnostic dilemma, often mimicking metastatic malignancy or other inflammatory conditions [3].

The diagnosis of abdominal TB is particularly challenging due to its variable clinical presentation and the lack of specific radiological features [4]. Patients may present with nonspecific symptoms such as fever, weight loss, and abdominal pain, which overlap with other abdominal pathologies [4–6]. Imaging findings, such as peritoneal thickening, lymphadenopathy, and miliary nodules, can further complicate the diagnostic process, as these features are also seen in metastatic cancer and other infectious diseases [7–9].

This case report describes a rare presentation of disseminated TB involving the gallbladder and liver, initially misdiagnosed as acute cholecystitis. The intraoperative discovery of miliary nodules and subsequent histopathological confirmation of TB highlight the diagnostic challenges and the importance of considering TB in the differential diagnosis of abdominal pathologies, even in the absence of pulmonary involvement.

Case demonstration

A 77-year-old male presented with a 4-month history of decreased appetite, weight loss, and 10 days of fever. He developed appetite loss without gastrointestinal symptoms, resulting in an 8 kg weight loss. Later, he experienced fever with chills, frequent urination and urgency, but denied other complaints. Despite receiving treatment at a local hospital, his fever persisted. His medical history included surgery for intestinal obstruction, corneal repair, and a history of smoking. Family history was notable for maternal gastric cancer and a brother with prior pulmonary tuberculosis. He denied any allergies or chronic illnesses.

Preoperative blood test

The patient's blood test results revealed elevated inflammatory markers, with CRP/hsCRP at 161.18 mg/L and PCT at 1.2 ng/mL. Hematological findings showed leukocytosis (WBC 13.23 × 10^9/L) with neutrophilia (neutrophil percentage 89.6% and absolute count 11.85 × 10^9/L), lymphopenia (lymphocyte percentage 4.9% and absolute count 0.54 × 10^9/L), mild anemia (hemoglobin 112 g/L, hematocrit 34.0%), and thrombocytopenia (platelet count 44 × 10^9/L). Coagulation tests indicated prolonged PT (16.8 s) and elevated INR (1.46), with reduced PT% (52.5%), an elevated APTT-R (1.21), and D-dimer at 3.76 mg/L FEU. Fibrinogen, APTT, and TT levels were within normal ranges. Liver and kidney function were generally normal.

Preoperative imaging

Preoperative imaging revealed several significant findings. Chest CT identified a calcified, patchy, and striate lesion in the upper lobe of the right lung, along with increased lung markings and pleural thickening in both lungs (Fig. 1A-B). Multiple mediastinal lymph nodes were noted, some of which appeared enlarged with slightly higher density (Fig. 1C). Abdominal CT demonstrated bile stasis in the gallbladder, with a suspected small low-density stone located at the gallbladder neck (Fig. 1D). The omentum and mesentery were slightly thickened, showing small patchy shadows (Fig. 1E), and thickening of the right peritoneum with scattered calcified foci was also observed (Fig. 1F). Abdominal MRI revealed multiple small punctate hyperintense foci on the gallbladder surface on T2-weighted imaging, and a small, round, low-signal filling defect in the gallbladder neck, consistent with a stone (Fig. 1G). Additionally, a local discontinuity of the posterior gallbladder wall suggested a micro-perforation (Fig. 1H). Coronal MRI further confirmed the presence of the stone at the gallbladder neck, with punctate T2 hyperintense foci visible on the gallbladder surface (Fig. 1I).

Intraoperative findings

Emergency laparoscopic cholecystectomy was performed for suspected acute cholecystitis. During surgery, numerous small nodules were discovered on the surfaces of the gallbladder and liver (Fig. 2A-B). Initially, these nodules raised concerns for metastatic cancer. However, rapid frozen pathology of the gallbladder serosa revealed epithelioid granulomas with necrosis. The surgical field after cholecystectomy is shown in Fig. 2C. The gross specimen of the resected gallbladder reveals multiple nodules on the gallbladder wall (Fig. 2D).

