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PRELIMINARY NOTE

The Demonstration of Extracranial Neoplasms with ^{99m}Tc Pertechnetate

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Sodee *et al* have reported selective localization of ^{197}Hg chlormerodrin in extracranial neoplasms in a variety of organs.[1] While utilizing ^{99m}Tc pertechnetate in routine brain scanning, we noted that it concentrated in metastatic lesions of the calvarium. These observations led us to attempt to scan known extracranial neoplasms with ^{99m}Tc.

MATERIALS AND METHODS

Eleven patients with known neoplasms were given intravenous injections of up to 5 μc of ^{99m}Tc prepared by normal saline elution of the ^{99}Mo generator and subsequent autoclaving. Scans were begun immediately over the area of interest. With the relatively high count rates obtained, scanning speeds of 120-150 cm/min were utilized.

The scanner employed was a Picker Magnascanner with a 3 × 2 inch crystal modified for speeds up to 200 cm/min. The collimator was a low energy, (less than 150 keV), design with 31 holes. The spectrometer was set at 130-160 keV and the spacing index was 0.4 cm.

RESULTS

Individual primary neoplasms demonstrated by scanning included adenocarcinoma of the lung, a carcinoma of the pancreas, a villous adenoma of the rec-

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tum, a poorly differentiated carcinoma of the main stem bronchus, a fibrosarcoma of the proximal tibia (Fig. 1), and a malignant lymphoma of the chest (Fig. 2). Metastatic lesions of adenocarcinoma and of a poorly differentiated carcinoma, neither having clearly identified primary sites, have also given positive scans. The metastases were in bone. Scans not showing obvious ^{99m}Tc concentration were obtained in individual cases of: plasma cell leukemia with lytic lesions in bone; chordoma; and radiation-treated Ewing's sarcoma.

DISCUSSION

Since ^{99m}Tc pertechnetate localizes in certain neoplasms in various parts of the body, it may afford a rapid atraumatic method of visualizing the presence, and the extent of these tumors with relatively low radiation dose to the patient. It should be pointed out, that we have encountered difficulty in demonstrating lesions in the abdomen and pelvis because of the concentration of pertechnetate

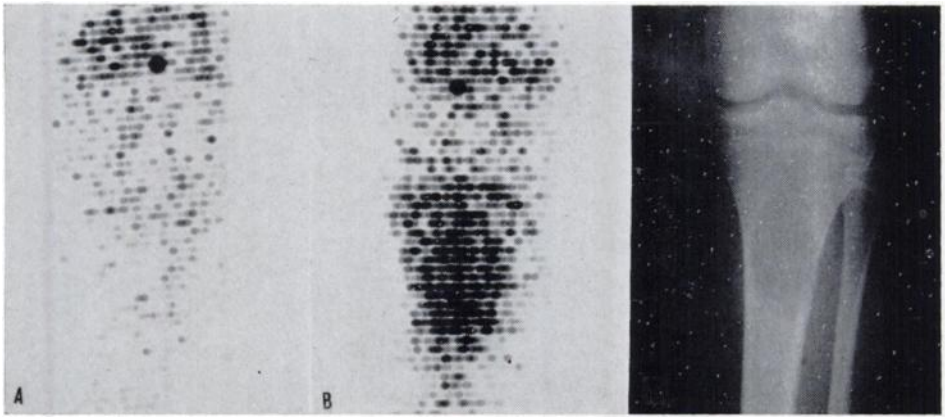

Fig. 1. Illustrated is the case of a primary fibrosarcoma of the proximal tibia of a 15-year-old female. A) ^{99m}Tc scan of the normal right tibia; B) ^{99m}Tc scan demonstrating concentration of activity in the proximal left tibia at the site of the tumor; and C) radiograph of the left tibia showing the position of the lesion.

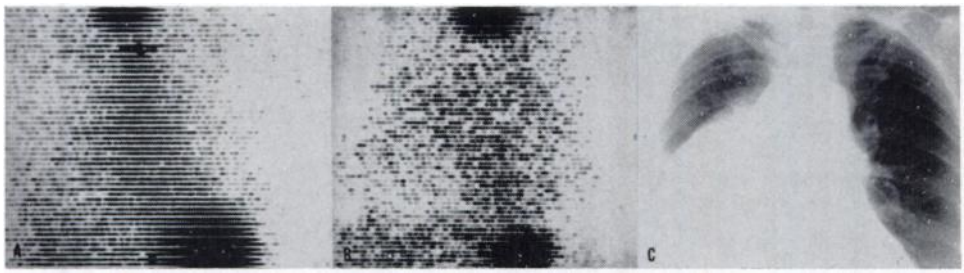

Fig. 2. Illustrated is the case of a malignant lymphoma of the chest in a 57-year-old female. A) ^{99m}Tc scan of a normal adult chest, demonstrating the radioactivity within the cardiac blood pool, the pulmonary hili, the thyroid superiorly, and within the stomach, which is intensely active, and the liver inferiorly; B) ^{99m}Tc scan of the patient, demonstrating a large area of abnormal radioactivity in the right lower lung field; and C) radiograph of the chest, showing the location of the malignancy.

in stomach, large bowel, etc. Lesions of the mediastinum may also be difficult to visualize because of large, adjacent, radioactive blood pools.

At the present stage of development it is important to interpret the pertechnetate distribution with reference to scans of the symmetrical body part and/or with knowledge of the normal distribution of ^{99m}Tc radioactivity. A positive scan of a neoplasm does not always indicate malignancy.

The biochemical and ultrastructural events attending the localization of ^{99m}Tc pertechnetate within tumor tissues are unelucidated. However, early evidence from well counts of selected tissues suggests that hypervascularity accounts for part of the radioactivity associated with the visualized neoplasms.

SUMMARY AND CONCLUSIONS

Extracranial neoplasms have been visualized by scintiscanning as a result of their selective localization of ^{99m}Tc pertechnetate. The initial experience in 11 known neoplasms is presented. Compared with reported results with ^{197}Hg chlormerodrin, ^{99m}Tc pertechnetate has the advantages of immediate and rapid scanning; it has the limitation of activity in normal blood pools, as well as in certain abdominal organs.

REFERENCE

1. Sodee, D., Renner, R. R. and DiStefano, B.: Photoscanning Localization of Tumor, Utilizing Chlormerodrin Mercury^{197}. *Radiology* 84:873-875, May, 1965.