Clinical Case Report

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Diagnostic value of endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) in solitary mediastinal, hilar lymphadenectasis, or peribronchial lesions

Six cases reports and review of literature

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Abstract

Background: Patients with isolated mediastinal or hilar lymphadenopathy, or peribronchial lesions, are common presentation to clinicians. Due to the difficulty in tissue sampling, the pathological diagnosis is not so easy. Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) is an established, highly effective, minimally invasive technique for sampling. The current study was conducted to investigate the value of EBUS-TBNA in patients of solitary mediastinal, hilar lymphadenectasis, or peribronchial lesions.

Methods: Six patients with different pathological results diagnosed via EBUS-TBNA were retrospectively analyzed in this study.

Results: All 6 patients of solitary mediastinal, hilar lymphadenectasis, or peribronchial lesions underwent conventional flexible bronchoscopy before EBUS-TBNA, but only EBUS-TBNA was helpful for the finally definite diagnosis. No complication was observed.

Conclusion: EBUS-TBNA is a safe and highly effective diagnostic procedure for both benign and malignant diseases, especially for patients with solitary mediastinal, hilar lymphadenectasis, or peribronchial lesions.

Abbreviations: ACCP = American College of Chest Physicians, CECT = contrast-enhanced computed tomography, cTBNA = conventional transbronchial needle aspiration, EBUS-TBNA = endobronchial ultrasound-guided transbronchial needle aspiration, IASLC = International Association for the Study of Lung Cancer, NSCLC = nonsmall cell lung cancer, PPD = purified protein derivative, PPSS = primary pulmonary synovial sarcoma, ROSE = rapid on-site examination, RUL = right upper lobe, TB = tuberculosis, TBLA = tuberculous lymphadenitis, TBLB = transbronchial lung biopsy.

Keywords: cases report, endobronchial ultrasound, lymphadenopathy, pathology, peripheral airway findings, transbronchial needle aspiration

1. Introduction

Patients with isolated mediastinal or hilar lymphadenopathy, or peribronchial lesions, commonly present, yet pathological diagnosis can be elusive. Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) is a minimally invasive modality for the evaluation of patients with solitary mediastinal, hilar lymphadenopathy, or peribronchial lesion, which may decrease the need for more invasive procedures such as mediastinoscopy. Here we provided 6 cases which were evaluated and diagnosed by EBUS-TBNA and review the literature at the same time.

We perform conventional flexible bronchoscopy for each patient to examine the tracheobronchial tree; then EBUS with a convex probe of 7.5 MHz on its tip (EVIS LUCERA ELITE CV-290; Olympus Ltd., Tokyo, Japan) is performed at once. All EBUS-TBNA procedures are performed using a 22-gauge needle (NA-201SX-4022; Olympus Ltd., Tokyo, Japan) under real-time ultrasound guidance through the working channel of the EBUS scope. All procedures are under local anesthesia. The location of lymph nodes are named and numbered according to criteria of the International Association for the Study of Lung Cancer (IASLC).[1] Rapid on-site examination (ROSE) is not used in our study. The study is approved by the Ethics Committee of the First Affiliated Hospital of Soochow University. Also, all participants provided written informed consent for their information and images to be included in this article for publication.

2. Case reports

2.1. Case 1

A 75-year-old man with chief complaint of hoarseness for 2 weeks was admitted to our hospital. He had history of rheumatoid arthritis for 12 years, and hypertension for 2 years.

