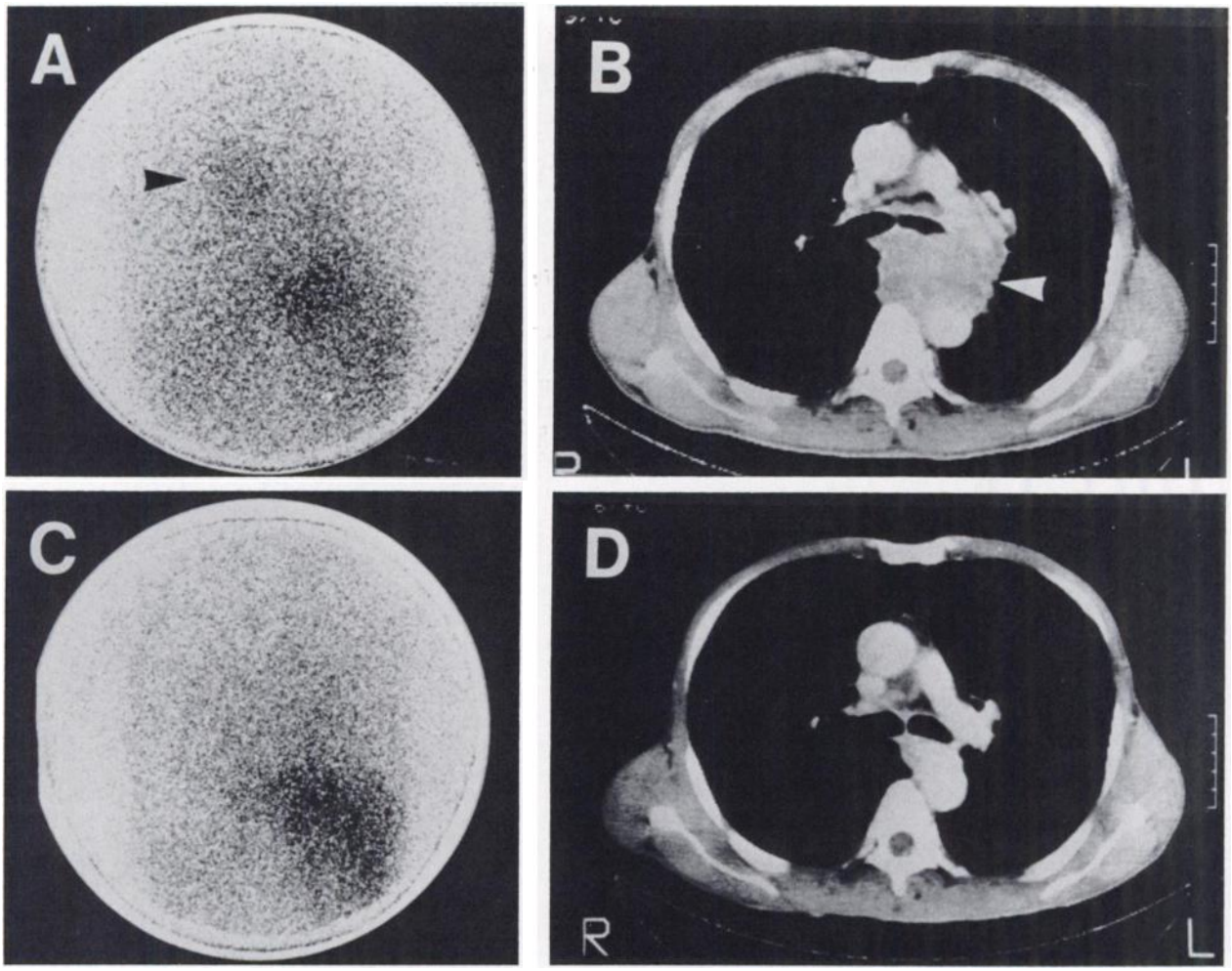

FIGURE 1
Pretreatment [^{131}I]MIBG posterior chest image (A) shows abnormal uptake (black arrowhead) in tumor which is delineated as irregular shaped mass involving left hilum and posterior mediastinum (white arrowhead) in CT image (B). After chemotherapy and radiation therapy, abnormal deposit disappeared (C). This finding is agreed with remarkable shrinkage of tumor in CT image (D)

