CASE REPORT

Mitral valve vegetation diagnosed with oesophageal ultrasound with bronchoscope (EUS-B)

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SUMMARY

Oesophageal ultrasound with bronchoscope (EUS-B) is designed to evaluate mediastinal structures. We describe a case of a 78-year-old woman who presented with altered mental status for 2 weeks. CT head revealed a subacute infarct in the right middle cerebral artery distribution. She was also found to have a lung mass on chest imaging. EUS-B-guided fine needle aspiration demonstrated the presence of adenocarcinoma in station 7 lymph node and in the mass. Immunohistochemistry confirmed it to be a lung primary as the Thyroid Transcription Factor-1 (TTF-1) was strongly positive. During the procedure, the cardiac valves were evaluated, and a mitral valve vegetation was noted. Formal echocardiography confirmed the presence of the vegetation. During hospital stay, the patient developed fever. Her blood cultures grew oxacillin-resistant *Staphylococcus aureus*. She was subsequently treated for infective endocarditis. We suggest that the use of EUS-B to routinely scan adjacent structures during a procedure may help obtain additional clinical information that may be critical to patient management.

BACKGROUND

Endobronchial ultrasound (EBUS) is a minimally invasive technique that is used for fine needle aspiration (FNA) sampling of lymph nodes and structures surrounding an airway or the oesophagus if they can be visualised by the ultrasound. The EBUS probe can be placed in the oesophagus to evaluate mediastinal structures. This is known as oesophageal ultrasound with bronchoscope (EUS-B). Use of EUS-B with transbronchial and transoesophageal needle aspiration allows for the evaluation of almost all mediastinal lymph node locations and is now the initial test of choice in evaluating mediastinal tissue.^{1 2} Usually, other structures such as the heart and adrenal glands, which can also be visualised using EUS-B receive less attention. Scanning adjacent structures when performing specific procedures may yield information critical to patient management.

We describe a case of infective endocarditis that was initially discovered during EUS-B performed for a lung mass.

CASE PRESENTATION

A 78-year-old woman was brought to the emergency department for confusion and subtle behavioural changes for 2-week duration. She complained of fatigue for 4 weeks prior to presentation. Family

members noticed that the patient exhibited bizarre behaviour such as wearing her shirt inside out and excess sleep. She denied any history of fever, chills, chest pain, cough, syncope, shortness of breath or skin rashes. She had a known medical history of hypertension, hyperlipidaemia, type 2 diabetes mellitus, coronary artery disease, hypothyroidism and a 30-pack-year smoking history. On physical examination, the patient was alert, awake, oriented to place but disoriented to time and person. Vital signs were stable. Physical examination was unremarkable except for a grade II/VI holosystolic murmur best heard at the apex. No focal cranial nerve findings were noted. No focal motor deficits were present. There were no sensory losses or signs of cerebellar dysfunction. Deep tendon reflexes were normal.

INVESTIGATIONS

Complete blood count and basic metabolic profile were within normal limits. Troponin was 0.29 ng/mL (normal reference range ≤ 0.04 ng/mL). ECG showed normal sinus rhythm with an old right bundle branch block. Chest radiograph revealed a 2.6×1.5 cm apical lung nodule (figure 1). CT of the chest showed a dominant 2.6×1.4×1.2 cm nodule along the medial margin of the right lung apex (figure 2) and a 1.5×1.0×0.8 cm nodule in the right lower lobe (figure 3). Multiple enlarged lymph nodes were noted within the mediastinum and right hilar region. This was suspicious for a malignancy. CT of the brain revealed a hypodense lesion within the right parietal region representing acute infarct or prior ischaemic event. MRI of the brain showed a multifocal acute infarct in the right MCA distribution most pronounced in the posterior portion of the territory and a small evolving subacute infarct in the inferior left temporal lobe. MR angiogram of the head and neck was suggestive of a thrombus in the distal right M1 segment of the MCA artery (figure 4). EUS-B with convex curvilinear bronchoscope was performed to evaluate and sample the apical lung nodule and mediastinal lymph nodes. During EUS-B evaluation, the operating physician noted vegetation on the mitral valve (see online video 1). A transthoracic echo was then performed which showed a large, highly mobile vegetation seen attached to the posterior aspect of the mitral annulus on the atrial side, measuring 20 mm x 7 mm, and mild to moderate mitral regurgitation was also noted. The patient was febrile during hospital stay, and blood cultures obtained grew oxacillin-resistant *Staphylococcus aureus*. The