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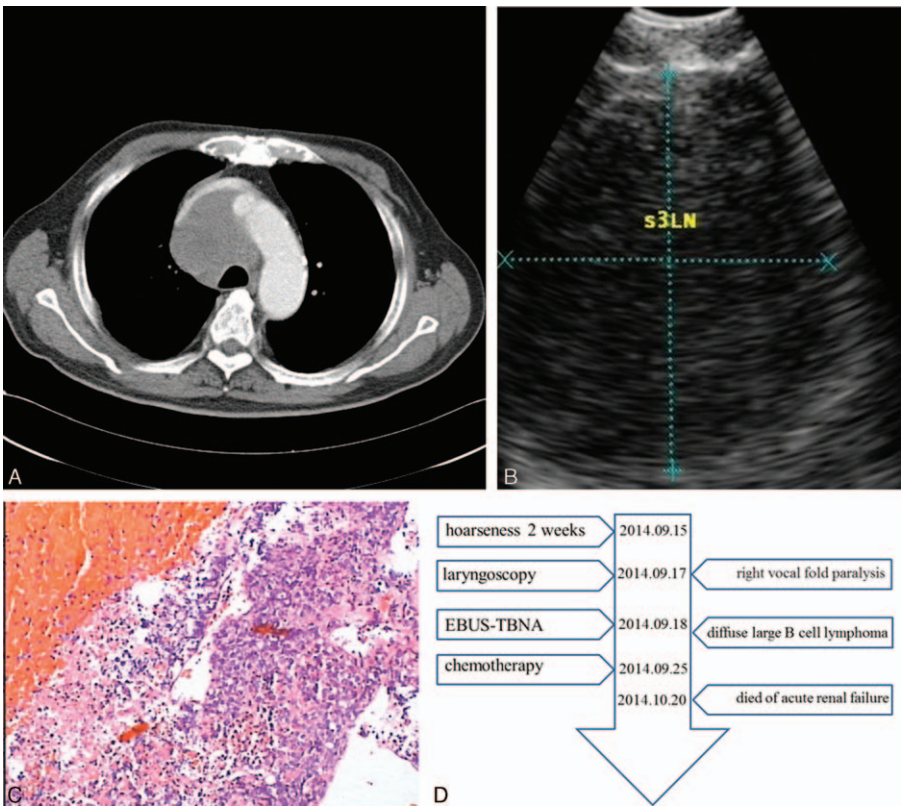

Figure 1. A and B, CECT of the chest and EBUS images showing a large station 4R lymph node. C, EBUS-TBNA samples showing lymphoid cells (hematoxylin and eosin staining 10×) along with LCA, CD20, CD99-positive expression in immunohistochemistry staining (pictures not shown), supporting the diagnosis of diffuse large B-cell lymphoma. D, The timeline of interventions and outcomes for case 1. CECT = contrast-enhanced computed tomography, EBUS-TBNA = endobronchial ultrasound-guided transbronchial needle aspiration, LCA = leukocyte common antigen.

He received percutaneous coronary stents implantation 1 year ago because of his severe coronary heart disease. He denied sore throat and cough. The right vocal fold paralysis was found on laryngoscopy examination. The patient did not show any peripheral lymphadenopathy. Contrast-enhanced computed tomography (CECT) of the chest showed enlargement of mediastinal lymph nodes (station 4R lymph node) without lung field infiltration (Fig. 1A). To make a definite diagnosis, EBUS-TBNA was performed (Fig. 1B). The pathological diagnosis was diffuse large B-cell lymphoma (Fig. 1C and D), and we did not perform bone marrow biopsy for him.

2.2. Case 2

A 38-year-old female suffering from chest distress for 1 year and bloody sputum for 1 week was admitted to our department. Her CECT image demonstrated mass lesion at right upper lobe (RUL) with lymphadenopathy and pleural effusion (Fig. 2A). Her pleural effusion was drained and the pathological results were not helpful for diagnosis. Bronchoscopic examination revealed compressed stenosis of RUL, but no malignancy result was present (Fig. 2B). EBUS-TBNA was performed, and lymph node of station 4R (Fig. 2C) and lesions outside RUL were punctured. The final result was primary pulmonary synovial sarcoma (PPSS) (Fig. 2D).

2.3. Case 3

A 20-year-old man was referred to our outpatient department with complaint of cough, night sweats, and low fever for 2 months. His CECT image demonstrated enlarged mediastinal lymph node without any lung parenchymal lesions (Fig. 3A). So we gave him EBUS-TBNA detection (Fig. 3B) and the result showed caseation necrosis (Fig. 3C). His purified protein derivative (PPD) test was positive. Mediastinal lymph node tuberculosis (TB) was diagnosed finally (Fig. 3D).

