



## Case report

# Chronic Pulmonary Melioidosis Masquerading as lung malignancy diagnosed by EBUS guided sheath technique

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## ABSTRACT

Diagnosis of pulmonary mass lesions can be challenging with several possible differentials. A 41-year-old Caucasian woman presented with intermittent non-specific chest pain on a background of 30 pack years of smoking history. A CT scan of the chest confirmed an opacity in the right lower lobe suspicious for primary pulmonary malignancy and PET scan showed moderate FDG avidity of the lesion. Conventional flexible bronchoscopy did not demonstrate an endobronchial lesion. Using Endobronchial Ultrasound (EBUS) Guide sheath technique, the lesion was localized in the posterior segment of the right lower lobe. Brushings, biopsies and washings were taken through the guide sheath, along with transbronchial cryobiopsy. Culture of bronchial brushings from the lesion on Ashdown's agar medium showed *Burkholderia pseudomallei*, confirming melioidosis. Treatment was with intravenous ceftazidime for 4 weeks, followed by oral sulphamethoxazole/trimethoprim for 3 months. During the follow up visits, the patient demonstrated significant improvement both clinically and radiologically.

## 1. Introduction

Rarely diagnosis of pulmonary mass lesions can be challenging with several possible differential diagnoses, especially with peripheral lung pathology that cannot be accessed by either conventional bronchoscopy or CT guided biopsy. Uncommon pulmonary presentations due to infectious and non-infectious conditions need to be considered in the relevant clinical and epidemiological context. Moreover, occupational, recreational history and geographic location of the patient are also important. More recently, accessibility to diagnostic procedures such as Endobronchial Ultrasound (EBUS) has made it possible to diagnose both malignant and non-malignant conditions for early diagnosis and treatment of complex pulmonary conditions [1]. Melioidosis is a condition secondary to infection with *Burkholderia pseudomallei*, a gram-negative saprophyte in soil and fresh water of epidemic regions in South East Asia, Northern Australia and an increasing global distribution [2,3]. Acute pulmonary melioidosis is well known to occur in endemic areas [4]. However, patients presenting with subacute or chronic pulmonary symptoms secondary to melioidosis can pose diagnostic challenges. In this report we describe a Caucasian woman with significant

smoking history presenting with non-specific chest symptoms diagnosed to have chronic melioidosis by EBUS guide sheath technique [5,6] while investigated for suspicion for primary pulmonary malignancy.

## 2. Case report

A 41-year-old Caucasian woman presented to the emergency department with four day history of intermittent non-specific chest pain on a background of 30 pack years of smoking history. She also had a history of progressive exertional dyspnea for a few months and also loss of appetite during this presentation. She denied fever, cough, hemoptysis, pleurisy or coryzal symptoms. She had no significant past medical history, in particular, there was no history of diabetes and she was not on any regular medications. She had no significant occupational or travel history of significance. There was no history of exposure to tuberculosis. She was an avid gardener, residing in Darwin, Northern Territory of Australia. She usually walked barefoot in her garden and used large amounts of potting mix while gardening. She denied excessive alcohol consumption or recreational drug usage.

