TECHNICAL NOTE

^{99m}Tc -Diphosphonate Uptake in Small Cell Carcinoma of the Lung[†]

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Technetium- ^{99m} phosphate tracers, introduced in 1971 as bone-scanning agents, have been found useful in the detection of bone lesions¹⁾. The accumulation of bone-seeking radiopharmaceuticals in extrasosseous lesions has been reported in patients with myocardial or cerebral infarction, or some soft-tissue tumor²⁾⁻²⁴⁾. Primary pulmonary lung cancer which had concentrated ^{99m}Tc -labeled phosphate did not refer to the histological type of cancer.

We observed Tc-^{99m} diphosphonate uptake in small cell carcinoma of the lung.

1. Materials and methods

The patient received an intravenous dose of 15 mCi of Tc-^{99m} diphosphonate prepared from a Tc-^{99m} cold kit (Dainabot RI Laboratory). The scintigraphy of the entire axial skeleton was taken with a scinticamera (Nuclear Chicago Pho Gamma III) 3 hr after injection.

2. Case report

A 53-year-old man developed left-sided chest pain and bloody sputum in May, 1977. In June he was admitted to a local hospital following chest roentgenography detection of a left upper mediastinal mass. Immediately after the admission, hoarseness supervened on his complaints.

Cytologic examination of bronchial brushing specimens revealed small cell carcinoma. Biopsy of the left scalene lymph node was negative. He was negative. He was treated with anti-tumor agents, but responded poorly.

He was then transferred to our hospital on September 14. Upon examination he was found to be affected with the left-sided Horner's syndrome and swelling of the right supraclavicular lymph node. Biopsy of this node was positive for small cell carcinoma. Chest roentgenograph showed an extension of the tumor (Fig. 1).

Fig. 1 Chest film showing a large lobulated mass in the mediastinum. Elevation of the left diaphragm and deviation of the trachea to the right side are noted.

[†] ^{99m}Tc -Diphosphonate の集積が見られた肺の小細胞型未分化がん. 田辺正忠, 水川帰一郎, 杉田勝彦, 玉井豊理, 若林寿生, 森野靖雄: 岡山大学医学部放射線医学教室 700 岡山市鹿田町2-5-1

Fig. 2 Technetium-99m-diphosphonate bone scan performed 3 hr after injection shows marked nuclide uptake by the mediastinal mass.

The tumor occupied the upper mediastinum and extended to the left hilum. The left hilar mass was clearly defined by a tomogram, in which no calcification was visible. Serum alkaline phosphatase and calcium were normal. On September 26, a bone scan was performed with intravenous administration with 15 mCi of ^{99m}Tc -diphosphonate. The radionuclide image showed a localized region of activity corresponding to the left hilar mass on the chest roentgenograph with no evidence of focal bony disease (Fig. 2). The patient died on December 20, 1977, with liver and subcutaneous metastasis. No bony metastasis was revealed at any time in the clinical course. Autopsy was not performed.

3. Discussion

The evaluation of the image of primary pulmonary lung cancer is often difficult during a bone scan, because the lung is covered with osseous structures. The bone scan of this patient showed an obvious concentration of ^{99m}Tc -diphosphonate in the left pulmonary hilar mass of small cell carcinoma. The concentration in the upper mediastinal mass was not evident, because it could not be differentiated from the normal accumulation of the sternal manubrium and bilateral sternoclavicular joints. The concentration of ^{99m}Tc -diphosphonate in primary small cell carcinoma of the lung has not been studied previously. Matsui, et al.¹⁰⁾ reported three cases of primary pulmonary lung cancer which had concentrated ^{99m}Tc -labeled phosphates,

but did not refer to the histological type of any case.

The extrasosseous tumor uptake of bone scanning agents has been reported in various malignant tumors, such as carcinoma, malignant lymphoma, and melanoma⁸⁾⁻²⁴⁾. In some cases, the occurrence of calcification in the tumor lesion seemed to be related to this phenomenon⁸⁾⁻¹⁰⁾. Most of the reported tumor lesions, however, contained no significant calcification. The mechanism of uptake of bone scanning agents is unknown.

On the other hand, ^{99m}Tc -labeled phosphates concentrated in ischemic or necrotic tissues affected with myocardial, cerebral, or splenic infarction or liver necrosis^{2), 4)-7), 23)}. D'Agostino²⁵⁾ suggested the concentration of the phosphate radiopharmaceutical in myocardial infarction associated with the formation of hydroxyapatite within the mitochondria of damaged cells. The mass of anaplastic small cell carcinoma may contain ischemic and necrotic tissues because the rate of its growth is usually rapid. Thus the mechanism of localization of ^{99m}Tc -diphosphonate in small cell carcinoma can be explained by the affinity of this substance for ischemic and necrotic tissues. In the present case, however, it was impossible to confirm it, because no further investigation has been performed.

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