



## Original article

## Bilateral synchronous multiple lung nodules: Surgical experience from two cases

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## ABSTRACT

Synchronous multiple lung cancer (SMPLC) has been increasingly detected as a result of improved imaging techniques, though the incidence of SMPLC is rare. Surgery is currently the only treatment offering potential cure and long-term survival in patients with SMPLC, and complete resection is widely accepted as the first choice of procedure for this type. However, due to the rarity of this clinical scenario, many surgeons lack experience in surgical treatment of SMPLC. Here, we present two cases whose SMPLC was successfully managed with aggressive surgical therapy through video-assisted thoracoscopic surgery.

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## 1. Introduction

Synchronous multiple primary lung cancer (SMPLC), defined as multiple primary lung cancer discovered around the same period of time (Detterbeck et al., 2003; Kozower et al., 2013), is rare with an incidence around 0.5% (Ferguson, 1993). However, in case of two or more nodules having identical histology, it is intractable to differentiate pulmonary metastases from SMPLC because genetic and molecular analyses are not routinely performed in clinical practice. A simple analysis of EGFR and KRAS mutations in the tumors seems a cost-effective way to identify true SMPLC from the cases that were hard to diagnosis by merely clinical characteristics (Liu et al., 2016). When confronted with respectable bilateral multiple pulmonary nodules, the thoracic surgeons often find himself

in a dilemma. Surgical treatment is still the first choice for these patients when possible, and the 5-year disease-free survival and overall survival rates can be close to 60% and 80%, respectively (Zhang et al., 2016). Although surgery was believed to prolong the survival of SMPLC patients, pneumonectomy was reported to be an indicator of poor prognosis (Liu et al., 2016; Trouse et al., 2007). Therefore, the surgical treatment of SMPLC is critical. Here, we report two cases of SMPLC which was managed by video-assisted thoracoscopic surgery.

## 2. Case report

## 2.1. Patient 1

A 71-year-old man without history of smoking had an abnormal chest computed tomography (CT) in his regular health examination. Two nodules in his right upper lobe and a material mass in his left upper lobe without mediastinal or hilar lymphadenopathy were disclosed (Fig. 1). He was asymptomatic and had nothing remarkable in his medical and family history. A physical examination also failed to reveal any significant abnormalities. A pulmonary function test showed a restrictive pattern on spirometry with a forced expiratory volume-one second (FEV1) of 1.55 L (65.6% of predicted), a forced vital capacity (FVC) of 2.22 L (79.9% of predicted), and an FEV1/FVC ratio of 69.83%.

The patient was administered with double-lumen endotracheal intubation after general anesthesia. He was firstly placed in a left

*Abbreviations:* CT, computed tomography; FEV1, forced expiratory volume-one second; FVC, forced vital capacity; GGO, ground glass opacity; NSCLC, non-small cell lung cancer; SMPLC, synchronous multiple lung cancer.

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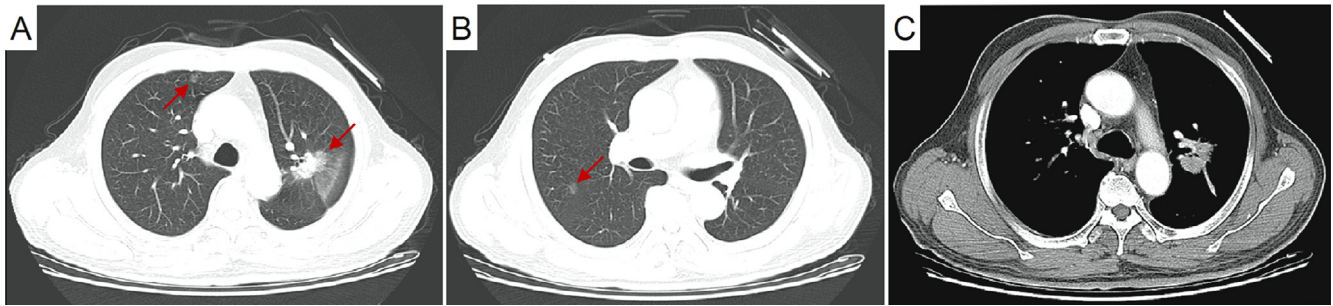
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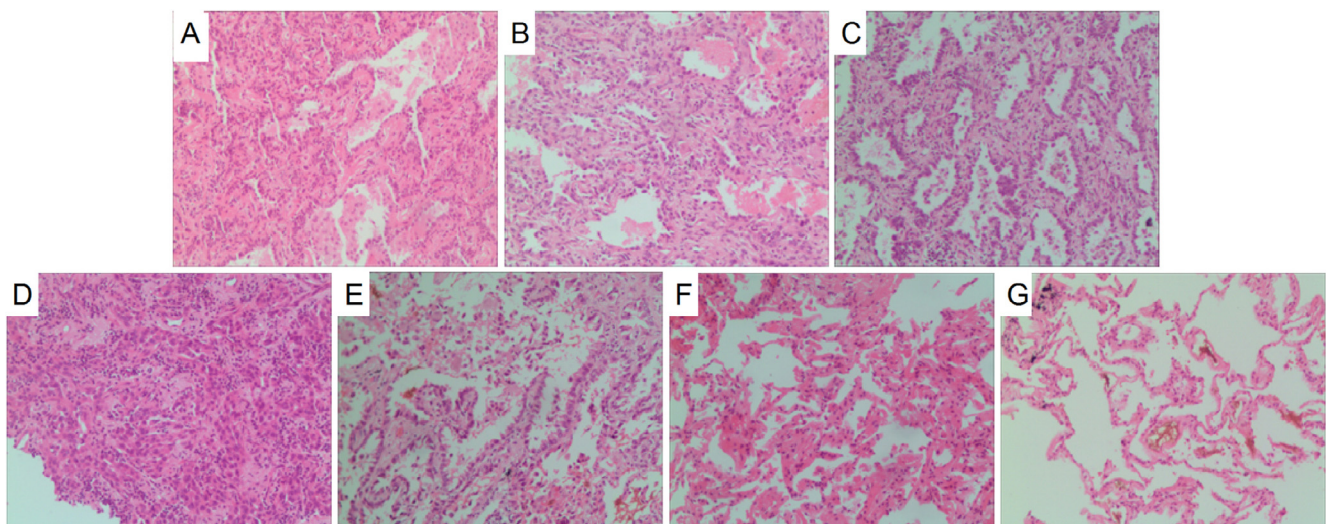
**Fig. 1.** Chest CT on admission revealed two lung nodules in the right lobe and a tumour mass in the left upper lobe of patient 1. (A) A 7-mm ground-glass nodule was detected in anterior segment of right upper lobe. A 25-mm solid nodule was located in left upper lobe. (B) A 9-mm partially solid nodule was located in posterior segment of right upper lobe. (C) No enlarged lymph nodes were found in the mediastinum.

