jnm / CASE REPORT

POSITIVE ^{99m}Tc-POLYPHOSPHATE SCAN IN CASE OF METASTATIC OSTEOGENIC SARCOMA AND HYPERTROPHIC PULMONARY OSTEOARTHROPATHY

Anne C. Brower and Charles D. Teates

University of Virginia Medical Center, Charlottesville, Virginia

A positive ^{99m}Tc-stannous polyphosphate scan is reported in a patient with a known osteogenic sarcoma, demonstrating metastatic lesions and hypertrophic pulmonary osteoarthropathy.

Technetium-99m-stannous polyphosphate within the past year has become the agent of choice in bone scanning (*1*). In the authors' experience, like radiostrontium, it has been seen to accumulate in bone tumors, infection, metabolic aberrations, Paget's disease, fractures, arthritides, and ectopic calcification. Although not yet seen, it may also accumulate in aseptic necrosis. In January 1972 a case of positive ^{87m}Sr bone scan in hypertrophic pulmonary osteoarthropathy was reported (*2*). We are presenting a case of a positive ^{99m}Tc-polyphosphate scan in a patient with metastatic osteogenic sarcoma and hypertrophic pulmonary osteoarthropathy, demonstrating the increased accumulation of ^{99m}Tc-polyphosphate in the long bones around the joints as well as in metastatic lesions in the lung.

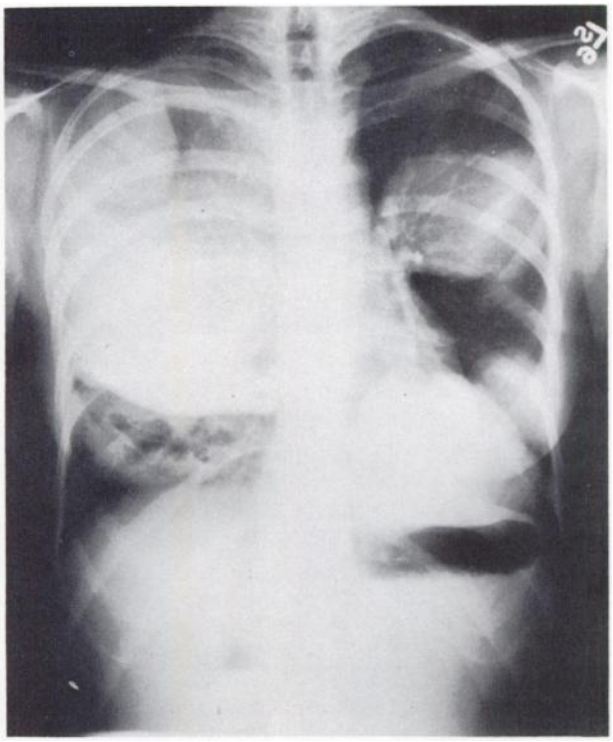

FIG. 1. PA chest radiography of patient in September 1972. Metastatic masses occupy most of right hemithorax and half of left hemithorax. No calcification is seen.

CASE REPORT

A 21-year-old white woman underwent an A-K amputation of the right leg in June 1969 for an osteogenic sarcoma of the right femur. In October 1971 she was found to have metastatic disease to the lung; despite chemotherapy, her metastases progressed, involving the entire chest (Fig. 1). In September 1972 she developed arthralgias of her hands, foot, wrists, elbows, and shoulders. Physical examination revealed clubbing of her nails, pain on movement in her joints, and decreased breath sounds, especially on the right. Radiographs of the left knee and ankle showed extensive periosteal elevation consistent with hypertrophic pulmonary osteoarthropathy (Fig. 2). Radiographs of the upper extremities were not obtained. An arterial pO_2 was not obtained. A ^{99m}Tc-polyphosphate scan showed increased uptake in the right upper chest area most likely caused by metastatic osteoid-like tumor. Increased uptake

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For reprints contact: Anne C. Brower, Dept. of Radiology, University of Virginia Medical Center, Charlottesville, Va. 22901.

