

# Lung adenocarcinoma and pulmonary metastases coexist in a patient with papillary thyroid carcinoma

## A case report

Changhai Cheng, MD<sup>a</sup>, Jinxin Zhou, MD<sup>b</sup>, Xiaonan Shao, MD<sup>c,\*</sup>

### Abstract

**Rationale:** Multiple primary malignant tumors (MPMTs) are defined as 2 or more independent primary malignancies of different histologies/origins in the same individual. Although the incidence of MPMTs is being increasing, second primary cancer (SPC) is still rare and difficult to distinguish from metastasis. Here, we present a case of thyroid carcinoma with lung metastasis and primary lung cancer.

**Patients concerns:** The patient was a 66-year-old man diagnosed of papillary thyroid carcinoma (PTC) with lymph nodes, lung, and skeletons metastases. One of the pulmonary nodules had contrary manifestations, such as, noniodine avid, high uptake of <sup>18</sup>F-fluorodeoxyglucose (<sup>18</sup>F-FDG) and progress after iodine-131 radioiodine therapy.

**Interventions:** CT guided biopsy and I-125 seed brachytherapy of nodule in right upper lobe were performed.

**Diagnosis:** The patient was diagnosed of PTC with lymph nodes, lung, and skeletons metastases, accompanied by primary lung adenocarcinoma.

**Outcomes:** After 2 years of follow-up, nodules of inferior lobes almost disappeared and the nodule of right upper lobe shrank to only 0.7 cm.

**Lessons:** Physicians should be aware of SPC in clinical work, and improve the early diagnosis rate with a variety of examination methods and select the best treatment to improve the prognosis of patients.

**Abbreviations:** <sup>18</sup>F-FDG = <sup>18</sup>F-fluorodeoxyglucose, HES = hematoxylin, eosin, saffran, IH = immunohistochemistry, MPMTs = multiple primary malignant tumors, PET/CT = positron emission tomography/computed tomography, PTC = papillary thyroid carcinoma, SPC = second primary cancer, SUV = standardized uptake value.

**Keywords:** multiple primary malignant tumors, pulmonary cancer, second primary cancer, thyroid carcinoma

## 1. Introduction

In recent years, the diagnostic rate of multiple primary malignant tumors (MPMTs) has increased due to the improvement of tumor diagnosis level and the prolongation of survival time of patients with malignant tumors. The prevalence of MPMTs in foreign studies ranged from 11.0% to 21.0%;<sup>[1,2]</sup> however, the

prevalence of MPMTs was reported to be 0.99% in China.<sup>[3]</sup> So second primary cancer (SPC) is still rare and difficult to distinguish from metastasis in clinic. Here, we present a case of papillary thyroid carcinoma (PTC) with lung metastasis and primary lung cancer.

## 2. Case presentation

Previous written and informed consent were obtained from the patient, and this study was approved by the ethics review board of Soochow University. A 66-year-old man with history of semithyroidectomy 7 years ago for PTC presented a chest mass with pain for 1 month. The patient had significantly raised serum Tg of 500 ng/mL (reference range, 3.50–77.00 ng/mL) and abnormal tumor markers: CEA 85.02 (reference range, 0–5.00 ng/mL), CA19-9 97.41 U/mL (reference range, 0–37.00 U/mL), CA125 80.32 U/mL (reference range, 0–35.00 U/mL). The whole-body <sup>18</sup>F-fluorodeoxyglucose positron emission tomography/computed tomography (<sup>18</sup>F-FDG PET/CT) presented several lesions (Fig. 1A), a nodule of right upper lobe with intense FDG uptake (SUVmax 7.6; Fig. 1B), nodules of inferior lobes with slight FDG uptake (SUVmax 1.6; Fig. 1C), enlarged supraclavicular and mediastinum lymph nodes with intense FDG uptake (SUVmax 11.4; Fig. 1D/F) and left 3rd costa damage with intense FDG uptake (SUVmax 8.1; Fig. 1E).

Editor: N/A.

The authors have no conflicts of interest to disclose.

<sup>a</sup> Department of Radiation Oncology, the Third Affiliated Hospital of Soochow University, Changzhou, China, <sup>b</sup> Department of Nuclear Medicine, Ruijin Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China,

<sup>c</sup> Department of Nuclear Medicine, the Third Affiliated Hospital of Soochow University, Changzhou, China.

