TUMOR UPTAKE OF ^{99m}Tc-POLYPHOSPHATE: ITS SIMILARITY WITH ^{87m}Sr-CITRATE AND DISSIMILARITY WITH ^{67}Ga-CITRATE

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Some differences in the uptake of three radiopharmaceuticals by a metastatic lesion from primary adenocarcinoma of the rectum are presented. A large tumor on the abdominal wall metastasized from rectal cancer picked up ^{99m}Tc-polyphosphate and ^{87m}Sr-citrate but not ^{67}Ga-citrate. This tumor uptake of Tc-polyphosphate and strontium was not attributable to increased tumor vascularity as evidenced from negative ^{113m}In-transferrin scan.

The purpose of this paper is to present some differences in the tumor uptake of three radiopharmaceuticals commonly used in nuclear medicine practice; ^{99m}Tc-polyphosphate, ^{87m}Sr-citrate, and ^{67}Ga-citrate. The tumor model is an extraosseous noncalcified soft-tissue tumor metastasized from a primary cancer of the rectum.

CASE REPORT

A 75-year-old man who had a mucinous adenocarcinoma of the rectum excised locally several years previously presented with a huge lump in the left groin. A biopsy proved the mass to be a metastasis involving the skin and muscle of the abdominal wall. A ^{87m}Sr whole-body scan (Fig. 1) revealed no metastatic lesions in the bone. However, there was excessive accumulation of the isotope in the left inguinal area corresponding to the tumor site. Later, a ^{99m}Tc-polyphosphate scan (Fig. 2A) was obtained and this was also negative for bony metastasis but revealed increased uptake of Tc-polyphosphate in the tumor. An ^{113m}In-transferrin scan failed to show significant vascularity of the tumor (Fig. 2B). A ^{67}Ga-citrate scan (Fig. 2C) revealed no demonstrable uptake of this isotope in the tumor. Neither the x-ray nor the histology revealed calcification in the tumor. A Von Kossa stain failed to demonstrate microscopic calcification in the tumor.

DISCUSSION

Gallium-67 is a tumor-localizing agent. In addition to its uptake in various other tumors and inflamma-

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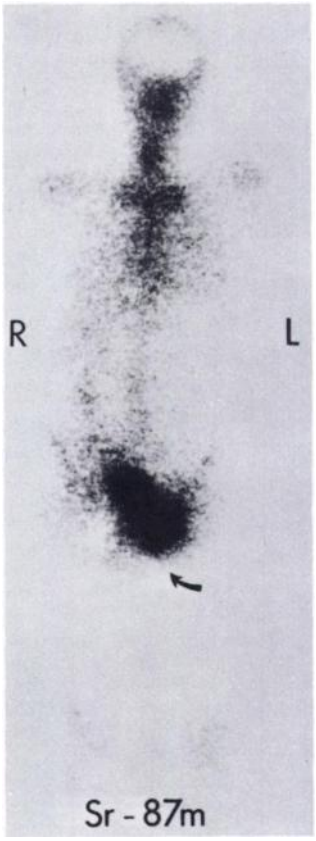

FIG. 1. ^{87m}Sr whole-body scan (anterior view) is negative for bony lesions. Note increased strontium uptake (arrow) in region of tumor. Activity in urinary bladder is easily separated from tumor activity.

