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



EDITORIAL

- 260 Actuality and underlying mechanisms of systemic immune-inflammation index and geriatric nutritional risk index prognostic value in hepatocellular carcinoma
Tchilikidi KY
- 266 Prognostic impact of preoperative nutritional and immune inflammatory parameters on liver cancer
Bae SU
- 270 Don't forget emergency surgery! Lessons to learn from elective indocyanine green-guided gastrointestinal interventions
Perini D, Martellucci J
- 276 Mutational landscape of TP53 and CDH1 in gastric cancer
Cai HQ, Zhang LY, Fu LM, Xu B, Jiao Y
- 284 Overview of ectopic pancreas
Li CF, Li QR, Bai M, Lv YS, Jiao Y

ORIGINAL ARTICLE

Clinical and Translational Research

- 289 Phospholipase A2 enzymes PLA2G2A and PLA2G2B as potential diagnostic and prognostic biomarkers in cholangiocarcinoma
Qiu C, Xiang YK, Da XB, Zhang HL, Kong XY, Hou NZ, Zhang C, Tian FZ, Yang YL

Case Control Study

- 307 Classification of anatomical morphology of cystic duct and its association with gallstone
Zhu JH, Zhao SL, Kang Q, Zhu Y, Liu LX, Zou H

Retrospective Cohort Study

- 318 Will partial splenic embolization followed by splenectomy increase intraoperative bleeding?
Huang L, Li QL, Yu QS, Peng H, Zhen Z, Shen Y, Zhang Q
- 331 Influence of donor age on liver transplantation outcomes: A multivariate analysis and comparative study
Bezjak M, Stresec I, Kocman B, Jadrijević S, Filipec Kanizaj T, Antonijević M, Dalbelo Bašić B, Mikulić D
- 345 Machine learning-based radiomics score improves prognostic prediction accuracy of stage II/III gastric cancer: A multi-cohort study
Xiang YH, Mou H, Qu B, Sun HR

- 357 Risk stratification in gastric cancer lung metastasis: Utilizing an overall survival nomogram and comparing it with previous staging
Chen ZR, Yang MF, Xie ZY, Wang PA, Zhang L, Huang ZH, Luo Y
- 382 Systemic inflammatory response index is a predictor of prognosis in gastric cancer patients: Retrospective cohort and meta-analysis
Ren JY, Xu M, Niu XD, Ma SX, Jiao YJ, Wang D, Yu M, Cai H
- Retrospective Study**
- 396 Development of a clinical nomogram for prediction of response to neoadjuvant chemotherapy in patients with advanced gastric cancer
Liu B, Xu YJ, Chu FR, Sun G, Zhao GD, Wang SZ
- 409 Laparoscopic left hemihepatectomy guided by indocyanine green fluorescence: A cranial-dorsal approach
Wang XR, Li XJ, Wan DD, Zhang Q, Liu TX, Shen ZW, Tong HX, Li Y, Li JW
- 419 Hemoglobin loss method calculates blood loss during pancreaticoduodenectomy and predicts bleeding-related risk factors
Yu C, Lin YM, Xian GZ
- 429 Short- and long-term outcomes of surgical treatment in patients with intestinal Behcet's disease
Park MY, Yoon YS, Park JH, Lee JL, Yu CS
- 438 Preoperative neutrophil-to-lymphocyte ratio predicts symptomatic anastomotic leakage in elderly colon cancer patients: Multicenter propensity score-matched analysis
Wang CY, Li XL, Ma XL, Yang XF, Liu YY, Yu YJ
- 451 Preoperative blood markers and intra-abdominal infection after colorectal cancer resection
Liu CQ, Yu ZB, Gan JX, Mei TM
- 463 Immune function status of postoperative patients with colon cancer for predicting liver metastasis
Xiong L, Liu FC
- 471 Efficacy of transjugular intrahepatic portosystemic shunts in treating cirrhotic esophageal-gastric variceal bleeding
Hu XG, Dai JJ, Lu J, Li G, Wang JM, Deng Y, Feng R, Lu KP
- 481 Correlation between serum markers and transjugular intrahepatic portosystemic shunt prognosis in patients with cirrhotic ascites
Hu XG, Yang XX, Lu J, Li G, Dai JJ, Wang JM, Deng Y, Feng R
- 491 Development of a new Cox model for predicting long-term survival in hepatitis cirrhosis patients underwent transjugular intrahepatic portosystemic shunts
Lv YF, Zhu B, Meng MM, Wu YF, Dong CB, Zhang Y, Liu BW, You SL, Lv S, Yang YP, Liu FQ
- 503 "Five steps four quadrants" modularized *en bloc* dissection technique for accessing hepatic hilum lymph nodes in laparoscopic pancreaticoduodenectomy
Hu XS, Wang Y, Pan HT, Zhu C, Chen SL, Liu HC, Pang Q, Jin H