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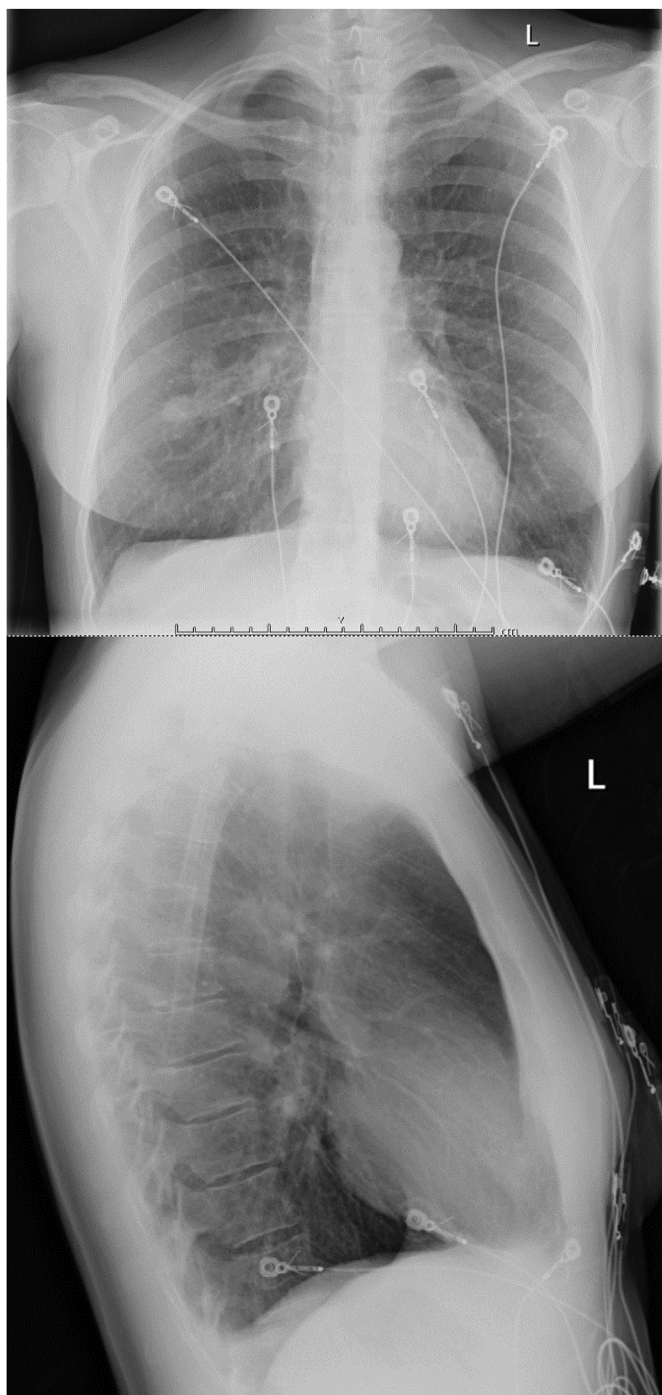


Fig. 1a. Chest X-Ray AP and Lateral view showing right mid-zone mass lesion.

On clinical examination, vital signs were normal. Respiratory examination was unremarkable, with normal breath sounds bilaterally and there were no crackles or rhonchi or pleural rub in particular. Cardiovascular examination was also normal. Systemic examination showed no evidence of clubbing, oedema, cyanosis or lymphadenopathy. Her ECG showed normal sinus rhythm without ischemic changes. Blood tests showed white cell count of  $11.5 \times 10^9/L$  with neutrophilia  $7.9 \times 10^9/L$  and CRP was 15 Mg/L, Serial troponins were negative. Liver function, electrolytes, renal function were within normal limits. Quantiferon gold test was negative. Pulmonary function showed FVC of 3.88 L, (97% predicted), FEV<sub>1</sub> 3.05 L (92% predicted), FEV<sub>1</sub>/FVC ratio 0.787 (96% predicted), DLCO 77% and TLC 4.75L (89% predicted). Chest X-ray showed an opacity in the right mid-zone

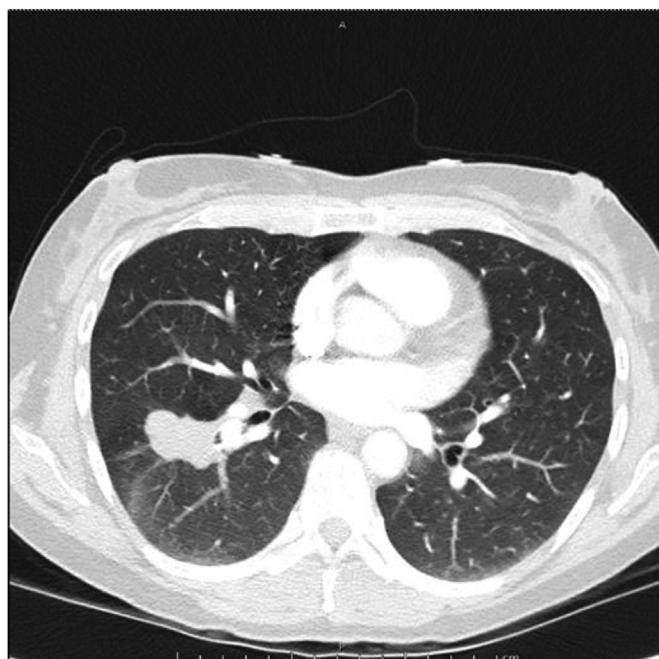


Fig. 1b. CT chest image showing mass in right lower lobe.