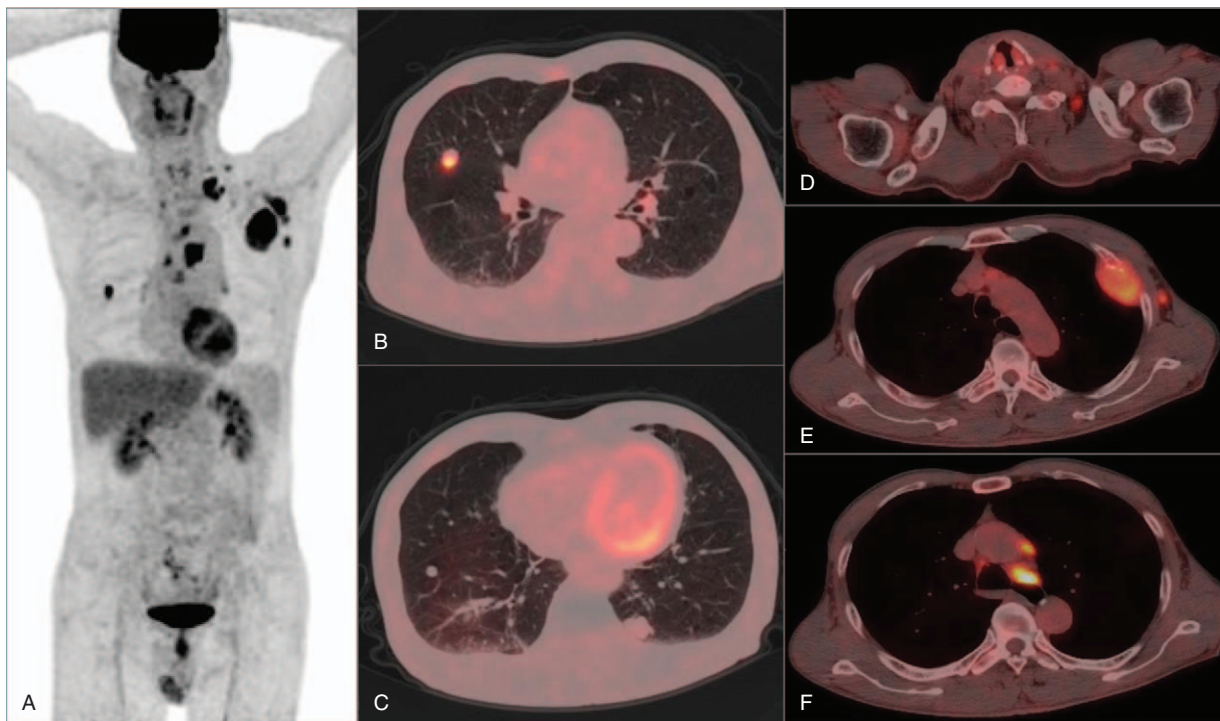
\* Correspondence: Xiaonan Shao, Department of Nuclear Medicine, The Third Affiliated Hospital of Soochow University, Changzhou 213003, China (e-mail: scorey@sina.com).

Copyright © 2017 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Medicine (2017) 96:49(e9078)

Received: 6 November 2017 / Accepted: 14 November 2017

http://dx.doi.org/10.1097/MD.0000000000009078

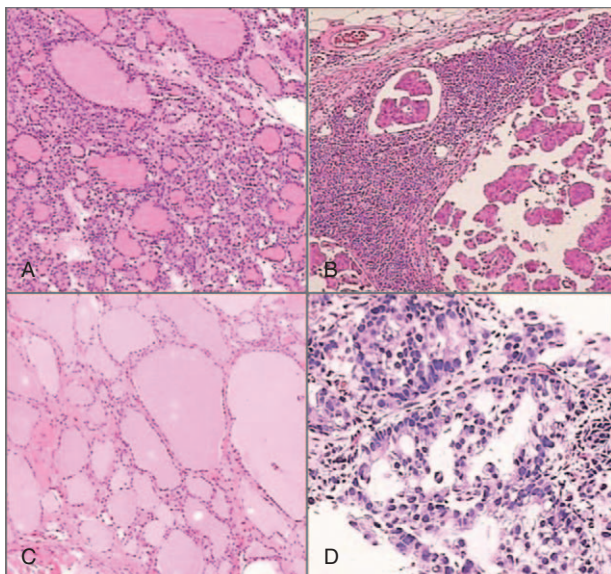


**Figure 1.** Imaging findings on  $^{18}\text{F}$ -PET/CT. (A) The whole-body  $^{18}\text{F}$ -FDG PET/CT presented several lesions; (B) a nodule of right upper lobe with intense FDG uptake; (C) nodules of inferior lobes with slight FDG uptake; (D, F) enlarged supraclavicular and mediastinum lymph nodes with intense FDG uptake; (E) left 3rd costa damage with intense FDG uptake.  $^{18}\text{F}$ -FDG =  $^{18}\text{F}$ -fluorodeoxyglucose, PET/CT = positron emission tomography/computed tomography.