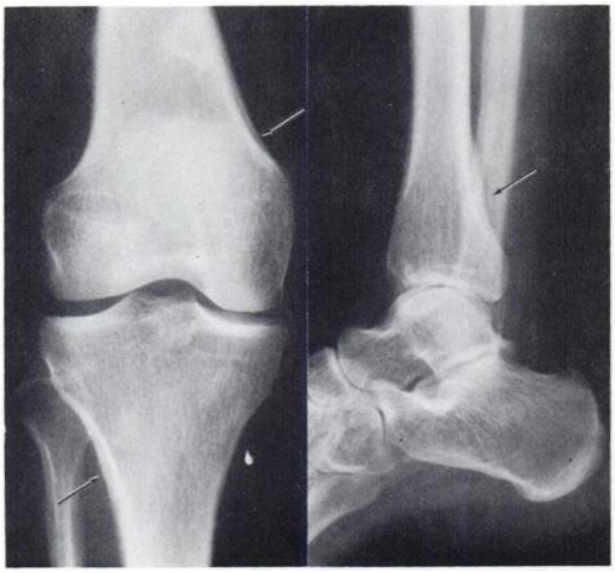

FIG. 2. Radiographs of left knee and ankle showing periosteal elevation.

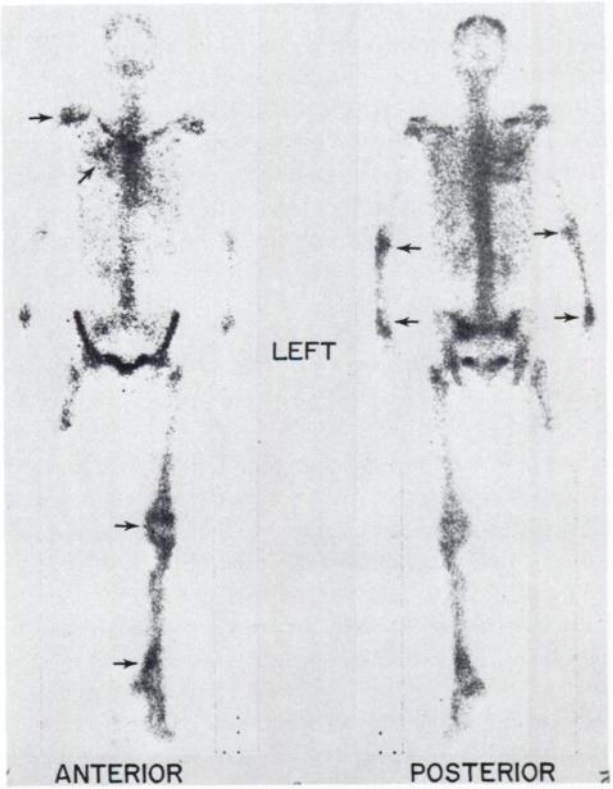

FIG. 3. Whole-body scan (anterior and posterior view) performed 3 hr after injection of 8 mCi of ^{99m}Tc-polyphosphate showing increased uptake in region of density seen on x-ray and around joints of wrists, elbows, shoulders, hip, left knee, and left ankle.

was also demonstrated around the joints of wrists, elbows, shoulders, hips, left knee, and left ankle (Fig. 3). This was felt to represent the pulmonary osteoarthropathy.

DISCUSSION

From the scan alone, one would be unable to determine the cause of the diffusely increased uptake of the ^{99m}Tc-polyphosphate around the joints. Certainly, metastatic disease would have to be considered. However, with the clinical and radiographic picture, one must attribute the increased uptake to the pulmonary osteoarthropathy.

Increased uptake of strontium has been seen in conditions associated with periosteal new bone formation—i.e., pachydermoperiostosis, periostitis deformans, periostitis secondary to vascular disease (*3*). Strontium accumulates in bone as an analog for a physiologic substance normally concentrated in bone. There is increased accumulation where there is increased blood flow or increased metabolic activity (*4*).

Increased ^{99m}Tc-polyphosphate uptake has not hitherto been described in hypertrophic pulmonary osteoarthropathy. The mechanisms of accumulation have not been explained. Technetium is bound to a physiologic carrier which acts as an analog, like strontium (*4*). It would appear that whatever causes increased uptake of strontium would also cause increased uptake of ^{99m}Tc-polyphosphate.

Another interesting feature of this case is the increased uptake of ^{99m}Tc-polyphosphate in the metastatic lung lesions. It is known that there is increased strontium uptake in osteogenic sarcoma metastasizing to the lung; these lesions usually contain osteoid. However, there have been several case reports of strontium localizing in extraskeletal malignant neoplasms not containing osteoid (*5–7*). The mechanism of this accumulation is unknown. Some authors have attributed it to increased blood pool activity. However, Chaudhuri has recently raised the possibility that strontium may have an affinity for certain tumor cells as does gallium (*8*).

Radiographically, the metastatic lesions in this patient were not ossified. The question is then raised as to whether the ^{99m}Tc-polyphosphate has localized in a tumor containing microscopic osteoid or not. If not, the possibility of tumor specificity of ^{99m}Tc-polyphosphate similar to that of strontium must be considered.

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