ISSN 1948-9366 (online)

World Journal of

Gastrointestinal Surgery

World J Gastrointest Surg 2024 February 27; 16(2): 260-634

Published by Baishideng Publishing Group Inc

World Journal of Gastrointestinal Surgery

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Monthly Volume 16 Number 2 February 27, 2024

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WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, *etc*.

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The *WJGS* is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Current Contents/Clinical Medicine, Journal Citation Reports/Science Edition, PubMed, PubMed Central, Reference Citation Analysis, China Science and Technology Journal Database, and Superstar Journals Database. The 2023 Edition of Journal Citation Reports® cites the 2022 impact factor (IF) for *WJGS* as 2.0; IF without journal self cites: 1.9; 5-year IF: 2.2; Journal Citation Indicator: 0.52; Ranking: 113 among 212 journals in surgery; Quartile category: Q3; Ranking: 81 among 93 journals in gastroenterology and hepatology; and Quartile category: Q4.

RESPONSIBLE EDITORS FOR THIS ISSUE

NAME OF JOURNAL

World Journal of Gastrointestinal Surgery

ISSN

ISSN 1948-9366 (online)

LAUNCH DATE

November 30, 2009

FREQUENCY

Monthly

EDITORS-IN-CHIEF

Peter Schemmer

EDITORIAL BOARD MEMBERS

https://www.wjgnet.com/1948-9366/editorialboard.htm

PUBLICATION DATE

February 27, 2024

INSTRUCTIONS TO AUTHORS

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https://www.wjgnet.com/bpg/GerInfo/288

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ARTICLE PROCESSING CHARGE

https://www.wjgnet.com/bpg/gerinfo/242

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World Journal of Gastrointestinal Surgery

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World J Gastrointest Surg 2024 February 27; 16(2): 616-621

DOI: 10.4240/wjgs.v16.i2.616

ISSN 1948-9366 (online)

CASE REPORT

Percutaneous ultrasound-guided coaxial core needle biopsy for the diagnosis of multiple splenic lesions: A case report

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Specialty type: Gastroenterology and hepatology

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): A
Grade B (Very good): 0
Grade C (Good): 0
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Eysselein VE, United States

Received: November 8, 2023
Peer-review started: November 8, 2023
First decision: December 6, 2023
Revised: December 18, 2023
Accepted: January 25, 2024
Article in press: January 25, 2024
Published online: February 27, 2024

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Abstract

BACKGROUND

The overlap of imaging manifestations among distinct splenic lesions gives rise to a diagnostic dilemma. Consequently, a definitive diagnosis primarily relies on histological results. The ultrasound (US)-guided coaxial core needle biopsy (CNB) not only procures sufficient tissue to help clarify the diagnosis, but reduces the incidence of puncture-related complications.

CASE SUMMARY

A 41-year-old female, with a history of pulmonary tuberculosis, was admitted to our hospital with multiple indeterminate splenic lesions. Gray-scale ultrasonography demonstrated splenomegaly with numerous well-defined hypoechoic masses. Abdominal contrast-enhanced computed tomography (CT) showed an enlarged spleen with multiple irregular-shaped, peripherally enhancing, hypodense lesions. Positron emission CT revealed numerous abnormal hyperglycemia foci. These imaging findings strongly indicated the possibility of infectious disease as the primary concern, with neoplastic lesions requiring exclusion. To obtain the precise pathological diagnosis, the US-guided coaxial CNB of the spleen was carried out. The patient did not express any discomfort during the procedure.

CONCLUSION

Percutaneous US-guided coaxial CNB is an excellent and safe option for obtaining precise splenic tissue samples, as it significantly enhances sample yield for exact pathological analysis with minimum trauma to the spleen parenchyma and surrounding tissue.

Key Words: Spleen; Splenic disease; Ultrasound; Biopsy; Ultrasound-guided coaxial core needle biopsy; Case report

Core Tip: Multiple splenic lesions caused by infection, lymphoma, sarcoid, metastasis and infarction may have similar imaging features. The overlapping imaging characteristics of splenic lesions cause a diagnostic dilemma. Consequently, a definitive diagnosis primarily relies on histological results. We describe a case of multiple indeterminate splenic lesions and confirmed the diagnosis with an ultrasound (US)-guided coaxial core needle biopsy (CNB). US-guided CNB is a safe and efficient puncture technique providing valuable diagnostic information and patient treatment guidance.