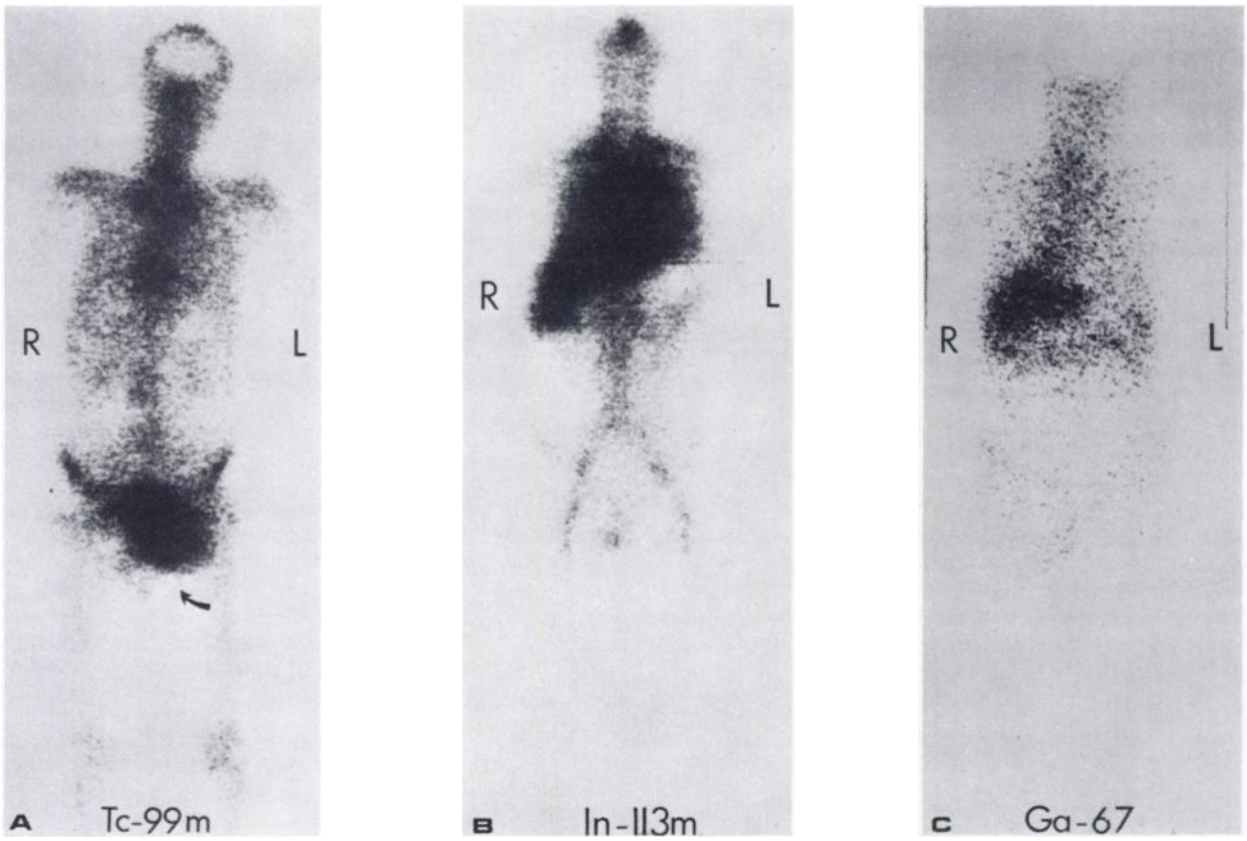

FIG. 2. (A) ^{99m}Tc-polyphosphate whole-body scan (anterior view) is also negative for bony metastasis but shows increased uptake (arrow) in tumor. The bladder activity is more dense and in superomedial aspect of tumor activity. (B) ^{113m}In-transferrin whole-body scan (anterior view) shows blood-pool activity in heart, liver, and great vessels. Note absence of activity in tumor area. (C) ^{67}Ga-citrate scan showing normal accumulation in liver but no uptake in tumor area.

tory conditions, gallium has been reported to be localized mainly in lymphoma (*1*). Uptake of ^{67}Ga in colonic and rectal tumor has been recently reported by Nash, et al (*2*). Chaudhuri, et al (*3*) reported uptake of ^{87m}Sr by a liver metastasis from colon cancer. The reports of tumor uptake of ^{99m}Tc-polyphosphate are not abundant.

This study is thus an interesting one demonstrating that some tumors are avid for ^{87m}Sr and ^{99m}Tc-polyphosphate but not for ^{67}Ga. The major questions that still remain unclear are: what causes this difference, and what is the exact mechanism of tumor uptake of these agents? This report seems to point out that the mechanism of tumor uptake of gallium may not be the same as that of bone-seeking radionuclides, namely, strontium and polyphosphate. The possible role of phosphatase enzyme systems in tumors in the binding of polyphosphate should be considered.

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