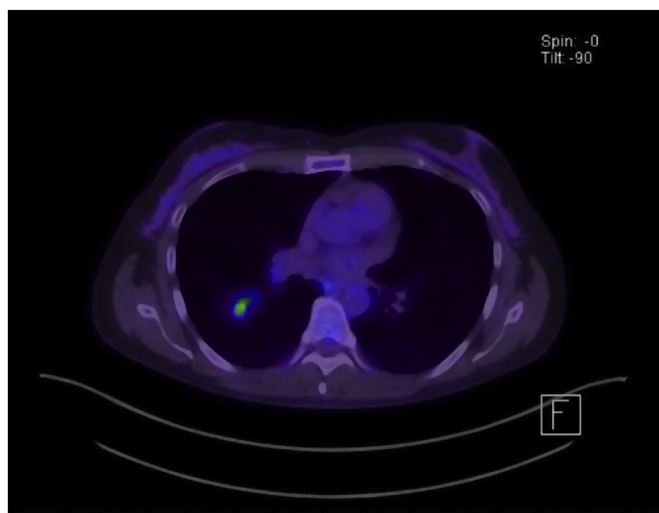
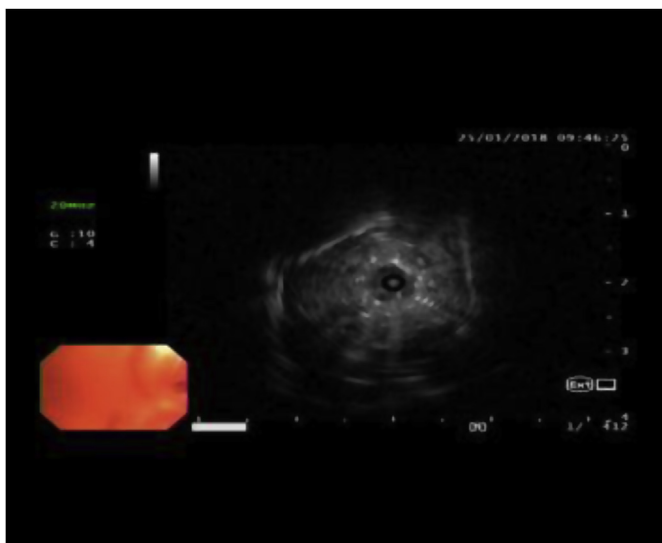


Fig. 2a. PET CT – FDG avidity shown in right lower lobe mass.

(Fig. 1a). She underwent a CT scan of the chest, that showed a mass in the right lower lobe measuring approximately  $36 \times 22$ mm suspicious of malignancy. There was no endoluminal bronchial lesion nor mediastinal or hilar lymph node enlargement. (Fig. 1b). Due to the high index of suspicion of lung malignancy, a PET-CT was performed, which demonstrated mild to moderate FDG avidity of the mass in the right lower lobe (Fig. 2a) but no other FDG avid nodal or distant metastatic disease. The patient underwent flexible bronchoscopy that showed no endobronchial lesion, then using the Endobronchial radial Ultrasound (EBUS) probe and utilizing the Guide sheath technique, the lesion was localized in the posterior segment of the right lower lobe. The EBUS images (Fig. 2b) demonstrated a heterogeneous lesion with non-compressed blood vessels and scattered air space shadows. Brushings, biopsies and washings were taken from the guide sheath, along with a transbronchial cryobiopsy from the same site identified by the ultrasound probe. The EBUS-guided biopsy of the lesion showed necrotic tissues and malignant cells were not identified. Culture of bronchial brushings on Ashdown's agar medium, however, grew bacterial



**Fig. 2b.** EBUS Guide sheath image of the lesion. The probe can be seen at the centre of the image and the surrounding echo-dense image confirms the probe is well located deep within the lesion, allowing safe and effect biopsy.

colonies which were identified microscopically as gram negative bacilli. Bacterial culture from bronchial brushings was subsequently confirmed as *Burkholderia pseudomallei*, making the diagnosis of pulmonary melioidosis (Fig. 3). She was treated with intravenous ceftazidime 2 g 6 hourly for 4 weeks, followed by oral sulphamethoxazole/trimethoprim (800mg/160mg) 2 tablets twice a day for 3 months with daily folic acid 5mg. During the follow up visits, the patient demonstrated significant improvement both clinically and radiologically. Her CRP was noted to be < 0.1 Mg/L consistently, with normal white cell and neutrophil counts. Her exertional dyspnea was considered to be related to early airway disease secondary to smoking, possibly aggravated in the presence of pulmonary melioidosis and she was provided with support for smoking cessation.

