Accumulation of ^{99m}Tc-Diphosphonate at Sites of Intramuscular Iron Therapy: Case Report

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Nonosseous accumulation of ^{99m}Tc-distannous diphosphonate (Osteoscan) was noted at the sites of intramuscular iron dextran (Imferon) injection. The possible mechanisms and relationships to other instances of nonosseous localization are discussed.

The localization of ^{99m}Tc-labeled phosphate bone scanning compounds within sites of extraosseous and noncalcified tissue pathology has been reported. This has included concentration within infarcts *(1-4)* and neoplasms *(5-7)*. The present report adds to this list by describing a patient with accumulation of ^{99m}Tc-diphosphonate (^{99m}Tc-Sn-EHDP) within sites of intramuscular iron therapy.

Case Report

A 64-year-old white man was admitted to Salem Hospital for evaluation of nonresolving prostatitis. Gentamycin antibiotic therapy was begun. Laboratory results showed a marked leukocytosis, thrombocytopenia, and severe anemia. Skin tests for TB and mumps showed anergic responses. Diagnostic consideration was that the patient had an occult neoplasm, perhaps of hematopoietic origin. The patient's anemia became more severe and required transfusions, as well as iron replacement by Imferon (Lakeside Laboratory) for six days with 2 ml administered to each buttock daily. Radiographic studies were noncontributory and radionuclide liver, pancreas, bone, and gallium studies were performed. The ^{99m}Tc-Sn-EHDP bone scan was performed three days after the last iron dose and revealed a normal distribution of isotope but with symmetric extraosseous accumulation in the buttocks (Fig. 1). Total body ^{67}Ga-citrate survey, including buttock regions, for four days following the bone scan failed to reveal any significant sequestration of activity. Routine radiographs of the pelvis failed to reveal any sites of calcification. The patient was eventually discharged following workup and resolution of his prostatitis but with no evidence of a neoplasm.

Chromatographic characteristics of $^{99m}TcO_4^-$, ^{99m}Tc-Sn-EHDP, and possible interference by Imferon, dextran (Pharmacia), and $Fe(OH)_3$ were tested using Gelman Seprachrom system, ITLC type SG chromatographic medium (Fisher Scientific), and previously described solvent separation techniques *(8, 9)*. Impaired mobility of ^{99m}Tc-Sn-EHDP was noted in the presence of Imferon and all its individual components while $^{99m}TcO_4^-$ demonstrated similar interaction with Imferon and $Fe(OH)_3$ (Table 1).

Discussion

The localization of phosphate bone-seeking radionuclide within a variety of nonosseous tissues has been reported. Neoplastic localization has been noted in breast *(5)* and lung *(6)* tumors, malignant melanoma, and Hodgkin's disease *(7)*. Nonneoplastic sequestration of bone-seeking agents has been seen in cerebral *(2, 4)* and myocardial infarcts *(1, 3)* as well as inflammatory disorders of the skeletal muscle *(10)*. All of these processes most likely shared an inflammatory component which included cellular response, local hyperemia, as well as disruption of tissues with the liberation of ionic and proteinaceous materials. Speculation as to basis of radionuclide location has included increased blood flow *(11)*, binding to liberated enzymes *(12)*, as well as binding to ionic substances, particularly calcium and phosphate *(13)*.

In this case localized hyperemia in response to the administered iron injections most likely occurred. This may have also included a cellular response. However, the latter is less likely, as a followup ^{67}Ga-citrate study failed to show any propensity for radiopharmaceutical localization. Another possibility included the complexing or binding of ^{99m}Tc-labeled bone agent to liberated proteins or ions. More significantly, in vitro chromatographic mobilities of ^{99m}Tc-Sn-O_4^- and ^{99m}Tc-EHDP were altered by the presence of Imferon and its components

