Radioiodine Uptake by Squamous-Cell Carcinoma of the Lung

Takashi Misaki, Ryo Takeuchi, Shin'ichi Miyamoto, Kanji Kasagi, Yusaku Matsui and Junji Konishi

Department of Nuclear Medicine, School of Medicine and Chest Disease Research Institute, Kyoto University, Kyoto Japan

A patient with a history of total thyroidectomy for papillary carcinoma showed a solitary hot spot in the chest on post-therapy radioiodine imaging. Subsequent evaluation demonstrated that this lesion was a primary squamous-cell lung cancer. Our case illustrates a rare but important differential diagnosis from lung metastatsis of thyroid cancer in ^{131}I scintigraphy. Alternatively, this "aberrant uptake" might be a rather common phenomenon for lung neoplasms, although the underlying mechanism is not yet known. Future experimental studies might lead to a new application of radioiodine imaging in pulmonary oncology.

Key Words: squamous-cell carcinoma; radioiodine scintigraphy; thyroid cancer

J Nucl Med 1994; 35:474–475

Whole-body scanning with ^{131}I has been assumed to be quite specific for detecting metastases from differentiated thyroid cancer. False-positive radioiodine studies due to nonthyroidal tumors have been reported (*1,2*). We present a patient with two primary neoplasms: a primary lung neoplasm masquerading as an iodine-concentrating metastasis from a previously diagnosed papillary thyroid adenocarcinoma.

CASE REPORT

A 71-yr-old male with 3-yr history of a large left neck mass underwent total thyroidectomy and bilateral neck dissection for advanced papillary carcinoma. Prior to surgery, he had refused to undergo therapy despite the growing mass until the disease progressed and caused local compression and swallowing disturbance. The thyroid tumor involved both lobes of the gland and invaded the adjacent skin, muscle and the esophagus with multiple lymph node metastases, part of which had been detected externally as the large left neck mass. Postoperatively, serum thyroglobulin (Tg), a tumor marker for differentiated thyroid cancer (*3*), was abnormally high at 4690 ng/ml (normal range <40), indicating substantial residue of the disease. The patient was treated with 3.7 GBq of ^{131}I in an attempt to reduce the remaining, unresectable portion of tumor in the esophagus, followed by a second dose of 4.44 GBq 9 mo later. Thereafter, serum Tg values fell as low as 106 ng/ml, but remained above normal, despite oral thyroid replacement adequate to normalize serum thyrotropin levels. The esophageal invasion persisted on scintigraphy (Fig. 1) but clinical symptoms diminished with improvement of dysphagia. Fifteen months after the total thyroidectomy, the patient noticed dyspnea on effort and developed a productive cough. A hot spot in the left middle lower lung field had been observed previously (Fig. 1) and Tg was still elevated at 219 ng/ml. These symptoms suggested lung metastasis from the thyroid tumor. A chest x-ray showed obstruction of the left lower bronchus, and computed tomography confirmed a mass in the posterobasal portion of left lung (Fig. 2). Biopsy material obtained at bronchoscopy revealed squamous-cell carcinoma of the lung (Fig. 3).

Although no special stains were done for thyroglobulin due to paucity of the specimen, the primary nature of the lung tumor was histopathologically undisputable even with the routine hematoxylin-eosin stain. Moreover, with a history of heavy smoking (2.5 packs of cigarette per day for 40 yr), the patient was at high risk to develop squamous-cell lung cancer (*4,5*).

Due to his poor reserve in respiratory function, surgical removal of the lung tumor was not performed. The patient received radiotherapy with partial regression of the lesion and improvement of the respiratory symptoms. He has since received repeated courses of combined chemotherapy.

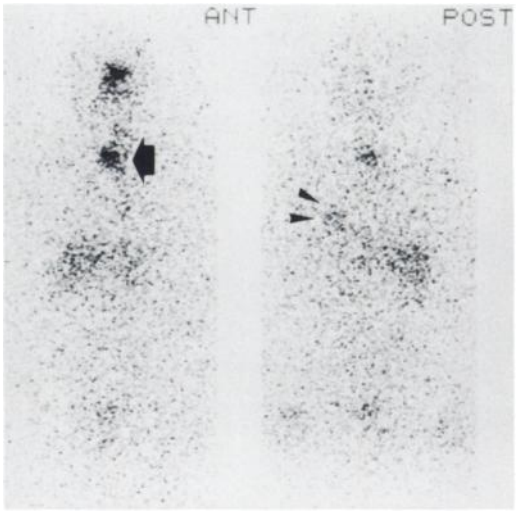

FIGURE 1. Whole-body scan 6 days after a second therapeutic dose (4.44 GBq) of ^{131}I showed fairly strong radioactivity at the esophageal invasion in the anterior view (bold arrow) and moderate spotty uptake at the left lower lung field in the posterior view (arrows).