The CT-guided biopsy for histopathological diagnosis of chest mass affirmed metastasis from thyroid (Fig. 2A). Thus, the patient received thyroidectomy and left cervical lymph node dissection. The thyroid operated confirmed to be multinodular goiter (Fig. 2C), while metastases have been found in cervical lymph

nodes (Fig. 2B). The nodule of right upper lobe received CT-guided biopsy and was confirmed to be pulmonary adenocarcinoma, mucous adenocarcinoma partly (Fig. 2D).

The patient received 2 times I-131 radioiodine therapy after surgery (150mCi, 200mCi; 6 months apart). Compared with first therapy, lesions of cervical lymph nodes, right humerus, and right ilium disappeared after the second therapy, while lesions of left 3rd costa and nodules of inferior lobes shrank (Before: Fig. 3A; After: Fig. 3B). The CT confirmed the shrink of the iodine avid nodules (Fig. 3C). Follow-up for 2 years, they almost disappeared in CT (Fig. 3D). The nodule of right upper lobe was non-iodine avid all the time. Follow-up by CT, diameter of this nodule increased 0.9 cm after 2 times I-131 radioiodine therapy (Fig. 3E). The nodule was histopathologically confirmed to be pulmonary adenocarcinoma. One year after I-125 seed brachytherapy and chemotherapy, the diameter shrank to only 0.7 cm (Fig. 3F).

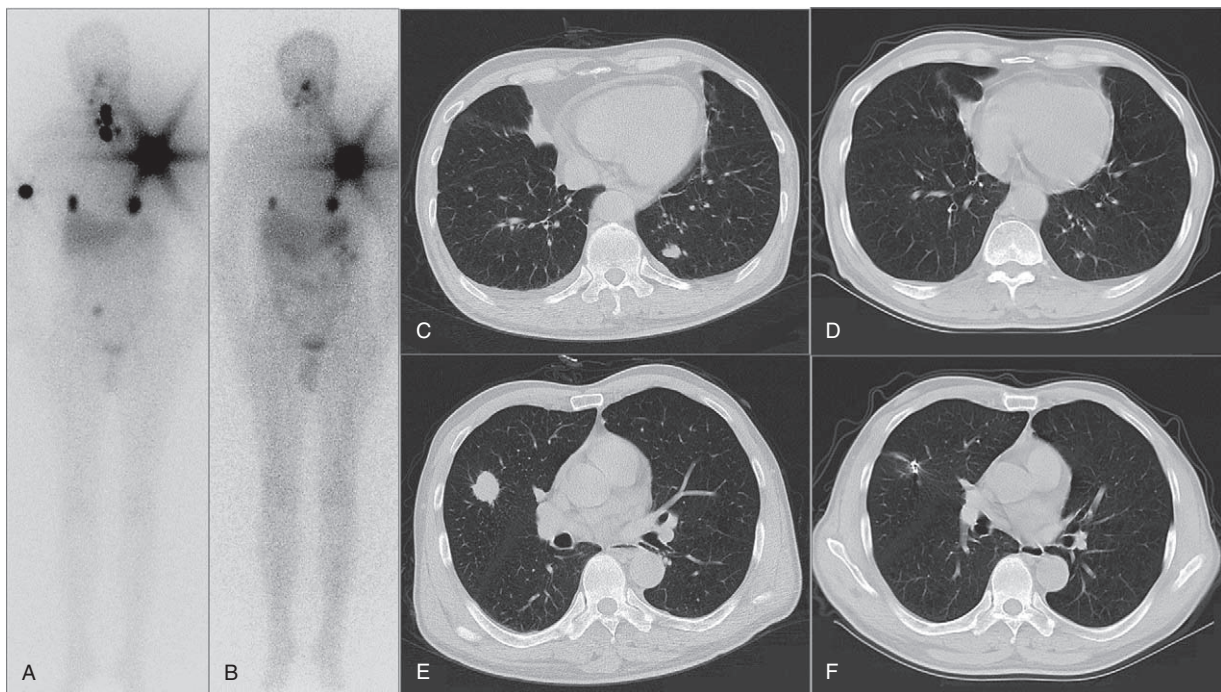


**Figure 2.** (A) Chest mass was affirmed metastasis from thyroid (HES  $\times 100$ ). (C) The thyroid operated confirmed to be multinodular goiter (HES  $\times 200$ ), while metastases have been found in cervical lymph nodes (B, HES  $\times 200$ ). (D) The nodule of right upper lobe was confirmed to be pulmonary adenocarcinoma, mucous adenocarcinoma partly (IH  $\times 200$ ). HES = hematoxylin, eosin, saffran, IH = immunohistochemistry.