2.4. Case 4

A 65-year-old female was admitted to our department with hilar lymph node enlargement accidentally found on her routine examination; her CECT image demonstrated bilateral hilar lymphadenopathy (Fig. 4A). She did not have any chest symptoms. EBUS showed enlarged hypoechoic station 4R, 7, 10R, and 10L lymph nodes (Fig. 4B). EBUS-TBNA of these lymph nodes showed noncaseating epitheloid cell granuloma. The patient's PPD test was negative. Also, her acid-fast bacillus smears from TBNA aspirate were negative too. So the patient was diagnosed as having sarcoidosis (stage I) (Fig. 4C).

2.5. Case 5

A 61-year-old man was referred with gradually increasing exertional dyspnea. CECT demonstrated 4.1 cm × 5.5 cm cystic lesion in the left paratracheal region (Fig. 5A). EBUS-TBNA was performed, and 80 mL of yellow clear fluid was aspirated (Fig. 5B and C) through the 22-gauge needle. The patient's condition improved with immediate relief of dyspnea. The mediastinal cyst has been stable without recurrence since drainage (Fig. 5D).

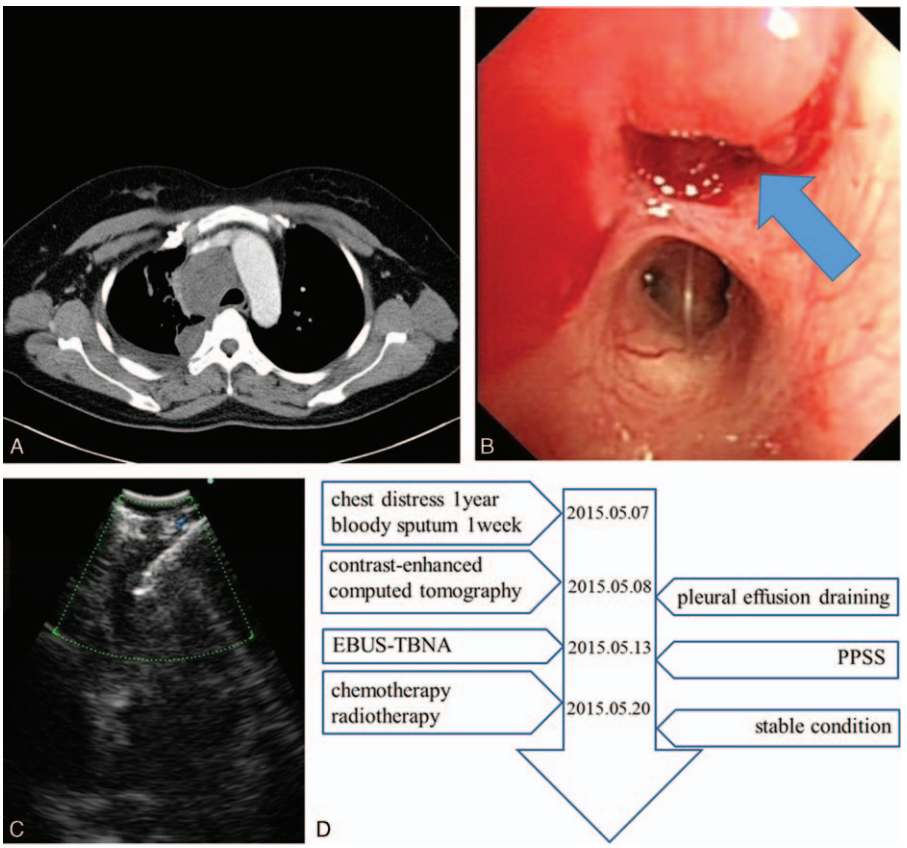

Figure 2. A, CECT image showing enlarged lymph node and pleural effusion in the right side. B, Bronchoscopic examination revealing compressed stenosis of RUL (arrow). C, EBUS-TBNA showing the needle within the fused lymph node of station 4R. D, The timeline of interventions and outcomes for case 2. CECT = contrast-enhanced computed tomography, EBUS-TBNA = endobronchial ultrasound-guided transbronchial needle aspiration, RUL = right upper lobe.

2.6. Case 6

A 73-year-old man was evaluated for gradually increasing dyspnea for 2 weeks. He had a history of tobacco use (60 pack-years) and chronic obstructive pulmonary disease. Computed tomography (CT) thorax showed left upper lobe (LUL) mass abutting the left wall of trachea (Fig. 6A). EBUS-TBNA was done on LUL paratracheal mass lesion (Fig. 6B). EBUS-TBNA results showed adenocarcinoma (Fig. 6C).

