Uptake of Tc-99m MDP in Muscle Anticipating Clinical Evidence of a Carcinomatous Myopathy

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There are numerous reports of soft-tissue uptake of Tc-99m phosphate analogs in soft tissue, and these have been reviewed in detail by Brill (*1*). In particular, muscle uptake of such agents is well known to result from unaccustomed exercise (*2*), idiopathic and alcohol-induced rhabdomyolysis (*3,4*), inflammatory muscle disease (*5–7*), and muscle enzyme disorders (*8,9*), as well as ischemia and necrosis (*10–14*).

We report a patient with carcinoma of the pyriform sinus, in whom bone scintigraphy was carried out to exclude metastatic disease. No skeletal lesions were found, but there was marked uptake of Tc-99m MDP in muscle. The patient was asymptomatic but later did develop profound muscle weakness and elevated serum muscle enzymes.

CASE REPORT

A 57-yr-old man presented in September 1983 with a mass in the right side of the neck, shown on biopsy to be a well-differentiated squamous-cell carcinoma of the right pyriform fossa. Bronchoscopy and esophagoscopy were both normal. He received local radiation treatment, but in the next two months he lost 30 lb and had pain and difficulty in swallowing. Investigations on November 22, 1983, included bone imaging, which revealed marked uptake of tracer in soft tissues (Figs. 1 and 2), and was interpreted as reflecting dermatomyositis. Mild elevations of the serum aspartate transferase and lactic dehydrogenase were recorded at that time, but the patient had no relevant symptoms.

On December 8, the patient was readmitted to hospital with further muscle weakness and loss of weight. The weakness was marked and involved proximal muscle, so that he was unable to sit up or rise from a chair unaided. There was no rash, little muscle pain, and no tenderness. The fingers were clubbed. A diagnosis of carcinomatous polymyopathy was made from the clinical findings and serum muscle-enzyme concentrations (Table 1). Treatment with glucocorticoids produced little response, but the patient's illness was complicated by severe pulmonary candidiasis.

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DISCUSSION

There have been previous reports of the uptake of Tc-99m phosphate analogs in muscle involved in inflammatory disease (*5,6*). Sarmiento et al. (*7*) noted the localization of Tc-99m pyrophosphate in calcinosis associated with dermatomyositis, but that is unlikely to have been the mechanism involved here, as the bone imaging abnormalities anticipated the clinical disorder by 16 days. Spies et al. (*5*) and Brown et al. (*6*) have noted the close correlation between the degree and extent of the clinical disease and the radionuclide abnormalities, and both of these reports noted a reduction in uptake of the tracer with treatment.

We report this patient because of the marked imaging abnormalities and because they anticipated the clinical disorder. Thus the technique may also have application in early diagnosis. In addition, carcinomatous myopathy, a diagnosis that can be made only by association, must be added to the list of disorders potentially causing localization of Tc-99m phosphate analogs.

Among the remote and nonmetastatic effects of focal cancers are a number of syndromes involving the neuromuscular system. In addition to a disease imitating dermatomyositis-polymyositis, these include Type II muscle-fiber atrophy, myasthenia gravis (as well as the facilitating myasthenic syndrome), and a peripheral neuropathy with sensory or mixed manifestations. It is also possible that in some patients amyotrophic lateral sclerosis is a manifestation of a cancer. While these associations have long been recognized clinically, in none is the pathogenesis understood, and the disorders cannot be differentiated from the idiopathic diseases except in that they occur in patients with overt or occult cancer (*15*). Carcinomatous myopathy may or may not respond to treatment with glucocorticoids, and sometimes, but not invariably, diminishes with treatment of the underlying cancer. Equally spontaneous remission may occur.

In a brief report such as this there is no place for an exhaustive discussion, necessarily speculative, about the mechanisms involved. To occur at that early stage in the disease, the abnormal uptake of Tc-99m MDP probably reflects localization in compromised muscle cells as well as an increase in the extravascular, extracellular space due to inflammation. The localization of Tc-99m phosphate analogs in infarcted myocardium is also well known (*10*) and the possible mechanisms involved have been reviewed by Brill (*1*).