Treatment and outcome

Postoperatively, nucleic acid testing of bronchial aspirate samples confirmed the presence of Mycobacterium tuberculosis complex. Xpert Mycobacterium tuberculosis/Rifampicin (MTB/RIF) further identified Mycobacterium tuberculosis without rifampin resistance, supporting the diagnosis of drug-sensitive TB. The patient was initiated on a standard regimen of isoniazid, rifampin, ethambutol, and pyrazinamide. Given the

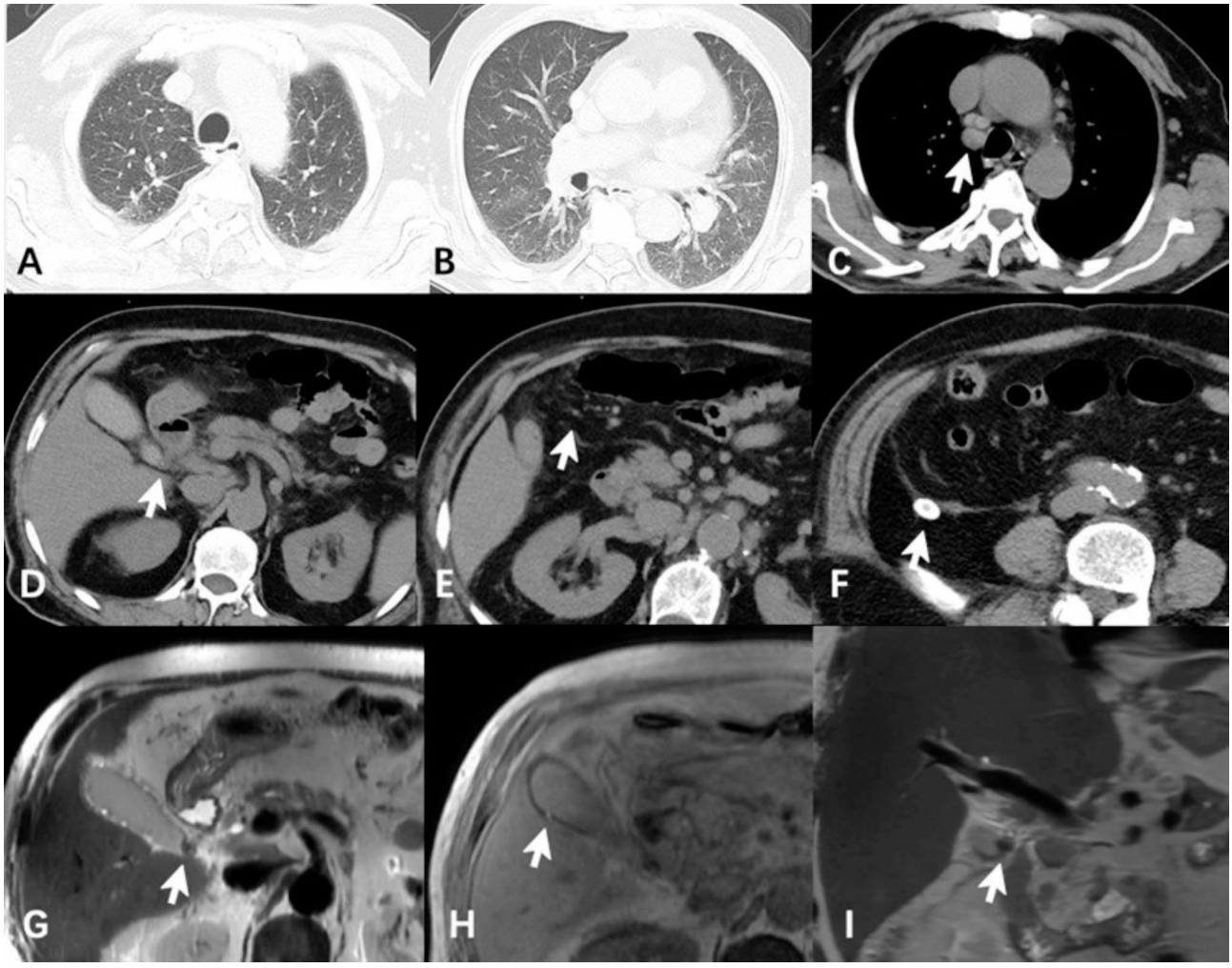

Fig. 1 Preoperative imaging. (**A**) Chest CT revealed a calcified, patchy, and striate lesion in the upper lobe of the right lung. (**B**) Increased lung markings and pleural thickening were observed in both lungs. (**C**) Multiple mediastinal lymph nodes were identified, with some appearing enlarged and exhibiting slightly higher density. (**D**) Abdominal CT demonstrated bile stasis in the gallbladder, with a suspected small low-density stone at the gallbladder neck, accompanied by central punctate calcifications. (**E**) The omentum and mesentery appeared slightly thickened with small patchy shadows. (**F**) Thickening of the right peritoneum was noted, with scattered calcified foci. (**G**) Abdominal MRI showed multiple small punctate hyperintense foci on the gallbladder surface on T2-weighted imaging, along with a small, round, low-signal filling defect in the gallbladder neck, consistent with a stone. (**H**) A local discontinuity of the posterior gallbladder wall suggested a micro-perforation. (**I**) Coronal MRI revealed the stone located in the gallbladder neck region, accompanied by punctate T2 hyperintense foci on the gallbladder surface

