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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 showed an enlarged spleen with multiple irregular-shaped, peripherally enhancing, hypodense lesions. Positron emission computed tomography 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-guided coaxial core needle biopsy. Ultrasound-guided coaxial core needle biopsy is a safe and efficient puncture technique providing valuable diagnostic information and patient treatment guidance.

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 medical unit due to recurrent fever and cough, and was diagnosed with pulmonary tuberculosis. 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-tuberculosis medication 3 months ago following a reexamination at the tuberculosis 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 (CECT) was performed which showed an enlarged spleen with multiple irregular nodular and patchy low density shadows, the largest measuring approximately 1.7 x 1.7 cm, with a suspicion of chronic infection (Figure 2). A great many abnormal hyperglycemia foci detected by positron emission computed tomography indicated an infectious disease, but the possibility of neoplastic lesions could not be definitively excluded.

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 tuberculosis (TB) DNA fragments were observed in the TB-qPCR. These findings supported the diagnosis of chronic granulomatous inflammation with necrosis, but did not exclude specific infections (tuberculosis).

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 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.* investigated the difference in spleen biopsy using 18G CNB and 21G fine needle aspiration (FNA). Their findings revealed that using 18G CNB enabled the acquisition of larger, unfragmented tissue samples with high diagnostic accuracy[8]. Importantly, protection of the outer cannula and reduction in the puncture frequency can mitigate tissue damage. With regard to bleeding after spleen puncture, Henry Kunin and colleagues 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[17]. 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.

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