- 511** Efficacy and safety of endoscopic submucosal dissection for early gastric cancer and precancerous lesions in elderly patients

Xu WS, Zhang HY, Jin S, Zhang Q, Liu HD, Wang MT, Zhang B

- 518** Nomogram model including *LATS2* expression was constructed to predict the prognosis of advanced gastric cancer after surgery

Sun N, Tan BB, Li Y

Observational Study

- 529** To explore the pathogenesis of anterior resection syndrome by magnetic resonance imaging rectal defecography

Meng LH, Mo XW, Yang BY, Qin HQ, Song QZ, He XX, Li Q, Wang Z, Mo CL, Yang GH

- 539** Biopsy forceps are useful for measuring esophageal varices *in vitro*

Duan ZH, Zhou SY

SYSTEMATIC REVIEWS

- 546** First experience in laparoscopic surgery in low and middle income countries: A systematic review

Troller R, Bawa J, Baker O, Ashcroft J

- 554** Comparative effectiveness of several adjuvant therapies after hepatectomy for hepatocellular carcinoma patients with microvascular invasion

Pei YX, Su CG, Liao Z, Li WW, Wang ZX, Liu JL

META-ANALYSIS

- 571** Is tumor necrosis factor- α monoclonal therapy with proactive therapeutic drug monitoring optimized for inflammatory bowel disease? Network meta-analysis

Zheng FY, Yang KS, Min WC, Li XZ, Xing Y, Wang S, Zhang YS, Zhao QC

- 585** Poor oral health was associated with higher risk of gastric cancer: Evidence from 1431677 participants

Liu F, Tang SJ, Li ZW, Liu XR, Lv Q, Zhang W, Peng D

CASE REPORT

- 596** Treatment of hemolymphangioma by robotic surgery: A case report

Li TN, Liu YH, Zhao J, Mu H, Cao L

- 601** Postoperative encapsulated hemoperitoneum in a patient with gastric stromal tumor treated by exposed endoscopic full-thickness resection: A case report

Lu HF, Li JJ, Zhu DB, Mao LQ, Xu LF, Yu J, Yao LH

- 609** Early endoscopic management of an infected acute necrotic collection misdiagnosed as a pancreatic pseudocyst: A case report

Zhang HY, He CC

- 616** Percutaneous ultrasound-guided coaxial core needle biopsy for the diagnosis of multiple splenic lesions: A case report
Pu SH, Bao WYG, Jiang ZP, Yang R, Lu Q
- 622** Spilled gallstone mimicking intra-abdominal seeding of gallbladder adenocarcinoma: A case report
Huang CK, Lu RH, Chen CC, Chen PC, Hsu WC, Tsai MJ, Ting CT
- 628** Ileal collision tumor associated with gastrointestinal bleeding: A case report and review of literature
Wu YQ, Wang HY, Shao MM, Xu L, Jiang XY, Guo SJ

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

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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

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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.

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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.