extensive involvement of the peritoneum and abdominal organs, close monitoring was maintained for potential complications, including abscess formation and bowel obstruction. Once stabilized, the patient was transferred to a specialized tuberculosis center for comprehensive management of pulmonary and abdominal TB.

Histopathological findings

Histological examination revealed characteristic pathological changes. Hematoxylin and eosin (H&E) staining at 40x magnification (Fig. 3A) displayed two adjacent granulomas with central necrosis within the fibrofatty tissue external to the muscular layer. Similarly, another granuloma with central caseous necrosis was observed adjacent to the serosal surface (Fig. 3B). At 100x magnification (Fig. 3C), epithelioid granulomas with caseous necrosis were identified within the outer fibrofatty tissue. Acid-fast staining at 400x magnification (Fig. 3D) demonstrated the presence of a single acid-fast bacillus (Mycobacterium tuberculosis) in the central area of the lesion, confirming the infectious nature of the granulomas. These findings are consistent with tuberculosis involvement.

Discussion

This case underscores the considerable diagnostic challenge of distinguishing disseminated tuberculosis (TB) from peritoneal metastases when multiple nodules are

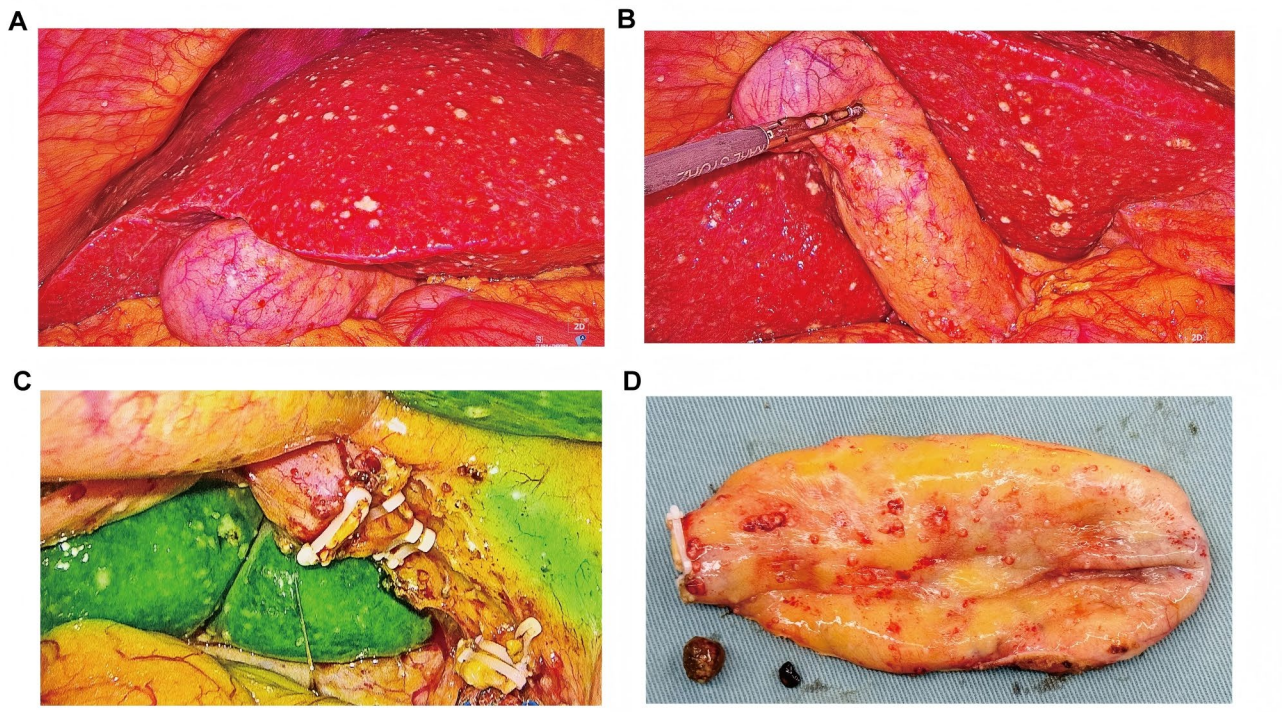

Fig. 2 Intraoperative findings and resected specimen. (**A-B**) Intraoperative view showing multiple white punctate lesions on the surfaces of the gallbladder and liver. (**C**) Post-cholecystectomy ICG imaging demonstrating the exposure of the gallbladder bed. (**D**) The resected gallbladder specimen showing multiple nodules on the serosal surface and two gallstones