### 3. Discussion

A multicenter study of 377 MPMTs from Turkey found that the most frequent initial cancer types were head and neck (54 patients, 14.3%); the most frequent second cancer types were lung (76 patients, 20.2%); the most common cancer pairs in males were head and neck-lung cancers (29 patients, 13%).<sup>[2]</sup> Liu et al<sup>[3]</sup> found that MPMTs were observed more frequently in patients with head and neck tumors (5.65%) and was over 4-fold greater than the prevalence of MPMTs in all patients (0.99%). The ratio of top 3 in SPC was digestive system tumors, lung cancer, and leukemia/lymphoma, respectively.<sup>[3]</sup> In addition to chemotherapy and radiotherapy, Liu believed that the higher survival time of patients with head-neck tumors may be a potential factor for suffering from MPMTs.<sup>[3]</sup> The patient was an elderly male patient who had undergone PTC for 7 years.





**Figure 3.** (A, B) The patient received 2 times I-131 radioiodine therapy after surgery. (C) The CT confirmed the shrink of the iodine avid nodules. (D) Follow-up for 2 years, they almost disappeared in CT. (E) Diameter of nodule in right upper lobe increased 0.9cm after 2 times I-131 radioiodine therapy. (F) One year after I-125 seed brachytherapy and chemotherapy, the diameter shrank to only 0.7 cm. CT=computed tomography.

Therefore, doctors should pay attention to the development of SPC for suspicious pulmonary nodules.

Primary lung adenocarcinoma with pulmonary metastases of PTC at the same time was rarely reported,<sup>[4,5]</sup> and lack of detailed diagnosis, treatment, follow-up information. As reported, about half pulmonary metastases of PTC are non-iodine avid with worse prognosis.<sup>[6]</sup> <sup>18</sup>F-FDG PET/CT is recommended in high-risk aggressive differentiated thyroid cancer patients with elevated serum Tg.<sup>[7,8]</sup> While FDG avid and non-iodine avid is not sufficient to distinguish lung primary cancer from metastasis, elevated tumor markers should not be ignored in this situation. CEA, CA125, and CA19-9 can elevate in medullary thyroid cancer,<sup>[9]</sup> but rarely observed in PTC. Once the diagnosis of SPC is clear, I-125 seed brachytherapy is a good method to improve the prognosis of patients with inoperable stage III/IV nonsmall cell lung cancer.<sup>[10]</sup>

In conclusion, clinicians should improve the understanding of SPC and improve the diagnostic accuracy by laboratory examination, imaging, and pathology. Moreover, reasonable treatment should be adopted to make the patients have better prognosis.

### Acknowledgment

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### References

- [1] Frodin JE, Ericsson J, Barlow L. Multiple primary malignant tumors in a national cancer registry—reliability of reporting. *Acta Oncol* 1997; 36:465–9.
- [2] Babacan NA, Aksoy S, Cetin B, et al. Multiple primary malignant neoplasms: multi-center results from Turkey. *J BUON* 2012;17:770–5.
- [3] Liu Z, Liu C, Guo W, et al. Clinical analysis of 152 cases of multiple primary malignant tumors in 15,398 patients with malignant tumors. *PLoS One* 2015;10:e0125754.
- [4] Xue L, Luan Z, Liu Y, et al. Pulmonary metastasis of a papillary thyroid carcinoma and primary lung adenocarcinoma: two coincident carcinomas at the same location. *Diagn Pathol* 2013;8:26.
- [5] Tamura M, Ohta Y, Tsunezuka Y, et al. Metastasis of thyroid cancer to primary lung cancer. *Jpn J Thorac Cardiovasc Surg* 2004;52:41–4.
- [6] Sohn SY, Kim HI, Kim YN, et al. Prognostic indicators of outcomes in patients with lung metastases from differentiated thyroid carcinoma during long-term follow-up. 2017.
- [7] Haugen BR. 2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer: what is new and what has changed? *Cancer* 2017;123:372–81.
- [8] Masson-Deshayes S, Schwartz C, Dalban C, et al. Prognostic value of (18) F-FDG PET/CT metabolic parameters in metastatic differentiated thyroid cancers. *Clin Nucl Med* 2015;40:469–75.
- [9] Milman S, Whitney KD, Fleischer N. Metastatic medullary thyroid cancer presenting with elevated levels of CA 19-9 and CA 125. *Thyroid* 2011;21:913–6.
- [10] Li W, Guan J, Yang L, et al. Iodine-125 brachytherapy improved overall survival of patients with inoperable stage III/IV non-small cell lung cancer versus the conventional radiotherapy. *Med Oncol* 2015;32:395.