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Figure 1 Chest X-ray showing a 2.6×1.5 cm left apical lung nodule (arrow).

apical lung mass biopsy and station 7 lymph node returned as adenocarcinoma on histopathology. Immunohistochemistry confirmed it to be a lung primary as the Thyroid Transcription Factor-1 (TTF-1) was strongly positive. CT of abdomen and pelvis was done to evaluate the extent of tumour involvement. It revealed wedge-shaped infarcts in the left pole of the kidney and spleen (figure 5). A paraneoplastic panel was negative.

DIFFERENTIAL DIAGNOSIS

This patient had evidence of embolic shower in the form of multiple strokes and infarcts in spleen and kidney. Causes of cardiac source of embolisation may include infective endocarditis, left atrial or ventricular thrombi. The left atrial and ventricular thrombi could be secondary to atrial fibrillation/atrial flutter, reduced ejection fraction, prosthetic valves

Figure 2 CT scan showing a dominant nodule (2.7 cm in greatest diameter) in the medial margin of the apex of right lung.

Figure 3 CT scan showing a nodule (1.4 cm in greatest diameter) in the right lower lobe.

or atrial myxomas. Patients with complex ascending aortic atherosclerotic plaques (>4 mm) can also present with embolic strokes. Patent foramen ovale in patients with venous thromboembolism increases the risk of thrombus entering the systemic circulation. In some cases, the cause of embolic stroke remains unidentified.

In our case, the patient had a valvular vegetation in setting of fever and positive blood culture with an organism typically

Figure 4 Axial diffusion weighted image (A) and corresponding ADC map (B) shows restricted diffusion in the right superior temporal and inferior parietal lobes, suggestive of acute ischaemic stroke. Three-dimensional time-of-flight non-contrast MR angiography (C) through the head shows abrupt loss of flow-related signal in the distal M1 segment (arrow), with reconstitution of flow in the proximal M2 branches, which are smaller in calibre compared with contralateral side. Findings were suggestive of thrombus in the right M1 segment.

Video 1 Oesophageal ultrasound with bronchoscope showing a mitral valve vegetation (marked in red circle).

known to cause infective endocarditis. This was considered diagnostic for infective endocarditis.

TREATMENT

Based on the blood culture and sensitivity results, the decision was made to treat oxacillin-resistant *S. aureus* bacteraemia using intravenous vancomycin. Due to presence of concomitant valvular vegetation confirming the diagnosis of infective endocarditis, a treatment duration of 6 weeks was chosen.

OUTCOME AND FOLLOW-UP

Bacteraemia resolved with intravenous vancomycin therapy. Follow-up transthoracic echo showed resolution of the mitral valve vegetation. The patient declined treatment for cancer and opted for palliative management.

DISCUSSION

The uniqueness of this case lies in the fact that a procedure was able to establish two diagnoses in the same setting, lung cancer as well as infective endocarditis. EBUS was initially developed for sampling of lymph nodes and structures surrounding an airway if they could be visualised via ultrasound.³ Later, it was found that placing the EBUS scope in the oesophagus could improve

access to the mediastinum and help sample nodes that were initially inaccessible via the endobronchial route. EUS-B has the advantage of shorter procedure time, fewer episodes of oxygen desaturation and lower sedative use during the procedure. This is expected since the scope is placed in the oesophagus and not in the bronchus. It has comparable diagnostic yield and patient tolerance compared with traditional EBUS, thus making it preferable to an EBUS in some cases.^{2,4}