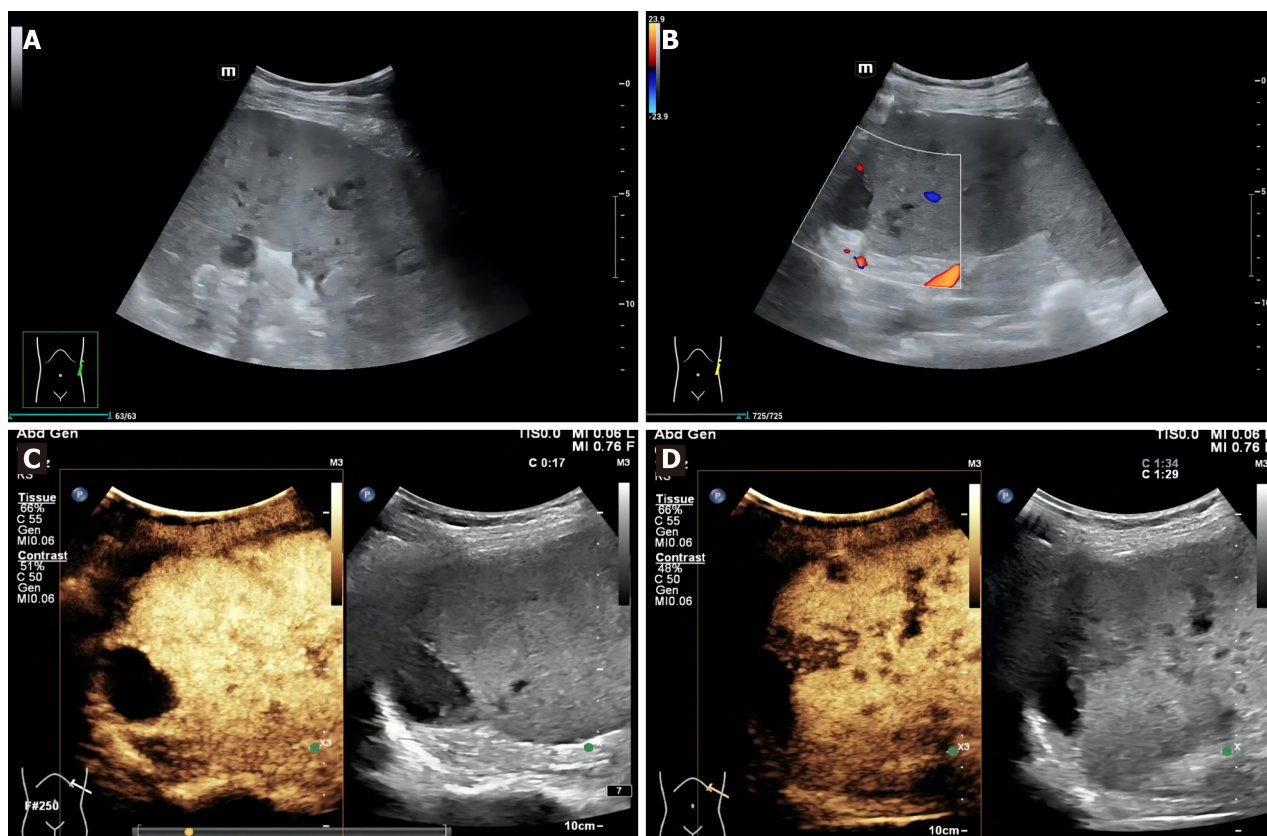


Figure 1 Ultrasonography images of the patient. A: Conventional grayscale ultrasound (US) showed multiple hypoechoic nodules and masses in the spleen; B: There were no blood flow signals in the splenic lesions on Color Doppler US; C: Arterial phase imaging on contrast-enhanced US; D: Venous phase imaging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

