Surgical algorithm for heterogeneous bilateral quadruple pulmonary nodules

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Abstract

A 65-year old female with no history of smoking reported experiencing 6 months of tightness in the chest. Chest computed tomography showed two pulmonary nodules in the left upper lobe (one in S3 segment, the other in S4 segment), one nodule in the left lower lobe and a ground-glass opacity (GGO) in the right upper lobe. Synchronous bilateral thoracoscopic wedge resections of the lung were performed to investigate the nodules. Intraoperative frozen section pathology revealed that the two nodules in the left upper lobe were malignant, the nodule in the left lower lobe was a benign lesion and the GGO in the right upper lobe was an atypical adenomatous hyperplasia. As a result, a left upper lobectomy with lymph node dissection was performed. The final pathological diagnosis of the nodule in the left S3 segment was well differentiated adenocarcinoma (pT1bN0M0, IA), the nodule in the left S4 segment was moderately to poorly differentiated adenocarcinoma (pT1aN0M0, IA), the nodule in the left lower lobe was cryptococcal granuloma and the GGO in the right upper lobe was adenocarcinoma in situ. The patient is currently following a favourable course in her recovery. Here, we would like to share the surgical algorithm used for the treatment of heterogeneous bilateral quadruple pulmonary nodules.

Keywords: Synchronous multiple primary lung cancers • Adenocarcinoma • Cryptococcosis • Surgery

INTRODUCTION

According to clinical reports, the incidence of synchronous multiple primary lung cancers ranges from 1 to 7% [1]. The occurrence of synchronous lung cancers, defined as a second tumour in a different lobe and with a different histological manifestation, is rare [1–3]. The differentiation between primary and metastatic cancers is often problematic in patients with multiple lung cancers. When confronted with bilateral multiple pulmonary nodules, all being resectable, the thoracic surgeon finds himself in a dilemma.

CASE

A 65-year old female was admitted to our hospital because of tightness of the chest lasting >6 months. She was a non-smoker and had nothing remarkable in her medical and family history. A physical examination also did not reveal any significant abnormalities.

Contrast-enhanced computed tomography (CT) revealed two nodular shadows in the left upper lobe (one measured 2.3 cm in the largest dimension in the S3 segment, the other measured 1.8 cm in the largest dimension in the S4 segment), a nodular shadow measured 0.8 cm in the largest dimension in the left lower lobe and a ground-glass opacity (GGO) measured 1.1 cm in the largest dimension in the right upper lobe (Fig. 1). Head magnetic resonance imaging isotope bone scan, abdominal ultrasound, bronchoscopy and laboratory tests showed normal results. Her spirometry was normal, with a forced expiratory volume in one second of 2.66 l.

Since multiple pulmonary metastases could not be ruled out and the nodule in the left lower lobe was round and peripheral, typical of metastasis, the patient started with a thoracoscopic wedge resection of the left lower lobe. The frozen section pathology turned out to be granuloma. In the second step, wedge resection was performed for the two nodules in the left upper lobe. This time the frozen section showed that both were adenocarcinoma but no differentiation between metastasis and primary disease was found. To determine whether these were metastatic from the nodule in the right upper lobe, the patient was repositioned and went on to the third step of surgery. This time, a thoracoscopic wedge resection of the right upper lobe was performed and the frozen section revealed the GGO to be atypical adenomatous hyperplasia. Since the malignant nodules in the left upper lobe could not be metastatic from the right upper lobe atypical adenomatous hyperplasia and a wedge resection was sufficient for atypical adenomatous hyperplasia but not for adenocarcinoma, intralobar metastasis or multiple primary carcinomas in one lobe, the patient proceeded to the last step of surgery. Finally, a thoracoscopic left upper lobectomy with lymph node dissection was completed after the patient was repositioned for the second time.

The final pathology revealed the following: the nodule in the left S3 segment was well differentiated adenocarcinoma, the nodule in the left S4 segment was moderately to poorly differentiated adenocarcinoma, the nodule in the left lower lobe was...
Cryptococcal granuloma and the GGO in the right upper lobe was adenocarcinoma in situ (Fig. 2). There was no tumour invasion in the lymph nodes.

The patient had an uneventful postoperative recovery and is currently faring well in the outpatient follow-up, in the last 12 months.

Figure 1: Preoperative chest CT scan of the patient showed four pulmonary nodules in four different lobes or segments. (A) A nodular shadow in the left S3 segment, (B) a nodular shadow in the left S4 segment, (C) a nodular shadow in the left lower lobe and (D) a GGO in the right upper lobe.

Figure 2: Final pathological diagnosis of the pulmonary nodules in four different lobes or segments. (A) Well differentiated adenocarcinoma in left S3 segment (HE 400×), (B) poorly differentiated adenocarcinoma in left S4 segment (HE 400×), (C) cryptococcal granuloma in the left lower lobe (PAS 1000×) and (D) adenocarcinoma in situ in the right upper lobe (HE 400×).
DISCUSSION

Our experience shows that for nodular shadow or GGO, thoracoscopic biopsy is a strong course of action. Fluorodeoxyglucose-positron emission tomography and fine needle aspiration may give false negative results, and a second pathological opinion is very useful for accurate diagnosis and management.

In the case of synchronous multiple lung cancers, it is very important that these lesions are diagnosed and staged correctly. Possible diagnoses for our case include but are not limited to the following: (i) multiple contralateral metastases of lung cancer; (ii) synchronous right upper lobe adenocarcinoma in situ and left upper lobe cancer with ipsilateral metastases in different lobes; (iii) synchronous triple primary lung cancers (S3 left upper lobe, S4 left upper lobe and right upper lobe). Prognosis and treatment will greatly vary between these possibilities. It is also difficult to draw an accurate diagnosis without surgery.

Our algorithm was to rule out inoperable contralateral or translobar metastases in the first place, by performing wedge resections of the left lung in the first and second steps. If multiple metastases existed, the operation would be terminated. If there was no metastasis or only intralobar metastasis at worst, the patient could proceed to the third step of right upper lobe wedge resection. If the nodules of both upper lobes were of the same origin, the operation would be terminated. If they were of different nature and both lobes were malignant, bilateral upper lobectomy would be performed. However, if the right upper lobe nodule was benign or an atypical adenomatous hyperplasia or an adenocarcinoma in situ, which could be cured by wedge resection, the patient had to proceed to the final step of left upper lobectomy.

According to Martini’s criteria, this case would be diagnosed as primary adenocarcinoma and its pulmonary metastasis. However, Junji et al. reported a case of synchronous lung cancers that shared the same EGFR mutation [4]. Takuwa et al. [5] reported a similar case of double primary cancers with identical histological findings.

Atypical adenomatous hyperplasia has a significant correlation with adenocarcinoma in situ. GGO was diagnosed as atypical adenomatous hyperplasia by intraoperative frozen sectioning. Extended resection is not recommended in the treatment of atypical adenomatous hyperplasia, so we only performed a wedge resection of the right upper lobe. Although the final pathological result was adenocarcinoma in situ, wedge resection was sufficient too, for its lack of invasion and in consideration of its small size and lung function.

When facing such a case of heterogeneous bilateral multiple pulmonary nodules, one needs to be very meticulous in designing the surgical protocol in order to provide an optimal diagnosis and treatment for the patient.

Conflict of interest: none declared.

REFERENCES