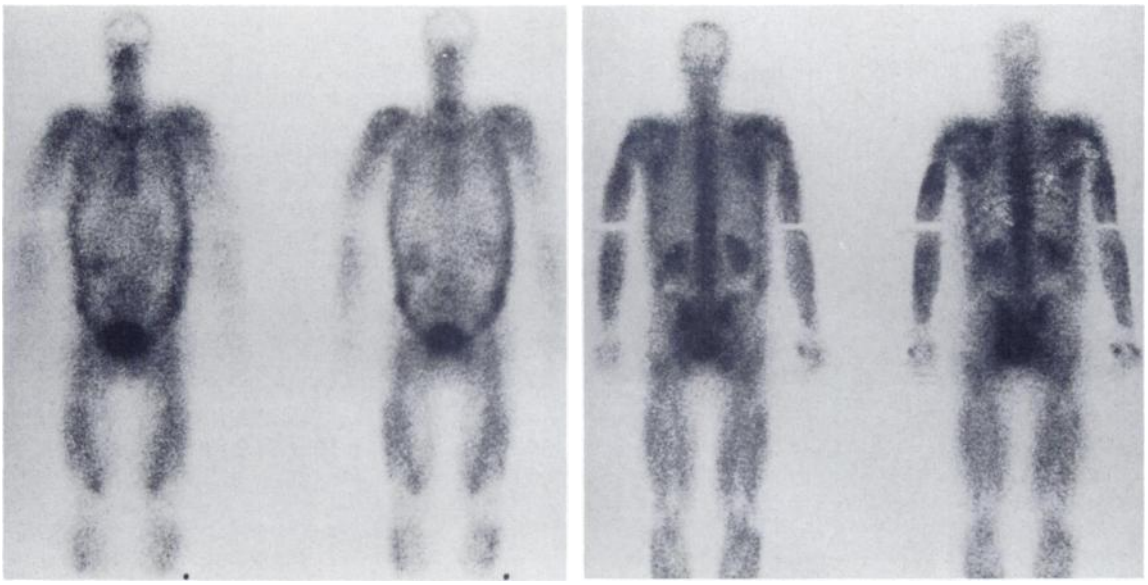

FIG. 1. Coronal tomographic sections of Tc-99m MDP image showing intense soft-tissue uptake of tracer in trunk, arms, thighs, and upper calves.

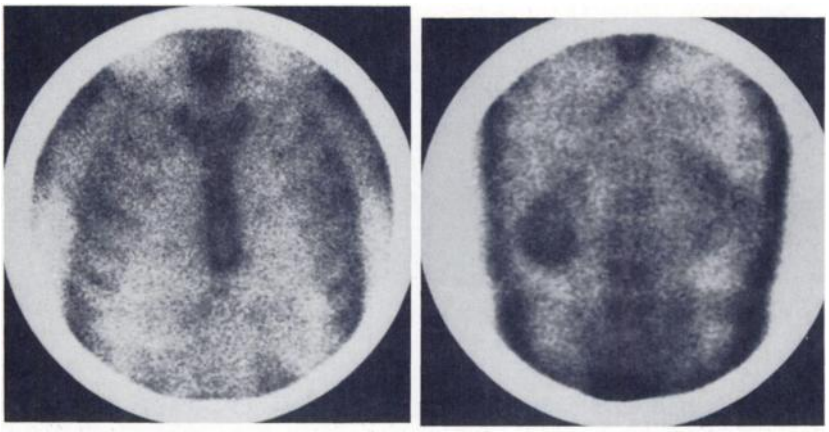

FIG. 2. Gamma camera images from same examination, revealing soft-tissue uptake of tracer over trunk.

TABLE 1. SERUM ENZYMES DURING THE COURSE OF PATIENT'S ILLNESS

	Aspartate transferase (IU/l)	Lactic dehydrogenase (IU/l)	Creatine phosphokinase (IU/l)	Aldolase (IU/l)
Sept. 20	39	171		
Nov. 16*	195	283		
Nov. 23	462	542		
Dec. 9†	1735	1426	6905	268
Jan. 3	164	625	2310	166
Normal values	<50	<200	<90	<12

* Date of Tc-99m MDP bone scintigram.
† Prednisone therapy started.

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Skeletal Photopenic Lesions in In-111 WBC Imaging

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Four cases of skeletal photon-deficient areas in In-111 white blood cell (In-111 WBC) images are reported. These were found in patients with lymphoma, vertebral osteomyelitis, and following radiotherapy and extensive surgical procedures. We emphasize that these photopenic lesions, although uncommon, may represent tumor involvement or benign processes, including osteomyelitis. Possible mechanisms to explain this phenomenon are discussed.

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Indium-111 leukocyte scintigraphy is currently used to diagnose or exclude abscesses and to locate sites of focal infection (*1,2*) in patients with a suspected abscess and without localizing signs. Normally the skeleton is well outlined and visualized in an In-111 WBC scintigram. We have encountered four instances of photopenic skeletal lesions. We present our experience and discuss possible mechanisms for these phenomena.

METHODS

Four cases were selected from a group of over 300 In-111 WBC studies obtained for detection of infection. Images are obtained approximately 24 hr after the administration of 500 μCi of In-111-labeled WBCs using a modification of a previously described method (*3*). Gamma camera images are obtained for 200,000 counts or 10 min, whichever comes first, with a medium-energy collimator and 20% windows covering the 173- and 247-keV energy peaks. Bone scintigrams for 500,000 counts were obtained 3 hr after the administration of 20 to 25 mCi of Tc-99m MDP using a gamma camera fitted with an all-purpose straight bore collimator and a 20% window around the 140 keV peak.

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CASE REPORTS

Case 1. A 56-yr-old female was diagnosed as having carcinoma of the cervix, Stage III B, in April, 1981. She received 5000 rad of external radiation to the whole pelvis in May 1981, followed by intracavitary radium therapy in June, 1981. In April, 1983, she presented with numbness and weakness in the left leg. A trans-