3. Discussion

Mediastinal lymphadenopathy and peribronchial/paratracheal lesions are challenging situations for clinicians owing to diversity of etiologies and the difficulty in obtaining tissue biopsy from these regions. To obtain cytology or histopathology samples from these regions, many modalities have been used including CT-guided transthoracic needle aspiration, transbronchial lung biopsy (TBLB), conventional transbronchial needle aspiration (cTBNA), mediastinoscopy, and thoracotomy.[2] Although EBUS-TBNA is a new method, the increasing number of literatures have shown that EBUS-TBNA has become standard diagnostic method for most patients, presenting with isolated mediastinal/hilar lymphadenopathy or peribronchial/paratracheal lesions of unknown origin.[3–5] The safety of EBUS-TBNA is higher than cTBNA, because EBUS guidance provides real-time visualization of TBNA needle, and thus helps in avoiding inadvertent vascular puncture or injury to other mediastinal structure or lung.[6] The sensitivity, specificity, and accuracy of EBUS-TBNA in the diagnosis of mediastinal and hilar adenopathy is 95.7%, 100%, and 97.1%, respectively.[7] In addition to mediastinal and hilar lymph nodes, EBUS bronchoscope can assess paratracheal and peribronchial lesions. Maximum outer diameter of Olympus EBUS scope is 6.9 mm; thus peribronchial regions of segmental or subsegmental bronchi (with minimum diameter of 6.9 mm size) can be visualized to obtain TBNA samples.[8]

Recent studies have shown that samples obtained by EBUS-TBNA with 22-gauge needle can be adequate for flow cytometry and immunohistochemistry analysis.[9,10] For the diagnosis of lymphoma, EBUS-TBNA has a sensitivity of 77%, specificity of 100%, and negative predictive value of 85%.[11–13] In our first case report, EBUS-TBNA successfully diagnosed lymphoma.

Primary pulmonary synovial sarcoma is a very rare tumor of the lung, accounting for less than 0.5% of all pulmonary malignancies. PPSS can affect the lung parenchyma, bronchial tree, and pulmonary vessels.[14] The pathologic specimens were mostly obtained by surgical resection or CT-guided core-needle biopsy. In our report, TBNA from mass outside of RUL and from mediastinal lymph node station 4R were all positive for PPSS. To the best of our knowledge, case 2 is the first case of PPSS diagnosed by EBUS-TBNA.[15,16]

Endobronchial ultrasound-guided transbronchial needle aspiration has a high diagnostic value in the investigation of suspected intrathoracic TB via aspiration of target lymph nodes and tracheobronchial wall-adjacent lung lesions.[17] A meta-analysis showed sensitivity of EBUS-TBNA for diagnosis of