### 3. Discussion

The case presented in this report highlights that the pulmonary masses which mimic lung malignancy, benign tumour or granulomatous disease may also represent chronic pulmonary infection. Chronic pulmonary melioidosis should be considered in patients who have visited or residing in endemic area, presenting with infective symptoms, high white cell count, neutrophilia and an elevated CRP and EBUS guide sheet technique may be utilised as a diagnostic modality in relevant clinical context.

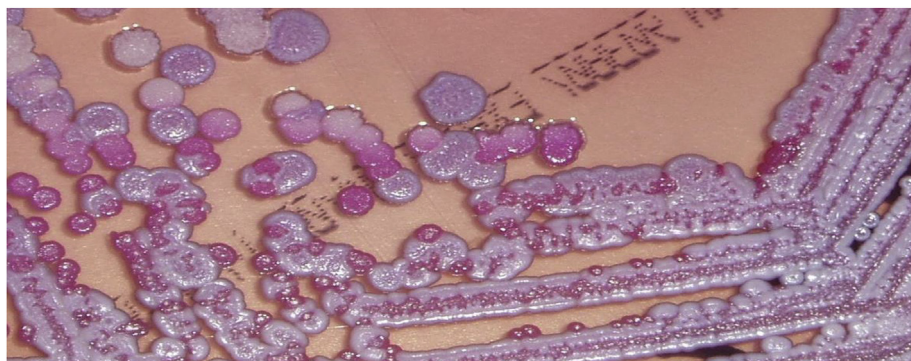
Some regions of the tropical top-end of Northern Territory of Australia and northeastern Thailand are known to be melioidosis hyper-

endemic areas. The predominant mode of transmission is inoculation through skin during wet/rainy seasons and pulmonary involvement is then secondary to haematogenous spread. Other modes of transmission include inhalation or aspiration of contaminated soil or water. Severe weather conditions such as tropical cyclones or heavy winds & rain can promote the transmission of infection, with higher mortality and a higher proportion of cases presenting with pneumonia and severe sepsis, presumptively resulting from a shift to inhalational infection [3]. The important risk factors for systemic infection are diabetes mellitus, chronic renal failure, hazardous alcohol use, immunosuppressive therapy and chronic lung diseases. In our case, the route of infection could be either cutaneous inoculation from gardening in bare feet or inhalation given the history of use of potting mix [2–4].

Incubation period in acute melioidosis varies from 1 to 21 days (mean 9 days) and the spectrum of presentation depends on bacterial load, mode of transmission, host risk factors and possibly virulence differences amongst different strains of *B.pseudomallei*. The most common clinical presentations are pneumonia (around half of all cases) and localized skin infection. However, the clinical spectrum is very diverse and includes genitourinary tract infection, osteomyelitis, septic arthritis, encephalomyelitis and sepsis without evident focus [2–4].

Acute infection of the respiratory tract can present with various manifestations including cough, productive sputum, hemoptysis and septic shock [4]. In subacute and chronic pulmonary infection, the presentation can mimic chronic infections such as tuberculosis or malignancy. The radiological features of melioidosis pneumonia vary from single or multi-lobar consolidation to patchy infiltrates and pleural effusion [7]. Melioidosis is definitively confirmed by culture of *B. pseudomallei* from clinical samples (blood, sputum, urine, wound swab, pus, throat and rectal swabs). Serologic testing can assist but has low sensitivity early in infection and background seropositivity in endemic regions means positive serology is not specific for active disease [3,4]. Chronic pulmonary melioidosis can demonstrate nodular, cavitary or fibrotic lesions on chest radiographs [7].

The EBUS guide sheet technique facilitates effective vision for a bronchoscopist when the lesions is in the subsegmental airways (when not visible endobronchially) [1,5] as in our case. It utilises a small radial ultrasound probe as in this case a 1.7 mm diameter (Olympus Tokyo UM20-20R). This probe is placed inside a plastic sheath (2.0mm in diameter, Olympus K203). This combined probe and sheath are passed down the working channel of the bronchoscope and into the target subsegment airway. The target subsegment airway is determined by close scrutiny of the CT images before the procedure is undertaken. Once in the lung periphery target area, the ultrasound images can confirm the correct placement of the probe preferably placed completely within the lesion in question as demonstrated in this case (Fig. 2b). Once the probe is in place the bronchoscope and the sheath are kept stationary and the ultrasound probe is removed, allowing a biopsy forceps, then a brush to be passed back down the sheath to the exact point where the probe showed the pathology. Use of X-ray



**Fig. 3.** Bacterial culture from bronchial brushings showing *Burkholderia pseudomallei*.

fluoroscopy confirms the safe sampling of the lesion with the forceps and brush.

