

Idiopathic Hepatic and Splenic Uptake of ^{99m}Tc-Methylene Diphosphonate

Abstract

Tc-99m-methylene diphosphonate (MDP) bone scintigraphy is mainly directed toward identifying sites of altered skeletal metabolism and abnormal foci of calcium phosphate deposition due to various etiologies. One of the requirements of an ideal bone scintigraphy is little or no extraosseous uptake. Nonosseous uptake of MDP in the bone scintigraphy is an unusual finding. We report a case of carcinoma prostate referred for bone scan, where diffuse hepatic and splenic uptake has been seen on the bone scan. However, on a further repeat bone scan, there was no nonosseous uptake.

Keywords: Bone scan, idiopathic hepatic uptake, idiopathic splenic uptake, methylene diphosphonate, single-photon emission computerized tomography/computed tomography

A 67-year-old man, with type II diabetes mellitus for 25 years and hypertension for 15 years (on regular medication), biopsy-proven case of carcinoma prostate, was referred for bone scintigraphy to rule out the possibility of bone metastasis. He presented with complaints of low backache and swelling associated with pain in the left ankle for 2 months. The previous bone scintigraphy revealed increased osteoblastic activity at bilateral acetabulum and left ischium – metastatic. Ultrasonography of the abdomen and pelvis revealed Grade II prostatomegaly. Magnetic resonance imaging pelvis revealed features suggestive of carcinoma prostate with bony metastasis. The patient is on hormonal therapy for the past 1 year with no history of chemotherapy or radiotherapy. Biochemical investigations such as serum electrolyte, calcium, phosphate, creatinine, lactate dehydrogenase, and alkaline phosphate levels were in the normal limit during both the initial and repeat bone scans. The bone scan revealed diffuse and intense tracer uptake in the liver and, to a lesser degree, in the spleen. Relatively decreased skeletal uptake on the bone scan was also observed with foci of increased radiopharmaceutical uptake in the left pubic bone and the left side of the mandible [Figure 1].

Single-photon emission computerized tomography/computed tomography (SPECT/CT) of the pelvic region revealed increased

radiopharmaceutical uptake in the superior rami of the left pubic bone with subtle sclerotic changes on low-dose CT. The bone scan of other patients done on the same day did not reveal such abnormal nonosseous tracer uptake.

A repeat bone scintigraphy with SPECT/CT of the pelvic region was performed 1 month later. There was considerably more skeletal uptake, and hepatic and splenic radiopharmaceutical localization was absent. Tc-^{99m}-methylene diphosphonate (MDP) bone scintigraphy is routinely performed nuclear medicine procedure in the workup of a patient with carcinoma.^[1] Increased radiopharmaceutical uptake is seen in lesions having increased osteoblastic activity. Due to urinary excretion of Tc-99m-MDP radiopharmaceutical, kidneys and urinary bladder are generally visualized [Figure 2].

Hepatic and splenic uptake of ^{99m}Tc-MDP is an unusual finding in nuclear medicine practice, occurring less frequently than focal hepatic abnormalities. Table 1 lists several reported causes of diffuse hepatic uptake.^[2]

The most common reason in the current clinical scenario is scintigraphic studies involving the use of Tc-99m-tagged colloid radiopharmaceuticals on the previous day to the bone scintigraphic study or misadministration of the radiopharmaceutical like ⁶⁷Ga-citrate or ¹¹¹In-labeled white blood cells. However, the patient did not have any scintigraphic study with radiocolloid on the previous

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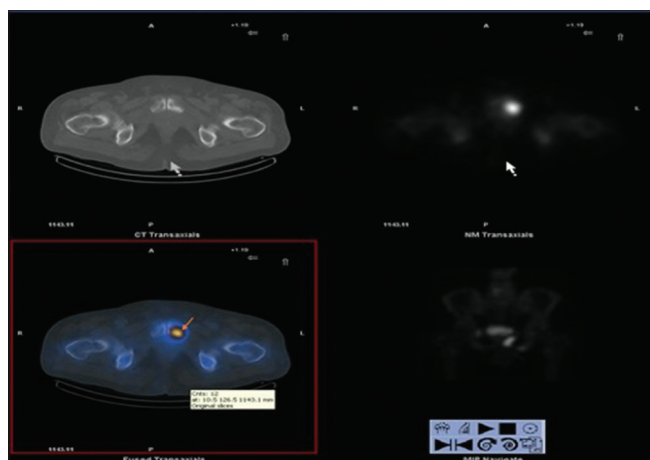


Figure 1: Single-photon emission computerized tomography/computed tomography image of the pelvic region revealing osteoblastic lesion in the superior rami of the pubic bone with subtle sclerotic changes