Citation: Pu SH, Bao WYG, Jiang ZP, Yang R, Lu Q. Percutaneous ultrasound-guided coaxial core needle biopsy for the diagnosis of multiple splenic lesions: A case report. *World J Gastrointest Surg* 2024; 16(2): 616-621
URL: https://www.wjgnet.com/1948-9366/full/v16/i2/616.htm
DOI: https://dx.doi.org/10.4240/wjgs.v16.i2.616

INTRODUCTION

Multiple splenic lesions can be caused by a variety of benign or malignant diseases, including infection, primary tumor, and metastasis[1]. Non-specific characteristics on imaging frequently pose a diagnostic dilemma[2,3]. Histological examination of the spleen is considered a valuable approach in achieving precise diagnoses. Splenic tissue specimens can be obtained by either splenectomy or percutaneous puncture biopsy[4]. However, splenectomy may potentially cause complications, such as infection, arterial and venous thrombosis, as well as pulmonary hypertension[5,6]. Compared with splenectomy, percutaneous ultrasound (US)-guided coaxial core needle biopsy (CNB) is a less invasive procedure that reduces the occurrence of complications[4,7]. We present a case of multiple splenic lesions in which US-guided coaxial CNB successfully obtained larger, unfragmented samples with high diagnostic accuracy[8].

CASE PRESENTATION

Chief complaints

A 41-year-old female was admitted to our hospital with focal splenic lesions discovered during routine abdominal ultrasonography as a part of health checkup.

History of present illness

The patient was in good health and did not report any discomfort.

History of past illness

One year ago, the patient was admitted to the tuberculosis (TB) medical unit due to recurrent fever and cough, and was diagnosed with pulmonary TB. Subsequently, 2HRZE/7HRE (strengthening period: Isoniazid 300 mg, rifampicin 450 mg, pyrazinamide 0.75 g, ethambutol 0.75 g, once a day, given for 2 months; consolidation period: Isoniazid 300 mg, rifampicin 450 mg, ethambutol 0.75 g, once a day, given for 7 months) therapy was administered. The patient discontinued anti-TB medication 3 months ago following a reexamination at the TB clinic.

Personal and family history

Patient and family histories were negative.

Physical examination

The patient did not complain of any abdominal pain or distension.

Laboratory examinations

Carbohydrate antigen 125 was mildly elevated, and other tumor markers including alpha-fetoprotein, carcinoembryonic antigen, and carbohydrate antigen 199 were within the normal range. Other biochemical results were unremarkable.

Imaging examinations

Grayscale US demonstrated splenomegaly with numerous well-defined hypoechoic masses (Figure 1A). Color Doppler imaging indicated no significant blood flow signals within these lesions (Figure 1B). Contrast-enhanced US (CEUS) showed peripheral heterogeneous slight hyper-enhancement in the arterial phase (Figure 1C) and hypo-enhancement in the venous phase (Figure 1D), while no enhancement was observed in the central area during the CEUS procedure. CEUS findings suggested an infectious disease. Abdominal contrast-enhanced computed tomography (CT) was performed which showed an enlarged spleen with multiple irregular nodular and patchy low density shadows, the largest measuring approximately 1.7 cm × 1.7 cm, with a suspicion of chronic infection (Figure 2). A great many abnormal hyperglycemia foci detected by positron emission CT indicated an infectious disease, but the possibility of neoplastic lesions could not be definitively excluded.