This case brings to notice the importance of EBUS/EUS-B for indications other than tissue sampling of the mediastinum. The other areas that could be visualised include the mediastinal vessels, cardiac structures, left adrenal gland, liver and coeliac nodes. EBUS probe can visualise mediastinal vessels, and thus help in the diagnosis of pulmonary embolism (PE). EBUS was able to detect 96% of thrombi in CT-diagnosed cases of PE.⁵ However, this study was not blinded and hence may have led to higher PE detection rates. The study did help define EBUS imaging characteristics of PE and provided additional diagnostic options in patients who were not candidates for intravenous contrast injection. Non-thrombotic endovascular lesions of pulmonary vessels such as pulmonary sarcoma, metastatic lesions and septic pulmonary emboli can present as diagnostic dilemmas. Most of these cases are misdiagnosed as PE, and they do not improve with anticoagulation therapy. Prior to EBUS, either surgical approach or the use of cardiac catheterisation was essential to make the diagnosis. FNA of these could be obtained using EBUS, in many cases with minimal complications, confirming their diagnoses.⁶

Thyroid nodule aspiration using EBUS in intrathoracic non-palpable nodules is reported in literature. Though most patients underwent successful sampling with no major complications, infectious complications in the form of abscesses were a concern among few. Further large-scale studies are thus needed to assess feasibility of EBUS in the sampling of substernal thyroid nodules.⁷⁻⁹

Cardiac structures may be visualised similar to a transoesophageal echocardiogram when the EBUS probe is placed in the oesophagus. Discovery of cardiac pathologies such as left atrial myxomas, pericardial effusions and pericardial mesothelioma using an EBUS probe has been described in literature.¹⁰ Cetinkaya *et al* described a case of atrial myxoma diagnosed with EBUS when FNA was performed for hilar adenopathy. The patient had stage I sarcoidosis but the evaluation of left atrium through the bronchus using EBUS showed a large atrial myxoma. The patient subsequently underwent surgical resection. The authors suggested that adjacent structures be evaluated during EBUS so as to identify similar anomalies that are not initially apparent.¹¹ In a novel method, aspiration of pericardial effusion using EBUS needle from the bronchus is being performed by a few pulmonologists.¹²

Our centre recently published a retrospective review of 45 cases, where sampling of subdiaphragmatic sites were performed using EUS-B. The procedure is routinely performed and is found to be safe, yielding adequate cellularity.¹³ The left adrenal gland (n=25) was the most commonly biopsied subdiaphragmatic site, followed by coeliac lymph nodes (n=13). Liver biopsy was performed in seven cases. Though most cases were done to exclude malignancy, few were performed to establish a diagnosis of sarcoidosis. Presence of granulomas in liver FNA biopsies can be useful in the diagnosis of sarcoidosis when mediastinal nodes are negative, as 60%–90% of extrapulmonary sarcoidosis involves the liver.

It should be noted that when compared with a dedicated oesophageal ultrasound scope, EUS-B is inferior due to larger

Figure 5 CT abdomen with contrast shows wedge-shaped hypodensity in spleen suggestive of infarct.

field and depth of view and increased manoeuvrability of the former.¹³ Nevertheless, it is an important tool in the hands of pulmonologists to evaluate adjacent structures and is in direct alignment with the use of transoesophageal echocardiography by critical care physicians in the setting of shock.¹⁴

Our patient had multiple ongoing illnesses that affected her risk profile. Increased incidence of valvular vegetations is known in solid tumours.¹⁵ Evaluation of cardiac structures during sampling for lung malignancy helped in identifying the vegetation on the cardiac valve. Hence, we recommend that the endosonographer routinely scan adjacent structures during an EUS-B procedure, as this may yield additional information critical to patient management.

Learning points

- ▶ Confusion is a common initial presentation in elderly patients. It is important to be cognizant of the myriad of diseases that may have precipitated it.
- ▶ 'The eye sees only what the mind knows'. Thus, constant vigilance for associated illnesses often yield results that make significant impact on outcomes.
- ▶ Endobronchial ultrasound (EBUS), primarily used for the evaluation of the central airways and mediastinal lymph nodes has additional utility in the exploration of other surrounding structures.
- ▶ Use of EBUS/oesophageal ultrasound with bronchoscope to routinely scan adjacent structures during a procedure may yield additional information critical to patient management.

Contributors AJK, preparation of manuscript; YMR and KK, case selection and preparation of manuscript; NKM, supervision and revision of manuscript, performed intervention and obtained video attached to the manuscript.

Competing interests None declared.

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