Received Aug. 20, 1993; revision accepted Nov. 11, 1993.

For correspondence and reprint requests contact: T. Misaki, MD, Dept. of Nuclear Medicine, Kyoto University School of Medicine, Shogoin, Sakyo-ku, Kyoto 606 Japan.

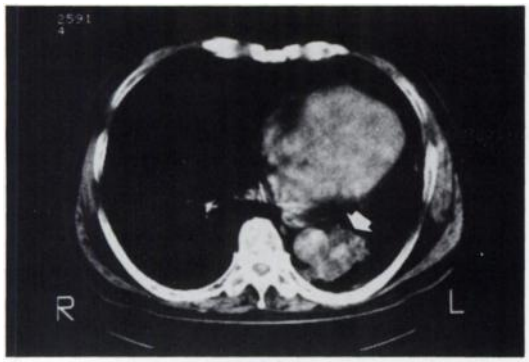

FIGURE 2. Precontrast computed tomogram depicted a tumor mass next to the aorta (white arrow).

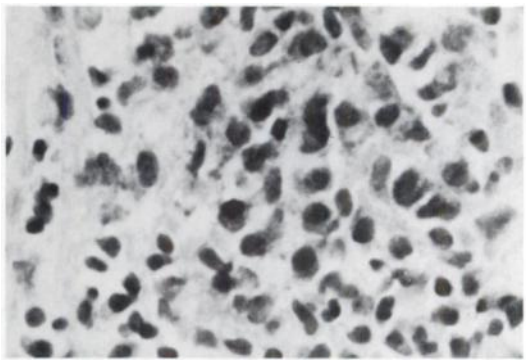

FIGURE 3. Biopsy of the lung tumor demonstrated a squamous-cell carcinoma. Microscopic appearance was rather homogeneous throughout the specimen, with no trace of follicle formation or secretory component. Hematoxylin and eosin stain (original magnification 250X).

DISCUSSION

To our knowledge, the literature has three cases so far of iodine- or technetium-concentrating lung adenocarcinoma (*1,2,6*). Two of these and another case with metastasizing gastric cancer (*7*) were positive for mucin or mucicarmin, which might imply glandular secretion as the mechanism of abberant uptake. However, our present case does not agree with this hypothesis. Further accumulation of data from similar cases, hopefully with autoradiography of resected tumors, may clarify the exact cellular and subcellular location of trapping, and elucidate the cause(s) of this phenomenon.

Alternatively, it may not be so uncommon for lung cancer to trap radioiodine, especially in dedifferentiated tumors. We may have just overlooked their ability in this regard since we do not usually perform iodine or technetium scans for nonthyroid tumors (except those of salivary glands). If in vitro studies and/or animal experiments support this assumption, then we could have a new application of radioiodine scintigraphy in the diagnosis of lung tumors.

REFERENCES

1. Fernandez-Ulloa M, Maxon HR, Mehta S, Sholiton LJ. Iodine-131 uptake by primary lung adenocarcinoma. *JAMA* 1976;236:857–858.
2. Acosta J, Chitkara R, Khan F, Azueta V, Silver L. Radioactive iodine uptake by a large cell undifferentiated bronchogenic carcinoma. *Clin Nucl Med* 1982;8:368–369.
3. Iida Y, Hidata A, Kasagi K, Konishi J. Follow-up study of postoperative patients with thyroid cancer by thallium-201 scintigraphy and serum thyroglobulin measurement. *J Nucl Med* 1991;32:2098–2100.
4. Lubin JH, Blot WJ. Assessment of lung cancer risk factors by histologic category. *J Natl Cancer Inst* 1984;73:383–389.
5. Tominaga S. Smoking and cancer. *Asian Med J* 1988;31:209–215.
6. Patton DD, Hertsgaard DB. Adenocarcinoma of the lung with marked uptake of ^{99m}Tc-pertechnetate: case report. *J Nucl Med* 1976;17:116–118.
7. Wu SY, Kollin J, Coodley E, et al. Iodine-131 total-body scan: localization of disseminated gastric adenocarcinoma. *J Nucl Med* 1984;25:1204–1209.