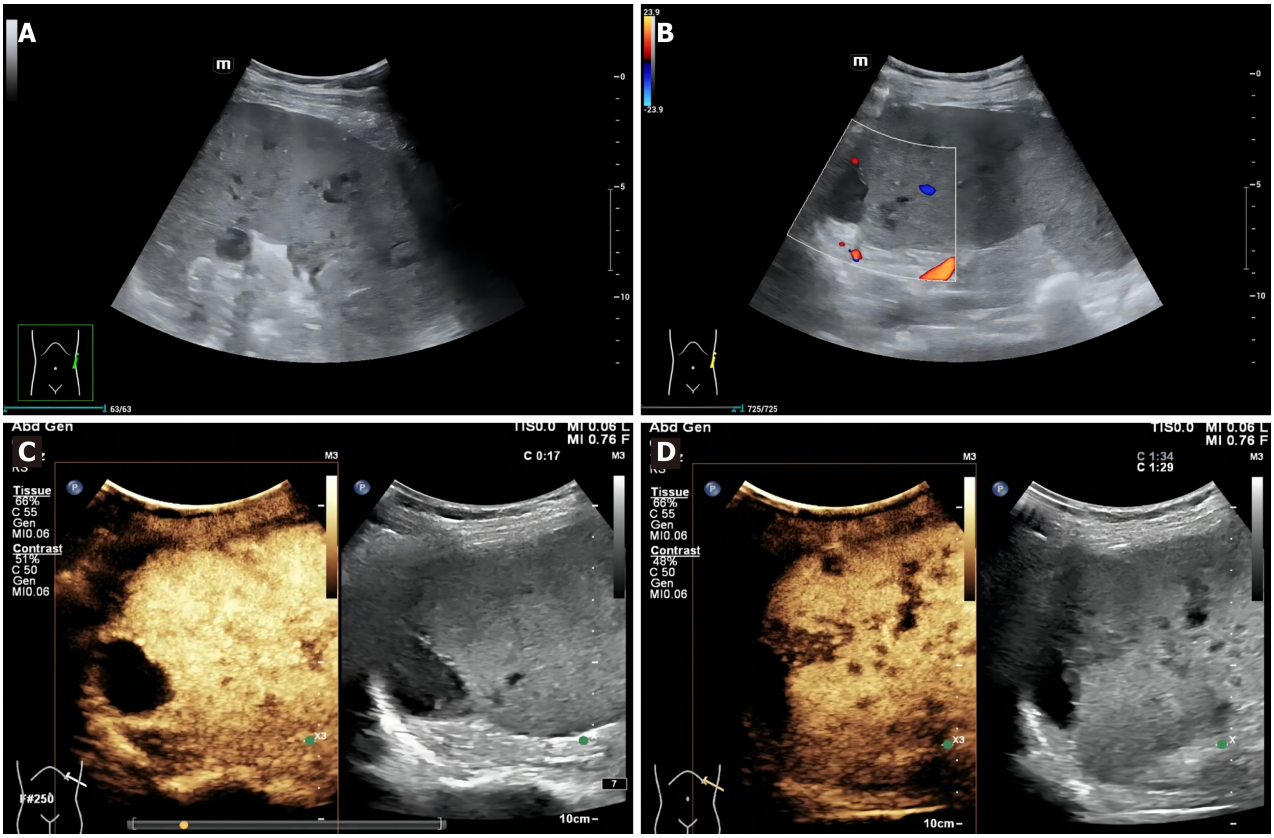

Figure 1 Ultrasonography images of the patient. A: Conventional grayscale ultrasound (US) showed multiple hypoechoic nodules and masses in the spleen; B: There were no blood flow signals in the splenic lesions on Color Doppler US; C: Arterial phase imaging on contrast-enhanced US; D: Venous phase imaging on contrast-enhanced US.

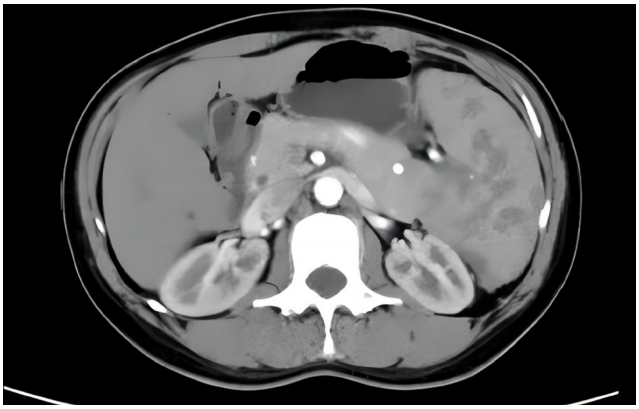

Figure 2 Contrast-enhanced computed tomography images of the patient. Contrast-enhanced computed tomography revealed an enlarged spleen, with multiple irregular nodular and patchy low density shadows, the largest measuring approximately 1.7 cm × 1.7 cm.

Further diagnostic work-up

The differential diagnoses based on clinical and radiological results included splenic tuberculosis, fungal infection, metastasis, lymphoma and hemangioma. For further diagnostic analyses, the US-guided coaxial CNB for histological diagnosis was performed by a doctor with over 5 years of experience in interventional US. Platelet count and prothrombin time were within normal limits at the time of the procedure. The procedure was conducted with the patient in the right lateral decubitus position, ensuring optimal visualization and access to the target area. First, conventional US was performed to determine the optimal puncture route. Subsequently, 5 mL of 2% lidocaine was infiltrated into the subcutaneous tissues. A 18G coaxial needle was introduced through the coaxial system under real-time US guidance. Three cores were obtained with the 18G biopsy needle *via* the access established by the sheath of the aforementioned coaxial needle (Figure 3A). The biopsy specimens were fixed in 95% ethanol and sent to the Pathology Department for histological and immunohistochemical evaluation. In order to reduce the risk of bleeding, a muddy mixture of gelfoam and saline was injected into the coaxial needle sheath to block the needle path immediately after the sampling procedure