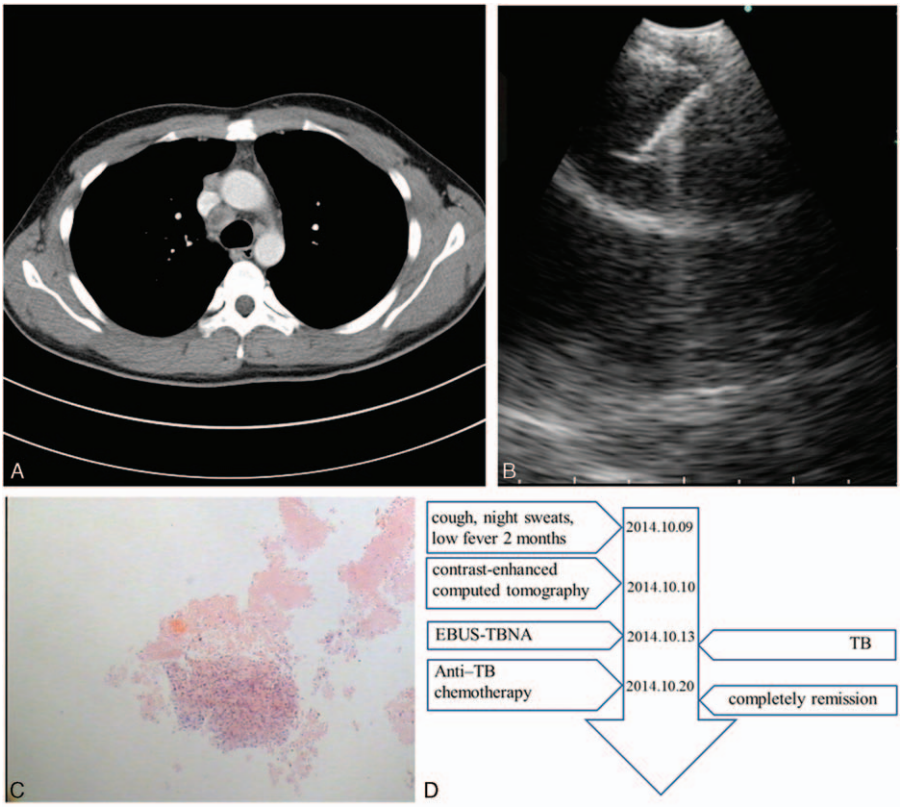

Figure 3. A, CT scan demonstrating a right paratracheal lymph node. B, Tip of the needle showing in lymph node on EBUS-TBNA examination. C, EBUS-TBNA tissue revealing epithelioid granuloma with caseous necrosis (hematoxylin and eosin staining 10×). D, The timeline of interventions and outcomes for case 3. CT = computed tomography, EBUS-TBNA = endobronchial ultrasound-guided transbronchial needle aspiration.

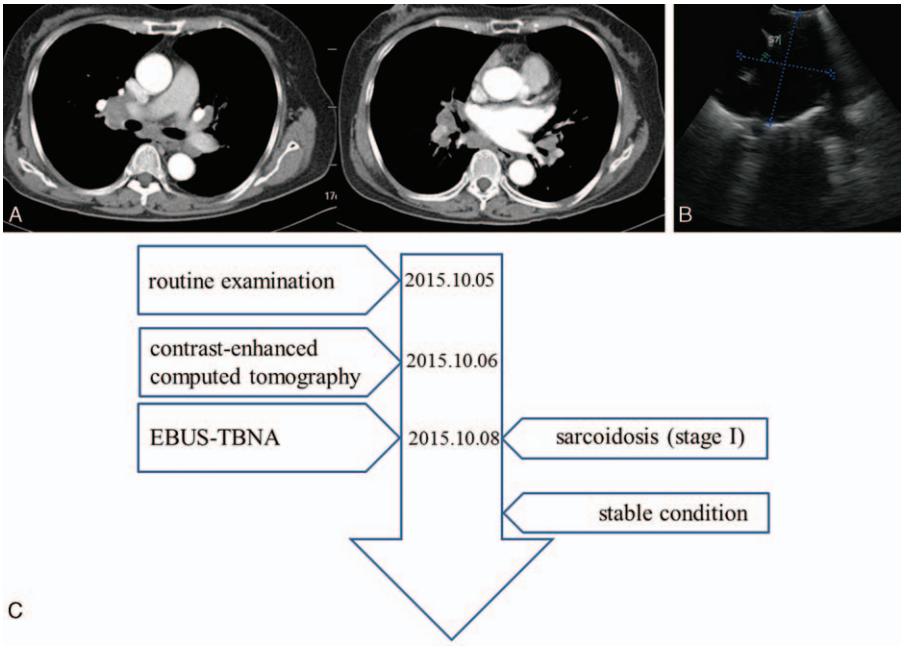

Figure 4. A, CECT image showing enlarged bilateral hilar lymphadenopathy. B, EBUS image demonstrating transbronchial needle aspiration from right hilar lymph node with a 22-gauge needle. C, The timeline of interventions and outcomes for case 4. CECT = contrast-enhanced computed tomography, EBUS = endobronchial ultrasound.