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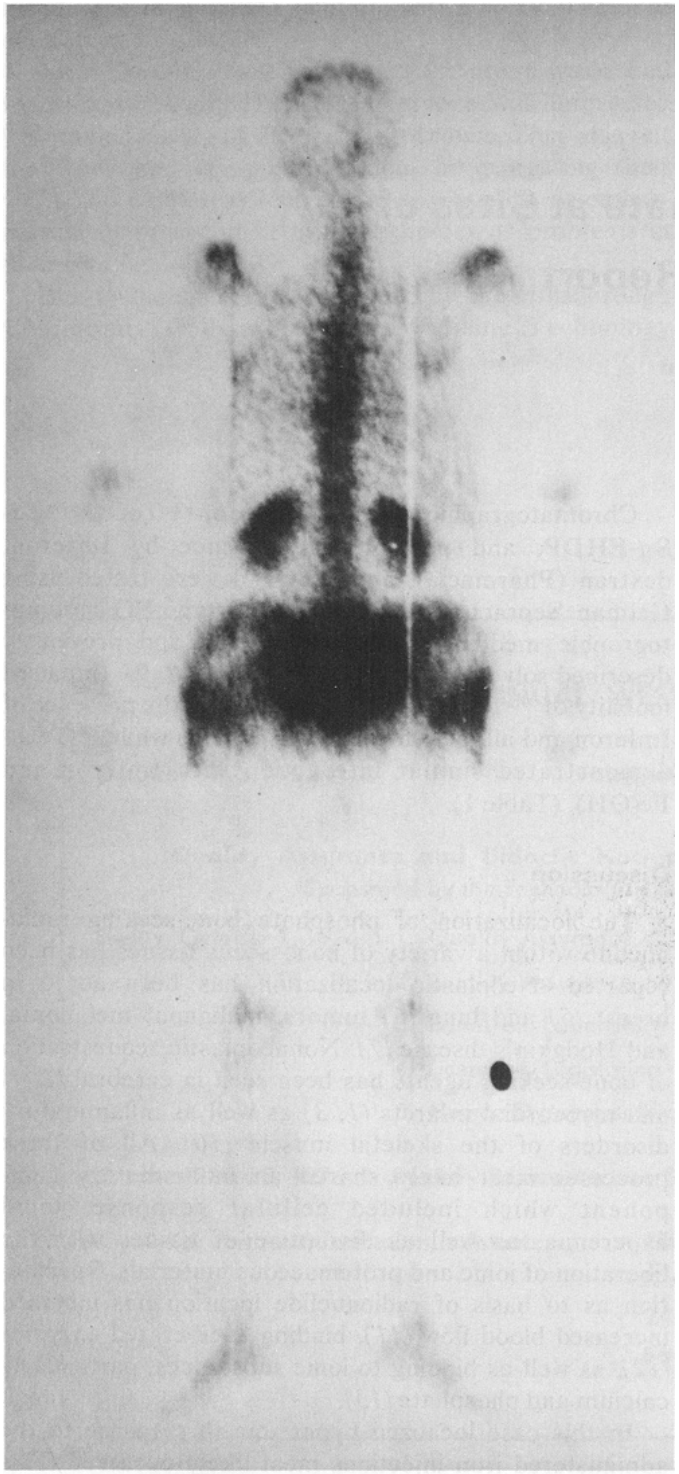

FIG. 1. Posterior whole-body bone scan shows marked localization of ^{99m}Tc-Sn-EHDP in buttock regions.

(Table 1). Therefore, local complexing or binding of ^{99m}Tc-Sn-EHDP to Imferon or its components may well have contributed to the observed localization within the buttocks region. Although iron dextran is known to be absorbed from the site of injection primarily through the lymphatic system, the actual clearance from the site is very slow. Approximately 11–15% is absorbed within 2

TABLE 1. Instant Thin Layer Chromatography Data of ^{99m}Tc-Sn-EHDP, Imferon, and its Components

Compound	R_f
^{99m}Tc O_4^-	100
^{99m}Tc Sn-EHDP	75
^{99m}Tc O_4^- and Imferon	24
^{99m}Tc Sn-EHDP and Imferon	10
^{99m}Tc O_4^- and Dextran	100
^{99m}Tc Sn-EHDP and Dextran	20
^{99m}Tc O_4^- and $Fe(OH)_3$	24
^{99m}Tc Sn-EHDP and $Fe(OH)_3$	35

h, while 60–68% remains to be absorbed over several days. The remainder may be gradually absorbed over a period of several months or longer. Another observer *(14)* has briefly described accumulation of ^{99m}Tc-diphosphonate in areas of Imferon injection and attributed the finding to the combination of reduced technetium with $Fe(OH)_3$ as it is released from the iron dextran complex. However, our results showed that reduced ^{99m}Tc-Sn-EHDP not only combined with $Fe(OH)_3$, but also with dextran. Technetium-99m-pertechnetate failed to interact with dextran. Therefore, the dextran interaction with ^{99m}Tc-Sn-EHDP suggested a diphosphonate-dextran complex as another mechanism of localization.

This case emphasized that local factors other than neoplasm or inflammation may contribute to nonosseous accumulation of isotope. The possibility of iatrogenic factors due to diagnostic or therapeutic maneuvers should be considered as a potential cause of nonosseous localization of bone-seeking agents.

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The Annual Fall Meeting of the Central Chapter Technologist Section, SNM, will be held Saturday, Oct. 9, 1976, at the Wisconsin Center, University of Wisconsin, Madison.

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