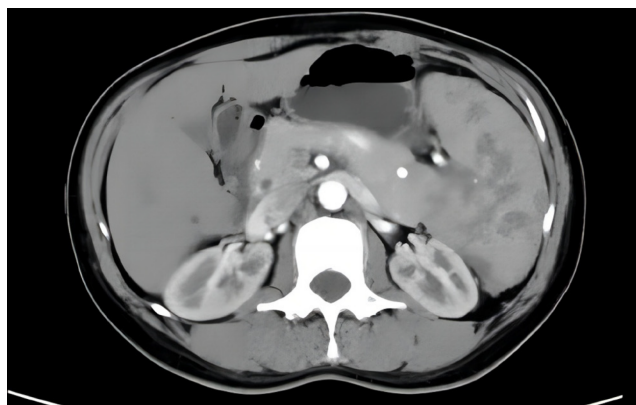


Figure 2 Contrast-enhanced computed tomography images of the patient. Contrast-enhanced computed tomography revealed an enlarged spleen, with multiple irregular nodular and patchy low density shadows, the largest measuring approximately 1.7 cm × 1.7 cm.

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

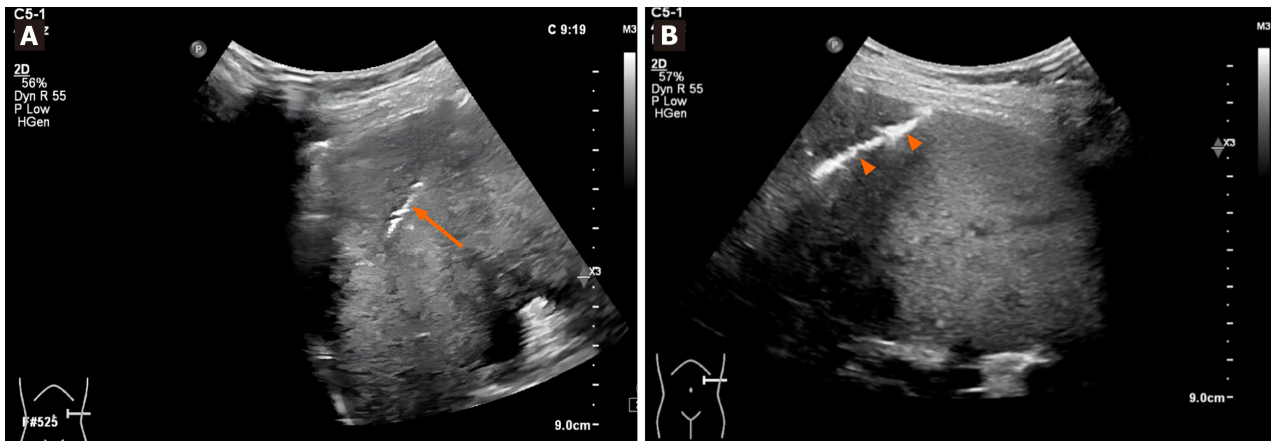


Figure 3 Images of the puncture procedure. A: A 18G coaxial needle (arrow) was applied under real-time ultrasound guidance; B: A muddy mixture (arrowheads) of gelfoam and saline was injected into the coaxial needle sheath to prevent hemorrhage at the end of procedure.

(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

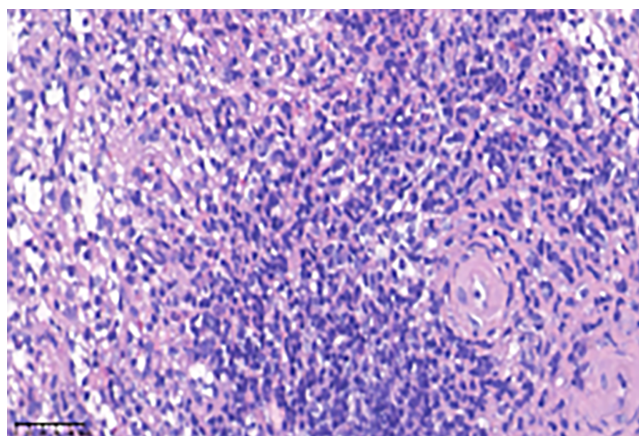


Figure 4 Histopathological findings by hematoxylin-eosin staining (40 ×). Granulomas were noted in focal areas, accompanied by peripheral lymphoid hyperplasia involving infiltration of neutrophils, monocytes, and plasma cells.

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, microfibrillar 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.

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