Table 1: Causes of abnormal diffuse hepatic activity with Tc-99m-methylene diphosphonate radiopharmaceuticals^[2]

Residual radioactivity from previous colloid scan
Misadministration of radiocolloid
Excessive aluminum ion from generator
Excessive serum aluminum
Excessive hydrolyzed-reduced ^{99m} Tc-MDP forming radiocolloids
Injection of radioiodinated contrast medium following bone agent injection
Metastatic calcification
Hepatic necrosis
Metastatic calcification
Conditions of iron therapy and iron overload

MDP: Methylene diphosphonate

day, and also, misadministration/delayed administration was also excluded. Metastatic calcification in soft tissue is mainly due to hypercalcemia. This can be due to increased secretion of parathormone, Vitamin D-related disorders, renal failure, and/or aluminum toxicity. These causes are ruled out due to normal biochemical profile. Faulty radiopharmaceutical preparations such as the formation of a Tc-99m colloid complex may be the cause of reticuloendothelial tissue uptake.^[3] ^{99m}Tc colloid may be formed in the presence of excessive aluminum ion or when excessive hydrolyzed-reduced ^{99m}Tc colloid from any cause is present. This radiochemical contaminant will localize in the extraosseous sites such as liver, spleen, or bone marrow if it is present in sufficient quantity in the ^{99m}Tc-MDP. Other causes could be iron overload,^[4] iodinated-based or gadolinium contrast study just before bone scintigraphy,^[5] and severe hepatic necrosis.^[6,7]

Pathologic changes occur due to change in the normal physiological event. Extraosseous localization of the bone-seeking radiopharmaceuticals in tissues other than kidney and urinary bladder should raise a suspicion of

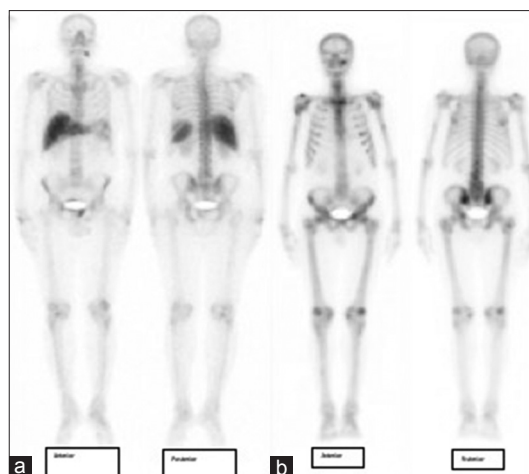


Figure 2: (a) Whole-body planar images (day-1) revealing diffuse hepatic and splenic uptake, (b) Whole-body planar images (day-2) revealing no nonosseous uptake of the tracer

the underlying cause, and pathophysiological basis of pathology should always be kept in mind while interpreting the scan as it may have a tremendous impact on the further management and follow-up of the patient. Recognition of specific mechanisms and appearance of soft-tissue abnormalities on skeletal scintigraphy reduces the possibility of confusion and enhances the diagnostic value of the study.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

References

- Francis MD, Graham R, Russell G, Fleisch H. Diphosphonates inhibit formation of calcium phosphate crystals *in vitro* and pathological calcification *in vivo*. *Science* 1969;165:1264-6.
- Verma S, Kumar N, Kheruka SC, Gambhir S. Extraosseous ^{99m}Tc-methylene diphosphonate uptake on bone scan: Unusual scenario. *Indian J Nucl Med* 2016;31:280-2.
- MacDonald J. Idiopathic hepatic uptake of ^{99m}Tc methylene diphosphonate: A case report. *J Nucl Med Technol* 2001;29:6.
- Hung JC, Ponto JA, Hammes RJ. Radiopharmaceutical-related pitfalls and artifacts. *Semin Nucl Med* 1996;26:208-55.
- Pérez-Lago del MS, De Virgala MC, Siurana R, Ferrando MJ, Danús M, Izquierdo V, *et al.* Altered biodistribution of bone

- seeking agents in the presence of iron-overload. *Clin Nucl Med* 2004;29:214.
6. Zhang W, Chen B, Deng H, Yang T, Ou X. Hepatic and splenic uptake on bone scintigraphy in patients with intravenous administration of ^{99m}Tc methylene diphosphonate prior to gadolinium-containing contrast. *Clin Nucl Med* 2013;38:219-20.
 7. Shih WJ, Coupal J. Diffuse and intense Tc-99m HMDP localization in the liver due to hypoxia secondary to respiratory failure. *Clin Nucl Med* 1994;19:116-20.