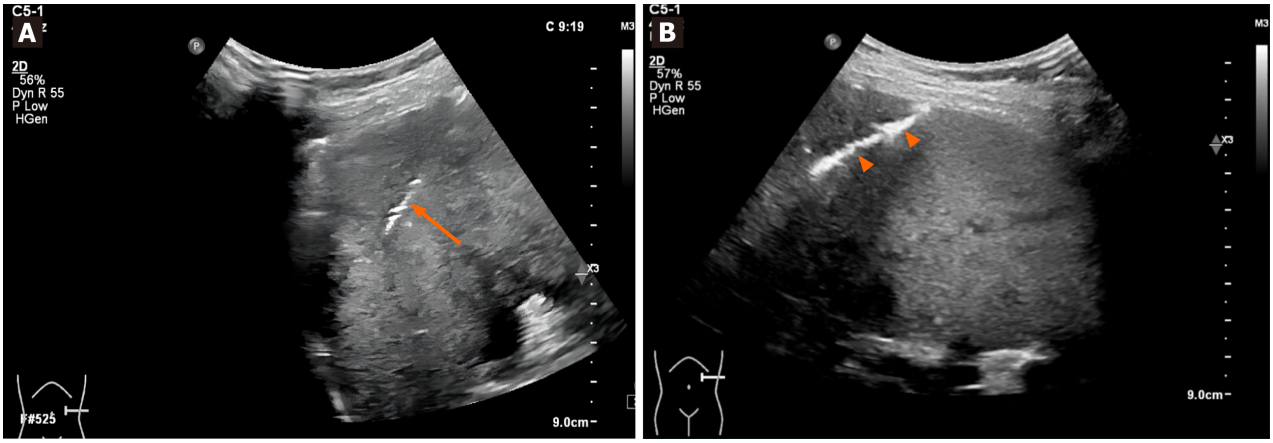

Figure 3 Images of the puncture procedure. A: A 18G coaxial needle (arrow) was applied under real-time ultrasound guidance; B: A muddy mixture(arrowheads) of gelfoam and saline was injected into the coaxial needle sheath to prevent hemorrhage at the end of procedure.

(Figure 3B).

FINAL DIAGNOSIS

Histological analysis showed no evidence of malignancy, but the proliferation of fibrous tissue and hyaline degeneration were observed in some areas. Granulomas were noted in focal areas, accompanied by peripheral lymphoid hyperplasia involving infiltration of neutrophils, monocytes, and plasma cells (Figure 4). Immunohistochemistry revealed CD20+ and CD3+ cells, in addition to some CD8+ cells. Acid-fast and methenamine silver stain did not reveal any pathogens. No mycobacterium TB DNA fragments were observed in the TB-quantitative real-time polymerase chain reaction. These findings supported the diagnosis of chronic granulomatous inflammation with necrosis, but did not exclude specific infections (TB).

TREATMENT

The patient opted for follow-up observation and underwent regular conventional US for ongoing monitoring.

OUTCOME AND FOLLOW-UP

Follow-up US 6 months later revealed that the lesions found on the initial examination were unchanged. The patient is presently in good physical condition without any discomfort.

DISCUSSION

Multiple splenic lesions caused by infection, lymphoma, sarcoid, metastasis and infarction may have similar imaging features[1]. The overlapping imaging characteristics of splenic lesions cause a diagnostic dilemma[2,3]. Hence, there is a need for confirmation by tissue biopsy. The US-guided coaxial CNB is considered a valuable technique for obtaining ample tissue for definitive diagnosis and to reduce puncture-related complications[8,9].

Spleen tissue samples can be obtained by splenectomy or percutaneous biopsy[4]. Splenectomy is an invasive technique and can potentially cause complications, including infection, arterial and venous thrombosis, and pulmonary hypertension[5,6]. The infrequency of image-guided percutaneous spleen biopsies can be attributed to concerns regarding potential bleeding[10]. In addition, adjacent tissues or organs may be injured during the procedure, such as the pleura, lung, or splenic flexure of the colon[11,12]. However, a recent meta-analysis reported a high overall diagnostic accuracy and a low complication rate of 4.2% with image-guided percutaneous spleen biopsy. The overall sensitivity and specificity were 87.0% and 96.4%, respectively[4].