encountered intraoperatively on abdominal organs, such as the liver and gallbladder. Although the patient initially presented with acute cholecystitis due to gallbladder neck stones, the unexpected intraoperative discovery of multiple nodules raised a strong suspicion of metastatic malignancy, complicating the surgical decision-making process. This highlights the importance of maintaining a broad differential diagnosis, particularly in TB-endemic regions [10, 11], where disseminated TB can closely mimic peritoneal metastases both radiologically and surgically [12, 13].

The patient's risk profile for disseminated TB may be multifactorial. Chronic smoking (40 pack-years) is known to impair mucociliary clearance and alveolar macrophage function, increasing susceptibility to Mycobacterium tuberculosis infection [14]. A recent meta-analysis revealed that tobacco use greatly raises the risk of tuberculosis relapse or recurrence and increases mortality during treatment [15]. Additionally, his history of intestinal obstruction surgery could have altered gut microbiota and mucosal immunity, potentially facilitating hematogenous dissemination [16, 17]. A family history of pulmonary TB further raises suspicion for latent TB exposure. These factors collectively highlight the importance of integrating social, surgical, and familial histories when evaluating atypical abdominal presentations in TB-endemic areas.

The clinical and radiologic overlap between disseminated TB and malignancy often complicates preoperative assessment and management [18]. In this case, emergency cholecystectomy was performed to address the acute cholecystitis. However, the intraoperative presence of nodules necessitated rapid diagnostic clarification to guide further surgical intervention. Intraoperative frozen section analysis provided critical information, revealing epithelioid granulomas with necrosis, a hallmark of TB infection [19], which allowed the surgical team to proceed with resection and tissue sampling for definitive histopathologic evaluation. Molecular testing with the Xpert MTB/RIF assay further confirmed the presence of Mycobacterium tuberculosis and ruled out rifampin resistance, facilitating the prompt initiation of appropriate anti-TB therapy [20]. This case underscores that TB, even in the absence of evident pulmonary involvement, should be considered when encountering intra-abdominal nodules, especially in patients with relevant epidemiological risk factors.

Cholecystectomy not only alleviated the acute symptoms but also enabled definitive histopathologic diagnosis, confirming TB and excluding malignancy. This case highlights the dual role of surgery in both symptom management and diagnostic confirmation. Our findings emphasize that intraoperative frozen pathology, combined with molecular diagnostics, is indispensable for