The benefits of using the EBUS Guide Sheath technique includes excellent peripheral lesion localisation and safety. It is not uncommon for conventional transbronchial biopsy of lesions in subsegmental airways to be non-diagnostic when performed using only fluoroscopy guidance. This is due to parallax errors which occur due to patient angulation compared to the beam of the fluoroscopy and because lesions are often poorly visualised on fluoroscopy, (including even lesions of the size as in this case). Conversely with EBUS, the probe can be guided up to 6th or 7th order bronchus, which can facilitate an excellent circumferential image as seen in our case (Fig. 2b). The sensitivity of traditional transbronchial biopsy under fluoroscopic control only ranges from 14% to 63%, depending on the size and location of the nodule [8,9] A meta-analysis of EBUS Guide sheath results showed a mean yield of 73% (95% CI 64.4–81.8), with even higher yields shown in lesions > 2cm diameter [10]. Additionally and just as importantly the incidence of adverse events with this type of technique is extremely low, particularly bleeding [6]. In a case such as this presented, a peripheral lesion and severe chronic inflammation, if standard biopsies were taken there would be the likelihood of significant post biopsy bleeding with the large size of biopsies. Conversely the deployment of the sheath in the target bronchus that acts as an excellent tamponade for bleeding after the biopsy.

This case is presented to highlight that diagnosis of pulmonary mass lesions can be complex with several possible differential diagnoses. However appropriate clinical evaluation and use of diagnostic techniques, such as EBUS guide sheath technique, when appropriate, for complex lung pathology may facilitate early diagnosis and management. Furthermore melioidosis should be considered in the differential

diagnosis in endemic areas.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.rmcr.2019.100894>.

## References

- [1] N. Kurimoto, H. Nakamura, T. Miyazawa, Overview of endobronchial ultrasonography in chest medicine, *J. Med. Ultrasound* 17 (2009) 31–43.
- [2] A.C. Cheng, B.J. Currie, Melioidosis: epidemiology, pathophysiology, and management, *Clin. Microbiol. Rev.* 18 (2005) 383–416.
- [3] B.J. Currie, Melioidosis: evolving concepts in epidemiology, pathogenesis and treatment, *Semin. Respir. Crit. Care Med.* 36 (2015) 111–125.
- [4] E.M. Meumann, A.C. Cheng, L. Ward, B.J. Currie, Clinical features and epidemiology of melioidosis pneumonia: results from a 21-year study and review of the literature, *Clin. Infect. Dis.* 54 (2012) 362–369.
- [5] D.I.K. Fielding, P.J. Robinson, N. Kurimoto, Biopsy site selection for endobronchial ultrasound guide-sheath transbronchial biopsy of peripheral lung lesions, *Intern. Med. J.* 38 (2008) 77–84.
- [6] L. Zhang, H. Wu, G. Wang, Endobronchial ultrasonography using a guide sheath technique for diagnosis of peripheral pulmonary lesions, *Endosc. Ultrasound* 6 (2017) 292–299.
- [7] V.F. Chong, Y.F. Fan, The radiology of melioidosis, *Australas. Radiol.* 40 (1996) 244–249.
- [8] M.P. Rivera, A.C. Mehta American College of Chest Physicians, Initial diagnosis of lung cancer: ACCP evidence-based clinical practice guidelines, *Chest* 132 (2007) 131S–148S.
- [9] W.A. Baaklini, M.A. Reinoso, A.B. Gorin, A. Sharafkaneh, P. Manian, Diagnostic yield of fiberoptic bronchoscopy in evaluating solitary pulmonary nodules, *Chest* 117 (2000) 1049–1054.
- [10] J.S. Wang Memoli, P.J. Nietert, G.A. Silvestri, Meta-analysis of guided bronchoscopy for the evaluation of the pulmonary nodule, *Chest* 142 (2012) 385–393.