lateral decubitus position. Under left single lung ventilation, a 1.5-cm incision was made for endoscopic observation in the seventh intercostals space at the posterior axillary line, and a 3.5-cm incision was served as operation in the fourth intercostals space at the anterior axillary line. Each of the two lesions was identified through CT-guided hook wire before the surgery. Wedge resection was performed using curved endostaplers with margins  $\geq 2$  cm. The frozen section revealed an adenocarcinoma *in situ* in the S3 segment and a microinvasive adenocarcinoma in the S2 segment. The values of the pulmonary function test suggested that bilateral upper lobectomy would have caused a considerable decline of pulmonary function, which was not acceptable for the patient. Accordingly, only systematic lymph node dissection was performed in the next step. A thoracic drainage tube was placed at the bottom incision. After the right-side operation, the patient was rotated to the opposite side for left upper lobectomy. The left upper pulmonary veins were exposed, followed by exposure of either bronchi or arterial branches, which were then dissected using staplers. Finally, systematic lymph node dissection was performed. One chest tube was placed at the bottom incision. Conventional pathology revealed that the nodule in the right upper lobe S3 and S2 segment were adenocarcinoma *in situ* (Tis) (Fig. 2A) and minimally invasive adenocarcinoma (T1a) (Fig. 2B), respectively. The nodule in the left upper lobe was invasive adenocarcinoma (T2a) (Fig. 2C).

## 2.2. Patient 2

a 72-year-old woman was referred to our pulmonary clinic for evaluation of multiple lung nodules on chest imaging. In October 2012, the patient underwent excision of a lesiofibroadenoma in her right breast. Chest CT scan revealed bilateral multiple pulmonary nodules during the latest hospitalization. After discharge, she was followed up using chest CT regularly (Fig. 3). On admission the physical examination was unremarkable. Laboratory tests were all in the normal ranges. The FVC was 2.67 L or 104.7% of predicted value, with a FEV1 of 2.29 L or 106.7% of predicted value in this patient.

Double-lumen endotracheal intubation after general anesthesia was also performed in this patient. She was firstly placed in a right lateral decubitus position to undergo a thoracoscopic partial resection of the left lower lobe. Frozen-section examination confirmed an inflammatory nodule. After the left-side operation, the patient was rotated to the opposite side for the further surgery. Wedge resections were performed for the two nodules in the right lower lobe and the right middle lobe. The frozen section showed an atypical adenomatous hyperplasia in the right lower lobe and a minimally invasive adenocarcinoma in the right middle lobe. The nodule in the right upper lobe is solid and irregular. A wedge resection is sufficient for an atypical adenomatous hyperplasia but not



**Fig. 2.** Photomicrographs of the tissue sections from the surgical specimens on hematoxylin and eosin staining. (A) An adenocarcinoma *in situ* in the right S3 segment of patient 1. (B) A minimally invasive adenocarcinoma in the right S2 segment of patient 1. (C) A well-differentiated adenocarcinoma in the left upper lobe of patient 1. (D) A well-differentiated adenocarcinoma in the right upper lobe of patient 2. (E) A minimally invasive adenocarcinoma in the right middle lobe of patient 2. (F) An atypical adenomatous hyperplasia in the right lower lobe of patient 2. (G) An inflammatory nodule in the left lower lobe of patient 2.

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