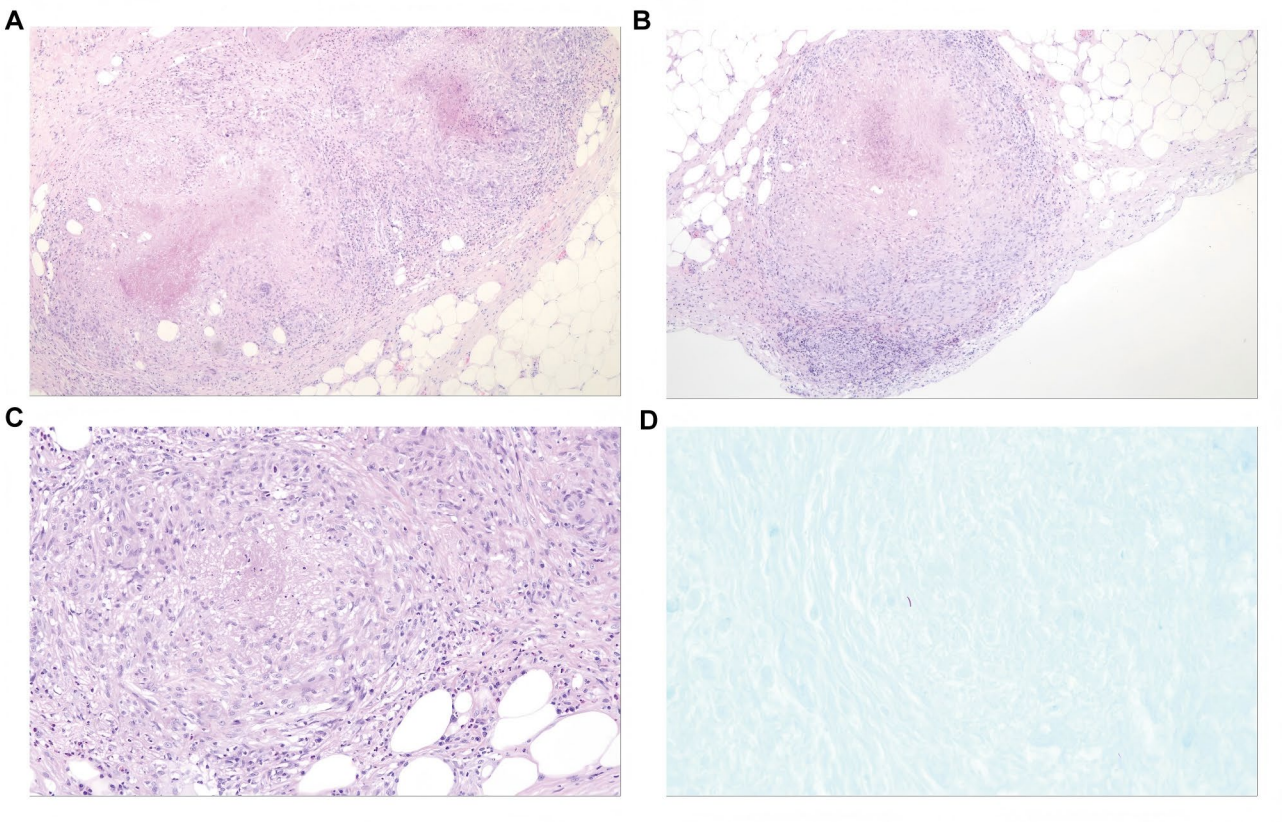

Fig. 3 Pathological findings (**A**) H&E stain, 40x: Two adjacent granulomas with central necrosis observed within the fibrofatty tissue outside the muscular layer. (**B**) H&E stain, 40x: A granulomatous nodule with central caseous necrosis located adjacent to the serosal surface. (**C**) H&E stain, 100x: Epithelioid granuloma and caseous necrosis within the outer fibrofatty tissue. (**D**) Acid-fast stain, 400x: A single acid-fast bacillus observed in the center

timely and accurate diagnosis, especially when managing complex presentations with overlapping infectious and malignant features.

In conclusion, our study reports a case of disseminated tuberculosis with prominent miliary nodules in the gallbladder and liver, where preoperative imaging highly overlapped with acute cholecystitis, and the intraoperative macroscopic features were easily misinterpreted as metastatic tumors. This finding expands the clinical spectrum of abdominal tuberculosis and reveals the "disguising" ability of tuberculosis in the absence of typical pulmonary manifestations. This case confirms the value of the following key clinical strategies: (1) if abnormal abdominal nodules are discovered intraoperatively, rapid pathology (e.g., identification of necrotizing granulomas) should be a routine part of emergency laparoscopic surgery; (2) the dual role of surgical intervention—both addressing acute abdominal symptoms and providing tissue samples for etiological diagnosis. These insights provide a replicable diagnostic framework for clinicians worldwide, emphasizing that tuberculosis should be a top priority to exclude as a "master of disguise" in cases of unexplained abdominal nodules, rather than merely a differential option in endemic areas.

Abbreviations

TB	Tuberculosis
CT	Computed Tomography
MRI	Magnetic Resonance Imaging
CRP	C-reactive Protein
PCT	Procalcitonin
WBC	White Blood Cell count
PT	Prothrombin Time
INR	International Normalized Ratio
APTT	Activated Partial Thromboplastin Time
TT	Thrombin Time
FEU	Fibrinogen Equivalent Units
H&E	Hematoxylin and Eosin (staining)
MTB/RIF	Mycobacterium tuberculosis/Rifampicin (test)

Author contributions

All authors contributed to the conception and writing of the manuscript. LTY and ZL wrote and prepared the original draft. CB provided detailed pathological pictures. SD and WMY edited the manuscript. LC took photographs during surgery. LC, WWB, and WX guided and edited the manuscript. All authors reviewed the final manuscript and agreed to submit.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Written informed consent was obtained from the patient, and the study was approved by the Ethics Committee of Peking Union Medical College Hospital.

Competing interests
The authors declare no competing interests.

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