Iodine-131 MIBG Uptake in a Small Cell Carcinoma of the Lung

TO THE EDITOR: Meta-iodobenzylguanidine (MIBG) is an analog of guanethidine, resembling norepinephrine (NE) in chemical structure (*1*). Iodine-131 (^{131}I) MIBG has been used to scintigraphically locate pheochromocytomas and neuroblastomas, and for treatment of these tumors. Besides these tumors, [^{131}I]MIBG uptake was also noted in a nonsecreting paraganglioma, carcinoid tumor, primary and metastatic medullary thyroid carcinoma. All these tumors are derived from the neural crest (*2*). The small cell carcinoma of the lung, which has in common with a variety of neuroendocrine tumors neurosecretory granules (*3*) and neuron-specific enolase (NSE) (*4*), has the potential to be delineated by [^{131}I]MIBG (*5*). We experienced a case of small cell carcinoma of the lung in which [^{131}I]MIBG uptake was observed in the tumor and disappeared after chemotherapy and radiation therapy.

A 56-yr-old man was diagnosed as having a small cell carcinoma of the left main bronchus by examinations of chest x-ray films and sputum cytology in April 1985. He was referred to our department for further examinations and therapy of his disease. On April 24–25, before his admission, [^{131}I] MIBG imaging was performed in this patient using a scintillation camera with dual detectors: After blocking of thyroidal uptake of ^{131}I and i.v. injection of 0.5 mCi of [^{131}I]MIBG, 24-hr anterior and posterior images were obtained from the skull to the pelvis. An abnormal deposit of [^{131}I]MIBG in the left hilar region (Fig. 1A) with clear portrayal of the salivary glands, liver, and urine bladder was noted in these overlapping images.

At admission on May 8, his symptoms included cough, hemosputum, dyspnea, and difficulty in swallowing. There were no symptoms suggesting hypercatecholaminemia. Blood pressure was 100/76 mmHg with a regular pulse rate of 90/min. The levels of plasma NE and epinephrine (E) concentrations and the urinary excretion rates of NE, E, normetane-

phrine, metanephrine, and VMA were all within normal limits. There were also no symptoms suggesting hyperadrenocorticism and hyperserotoninemia. However, abnormally high values were noted in serum ACTH, 289 pg/ml (normal <100); serotonin, 306 ng/ml (normal <50), suggesting that the tumor produced these hormones (*6*). The serum NSE level of this patient was also high, 16.2 ng/ml (normal <10). On May 13, chest and abdominal computed tomography (CT) scans were performed. The tumor was delineated as an irregular shaped mass which involved the left hilum and posterior mediastinum ranging from 2 cm above and to 6 cm below the carina. The maximum diameter of the tumor was 6.5 cm and 7.0 cm in RL and PA directions, respectively, in the consecutive CT images. The abnormal deposit of [^{131}I]MIBG corresponded to this tumor (Fig. 1B). The abdominal CT scans revealed no metastatic foci in the abdominal cavity including the liver.

On May 15, the patient suddenly developed focal and generalized seizures. The contrast enhanced CT study performed on the next day disclosed multiple focal nodular enhancing lesions less than 1 cm in diameter in the brain suggesting brain metastases from the small cell carcinoma of the lung. He was treated with chemotherapy with VP-16 (*7*) and radiation therapy with a total dose of 40 Gy to the primary lesion. On July 3, overlapping images were again obtained 24 hr after i.v. injection of 0.5m Ci of [^{131}I]MIBG. The abnormal deposit detected in the previous chest image disappeared at this moment (Fig. 1C). This finding corresponded to that of the marked shrinkage of the tumor in the CT image taken on June 28 (Fig. 1D). No abnormal deposits of [^{131}I]MIBG were seen in the overlapping images, although brain CT scans performed on June 28 revealed slight increase in size (maximum size 2 cm in diameter) and number of the metastatic lesions. Just before and during his admission, clinical workup for detection of metastatic foci was also made by a gallium-67 tumor scan, radionuclide bone and liver scans, and abdominal echography. These diagnostic methods demonstrated no other metastatic foci. The serum levels of ACTH and serotonin measured on July 16 decreased to 92 pg/ml and 102 ng/ml, respectively.