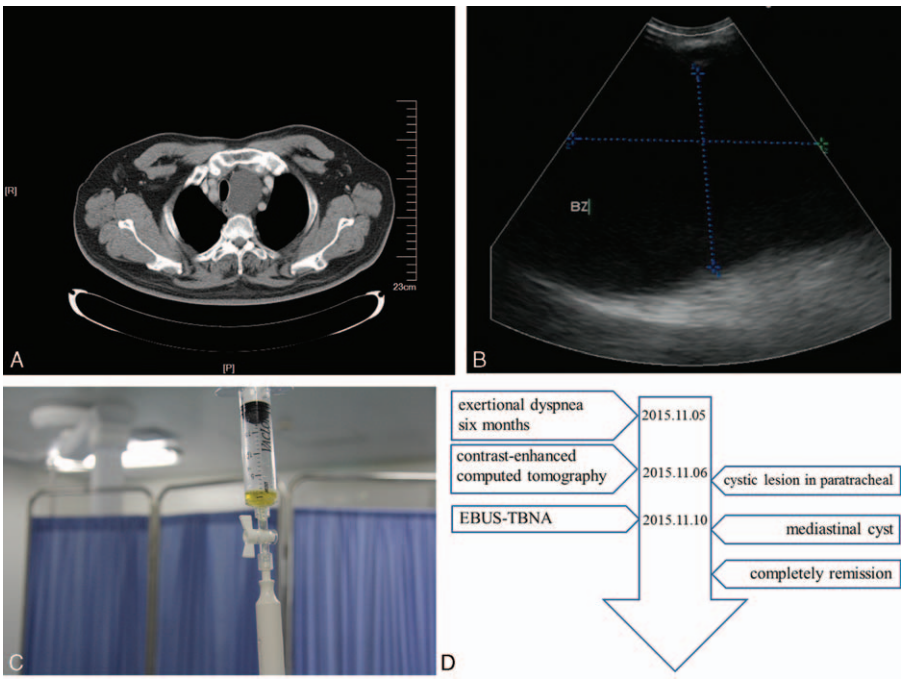

Figure 5. A, CECT imaging showing a large left paratracheal cyst extrinsically compressing the trachea. B, EBUS image showing a homogenous low-echoic mass. C, Approximately 80 mL of yellowish clear fluid is withdrawn with repeated aspirations. D, The timeline of interventions and outcomes for case 5. CECT = contrast-enhanced computed tomography, EBUS = endobronchial ultrasound.

intrathoracic tuberculous lymphadenopathy was 87%.[18] Another study demonstrated diagnostic value of 95.4% for EBUS-TBNA in intrathoracic tuberculous lymphadenitis (TBLA).[19] When culture and histology were combined, EBUS-TBNA demonstrated 98% accuracy for the diagnosis of mediastinal TBLA.[20] These findings suggest that EBUS-TBNA can be used as an initial tool for diagnosis of isolated mediastinal TBLA without any lung parenchymal lesions.[21,22]