Percutaneous biopsy is performed under US or CT guidance. US guidance is sometimes preferred over CT due to real-time guidance and no radiation risk. US-guided coaxial CNB demonstrates a high diagnostic accuracy, reduces complications and provides a specific therapeutic direction for patients[7,13-15]. The coaxial technique has had a positive impact on percutaneous image-guided biopsy since its introduction. The outer cannula is inserted into the spleen, and on the one hand, specimen collection yields can be improved using the same path by making slight adjustments to the angle of the

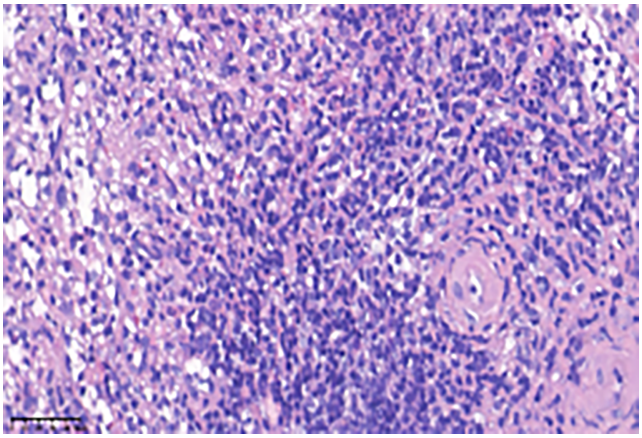

Figure 4 Histopathological findings by hematoxylin-eosin staining (40 ×). Granulomas were noted in focal areas, accompanied by peripheral lymphoid hyperplasia involving infiltration of neutrophils, monocytes, and plasma cells.

introducer needle; on the other hand, changes in tissue cutting length can be achieved by adjusting the degree to which the introducer needle protrudes the outer cannula[16]. Adequate tissue samples ensure comprehensive pathological analysis and avoid another puncture at the same time. Liang *et al*[8] investigated the difference in spleen biopsy using 18G CNB and 21G fine needle aspiration. Their findings revealed that using 18G CNB enabled the acquisition of larger, unfragmented tissue samples with high diagnostic accuracy. Importantly, protection of the outer cannula and reduction in the puncture frequency can mitigate tissue damage. With regard to bleeding after spleen puncture, Kunin *et al*[17] retrospectively analyzed 232 spleen biopsies and showed that higher systolic blood pressure, lower platelet count, and the lack of US guidance were independent predictors of major hemorrhage. Therefore, careful evaluation of preoperative indications, real-time US guidance throughout the procedure, coupled with tract embolization at the end of the procedure can prevent hemorrhage, thereby reducing the incidence of complications[17-19]. Tract embolization can be achieved by gelfoam, embolization coils, autologous blood clots, microfibrous collagen and other materials. The most commonly used embolic agent is gelfoam, which can be used in the form of either a gelfoam slurry or gelfoam torpedo. Compared with alternative materials such as autologous blood clots, gelfoam slurry is inexpensive and can be easily prepared by mixing gelfoam with saline[18,20]. Even pediatric patients benefit from the application of gelfoam in closing transhepatic and transsplenic parenchymal access[21]. Furthermore, the coaxial technique expedites the procedure by minimizing the time required to reposition the biopsy needle after each specimen acquisition. US-guided coaxial CNB also protects patients from splenectomy with potential complications, providing patients with a treatment choice.

US-guided coaxial CNB for the diagnosis of multiple splenic lesions is rarely performed clinically, and this case report provides a direction for clinical patient management and treatment. However, we lack the support of corresponding research data, which may not be very convincing.

CONCLUSION

US-guided coaxial CNB is a safe and efficient puncture technique for the diagnosis of multiple splenic lesions. It not only provides valuable diagnostic information but guides patient treatment based on histological analysis.

ACKNOWLEDGEMENTS

Thank Bao WYG, Jiang ZP and Lu Q for their suggestions on revising the draft.

FOOTNOTES

Author contributions: Lu Q contributed to the study conceptualization and supervision; Pu SH contributed to manuscript writing; Yang R contributed to data collection; Bao WYG, Jiang ZP and Lu Q contributed to manuscript revision; and all authors have approved the final manuscript.

Informed consent statement: Informed written consent was obtained from the patient for publication of this report and any accompanying images.

Conflict-of-interest statement: The authors declare that they have no conflict of interest.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised

according to the CARE Checklist (2016).

Country/Territory of origin: China

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S-Editor: Qu XL
L-Editor: A
P-Editor: Qu XL

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