To the best of our knowledge, this is the first case of small cell carcinoma of the lung which was delineated by [^{131}I] MIBG imaging. Iodine-131 MIBG uptake in the tumor was relatively low despite the large volume of the tumor. Therefore, much smaller brain metastatic lesions might not be visualized in the planar images. In Fig. 1A, there appears to be a focal accumulation of the tracer in the medial part of the right hepatic lobe despite no evidence of metastatis to this region. The cause of this accumulation is not clear. However, we have noticed the phenomenon that [^{131}I]MIBG in the liver decreases more rapidly in its peripheral or marginal than central portion and the tracer appears to concentrate in the region around porta hepatis with time; we therefore speculate it may represent [^{131}I]MIBG accumulation in the adrenergic neurons or bile ducts around porta hepatis. The storage sites of [^{131}I]MIBG in the tumor are not clear. We speculate that [^{131}I]MIBG may accumulate in neurosecretory granules in the cytoplasm of the tumor because it is suggested that MIBG appears to be sequestered within chromaffin granules of the adrenal medulla (*8*) and NE storage vesicles of the adrenergic nerve terminals (*9*). Further experimental and clinical studies are needed to elucidate the mechanism(s) of its uptake and retension in apudomas (*2*), and to establish the clinical role of [^{131}I]MIBG imaging in the diagnosis and management of these tumors, although [^{131}I]MIBG imaging has proven to be a reliable method for detecting pheochromocytomas (*10*).

References

1. Wieland DM, Wu JL, Brown LE, et al: Radiolabeled adrenergic neuron blocking agents: Adrenomedullary imaging with [^{131}I] iodobenzylguanidine. *J Nucl Med* 21:349–353, 1980
2. Pearse AGE, Polak JM: Endocrine tumors of neural crest origin: Neurolophomas, apudomas and the APUD concept. *Med Biol* 52:3–18, 1974
3. Moody TW, Pert CB, Gazdar AF, et al: High levels of intracellular bombesin characterize human small-cell lung carcinoma. *Science* 214:1246–1248, 1981
4. Johnson PH, Masangos PJ, Forbes JT, et al: Potential utility of serum neuron-specific enolase levels in small cell carcinoma of the lung. *Cancer Res* 44:5409–5414, 1984
5. Beierwaltes WH: Horizons in radionuclide therapy: 1985 update. *J Nucl Med* 26:421–427, 1985
6. Hori T, Nishihara H, Tateishi R, et al: Oat-cell carcinoma of the lung simultaneously producing ACTH and serotonin. *J Clin Endocrinol Metab* 37:212–219, 1973
7. Evans WK, Feld R, Osoba D, et al: VP-16 alone and in combination with cisplatin in previously treated patients with small cell lung cancer. *Cancer* 53:1461–1466, 1984
8. Wieland DM, Brown LE, Tobes MC, et al: Imaging the primate adrenal medulla with [^{123}I] and [^{131}I] metaiodobenzylguanidine: Concise communication. *J Nucl Med* 22:358–364, 1981
9. Wieland DM, Brown LE, Rogers WL, et al: Myocardial imaging with a radioiodinated norepinephrine storage analog. *J Nucl Med* 22:22–31, 1981
10. Shapiro B, Copp JE, Sisson JC, et al: Iodine-131 metaiodobenzylguanidine for the location of suspected pheochromocytoma: Experience in 400 cases. *J Nucl Med* 26:576–585, 1985

Masayuki Nakajo
Masato Taguchi
Kunisada Shimabukuro
Shinji Shinohara
Faculty of Medicine
Kagoshima University
Japan

Evolving Scintigraphic Pattern of Skeletal Metastasis from Prostatic Carcinoma

TO THE EDITOR: The most commonly encountered scintigraphic pattern in skeletal metastatic disease is multiple focal areas of increased radioactivity (*1*), while an area of photopenia or photon deficiency comprises about 3% (*2*). During progression of the disease process the scintigraphic pattern may undergo a change from one form to another (*3*). We have observed a patient with prostatic carcinoma in whom one of his skeletal metastatic foci, shown on bone scintigrams, evolved from an increased through decreased to normal tracer uptake in the lesion, and we present the case to re-emphasize that a review of previous bone scans and radiographs, including computed tomography (CT), should be a routine part of any bone scan interpretation.