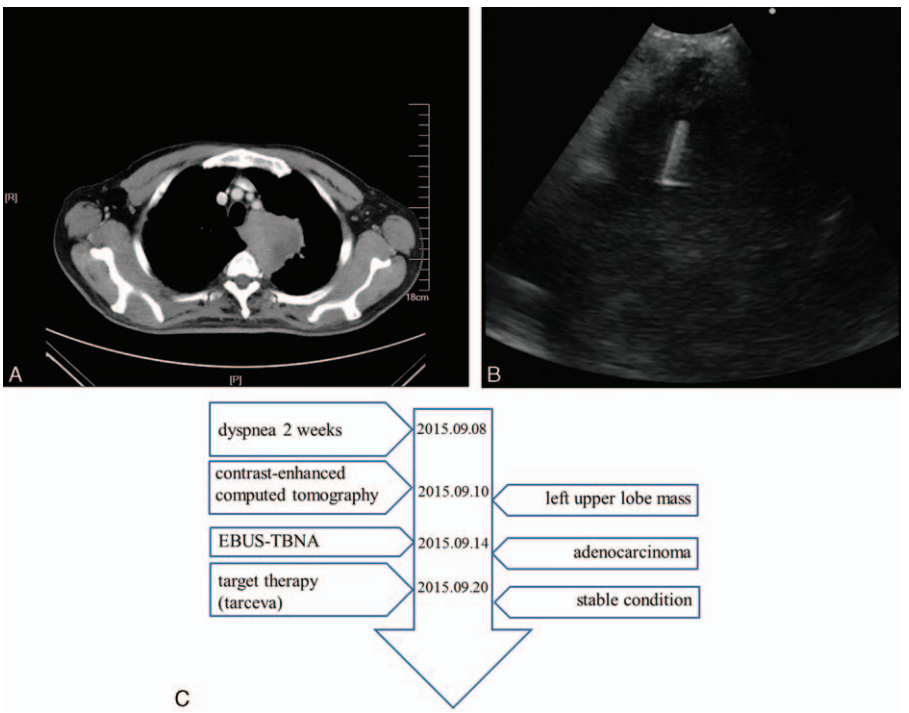

Figure 6. A, CECT scan revealing a large left paratracheal mass with heterogeneous density. B, EBUS-TBNA showing the needle within the lesion. C, The timeline of interventions and outcomes for case 6. CECT = contrast-enhanced computed tomography, EBUS-TBNA = endobronchial ultrasound-guided transbronchial needle aspiration.

Presence of noncaseating epithelioid cell granulomas is pathologic evidence of sarcoidosis. EBUS-TBNA could diagnose sarcoidosis more precisely than TBLB, especially for stage I and II sarcoidosis.[2,23–26] Meta-analysis involving 2097 patients showed that EBUS-TBNA had sensitivity of 84% and specificity of 100% for sarcoidosis.[27]

Bronchogenic cyst is a congenital anomaly in the tree, which is thought to result from the abnormal budding of the ventral foregut during development, and may differentiate into a fluid-filled blind-ended pouch later. Bronchogenic cysts can present with a wide spectrum of clinical presentation, from asymptomatic to acute respiratory distress. Traditional management of bronchogenic cysts is operation. Relief of compression by EBUS-TBNA had been reported before.[28,29] Real-time aspiration of EBUS-TBNA can be both diagnostic and therapeutic, and most of the mediastinal bronchogenic cysts can be fully aspirated.[30]

Recently, the third edition of the American College of Chest Physicians (ACCP) Guidelines for lung cancer recommended needle-based methods as first-line approaches for invasive mediastinal staging of nonsmall cell lung cancer (NSCLC),[31,32] which has attracted physicians and surgeons as an alternative modality to surgical biopsy.[33] In a prospective comparison of EBUS-TBNA and mediastinoscopy, EBUS-TBNA demonstrated better diagnostic yield to confirm lymph node staging in patients with NSCLC, with isolated mediastinal lymphadenopathy.[34] Meta-analysis demonstrated that real-time imaging with EBUS-TBNA is a potential technique for diagnosis and staging for patients with suspected lung cancer,[35,36] especially for central-type lung cancers without airway invasion.[37] Another meta-analysis which included 11 studies involving 1299 patients referred for EBUS for mediastinal staging in NSCLC found a sensitivity of 93% and a specificity of 100%.[38]

Because of its real-time monitoring, EBUS-TBNA increases the safety and accuracy significantly. The occurrence rate of complications during EBUS-TBNA procedure is very low, and most of them are listed as hypoxia, tachycardia, cough, agitation, or bleeding. None of the complications can lead to additional treatment or hospitalization.[39,40] Serious complications (incidence 0.16%) include fever lasting >24 hours, infection of bronchogenic cyst, airway laceration, intramural hematoma of the pulmonary artery, hemopneumomediastinum, mediastinal abscess, pericarditis, and pneumomediastinitis with empyema, all of which need treatment or hospitalization, even surgery.[41–44] There were no significant adverse events in any of the 6 cases reported in our study.

Our main limitations are the observational nature and small sample size of our cohort. However, it provides an adequate array of diagnoses that serve as a platform to discuss the available literature.

In conclusion, EBUS-TBNA procedure enables real-time aspiration of peribronchial or paratracheal lesions, and can be done under conscious sedation or general anesthesia. EBUS-TBNA will play an increasingly important role in the diagnosis, staging, and management of both benign and malignant diseases with high sensitivity, specificity, and diagnostic accuracy. EBUS-TBNA can be used as standard initial tool for diagnostic evaluation of paratracheal/peribronchial mediastinal/lung lesions. EBUS-TBNA should be used as a standard initial test of lymph node staging of NSCLC.[45–48]

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