

CASE REPORT

Liver uptake of ^{99m}Tc -MDP in metastatic breast carcinoma

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Abstract

The radionuclide bone scan is a sensitive modality for the detection of skeletal metastases. On occasion, there is incidental detection of soft-tissue lesions, both benign and malignant. We report a case of breast carcinoma with liver metastases where the bone scan showed increased uptake of ^{99m}Tc -MDP in the liver. Abdominal ultrasound performed soon after the bone scan revealed metastases in both lobes of liver from breast carcinoma. The intense non-homogenous liver uptake on bone scan using ^{99m}Tc -MDP during evaluation of skeletal metastases indicated the presence of liver metastases.

Key words: Bone scan, liver MDP uptake, breast carcinoma

Introduction

Bone scintigraphy with technetium-99m-labelled methylene diphosphonate (^{99m}Tc -MDP) is routinely used for the detection of skeletal metastases in

patients with various malignancies, including breast carcinoma. Francis and associates proposed that diphosphonates bind to hydroxyapatite crystals of bone [1]. There is a plethora of reports in the literature of soft-tissue uptake of ^{99m}Tc -MDP in primary soft-tissue tumours [2]. Many cases of ^{99m}Tc -MDP uptake in metastatic liver deposits have also been reported [3-7].

We present a case of enhanced and non-homogenous liver uptake of ^{99m}Tc -MDP on bone scintigraphy in a patient of breast carcinoma, which was later confirmed to represent uptake in metastatic liver deposits from breast cancer.

Case Report

A 56-year-old female patient had a modified radical mastectomy for a carcinogenic lump in right breast in 2006 followed by 6-cycles of FAC (fluorouracil, adriamycin, cyclophosphamide) chemotherapy and external beam radiotherapy, EBRT, to the right chest wall. Later, a follow-up ^{99m}Tc -MDP bone scan in November 2008 showed increased tracer uptake and collapse of the 12th dorsal vertebra suggesting infiltration, which was treated with EBRT.

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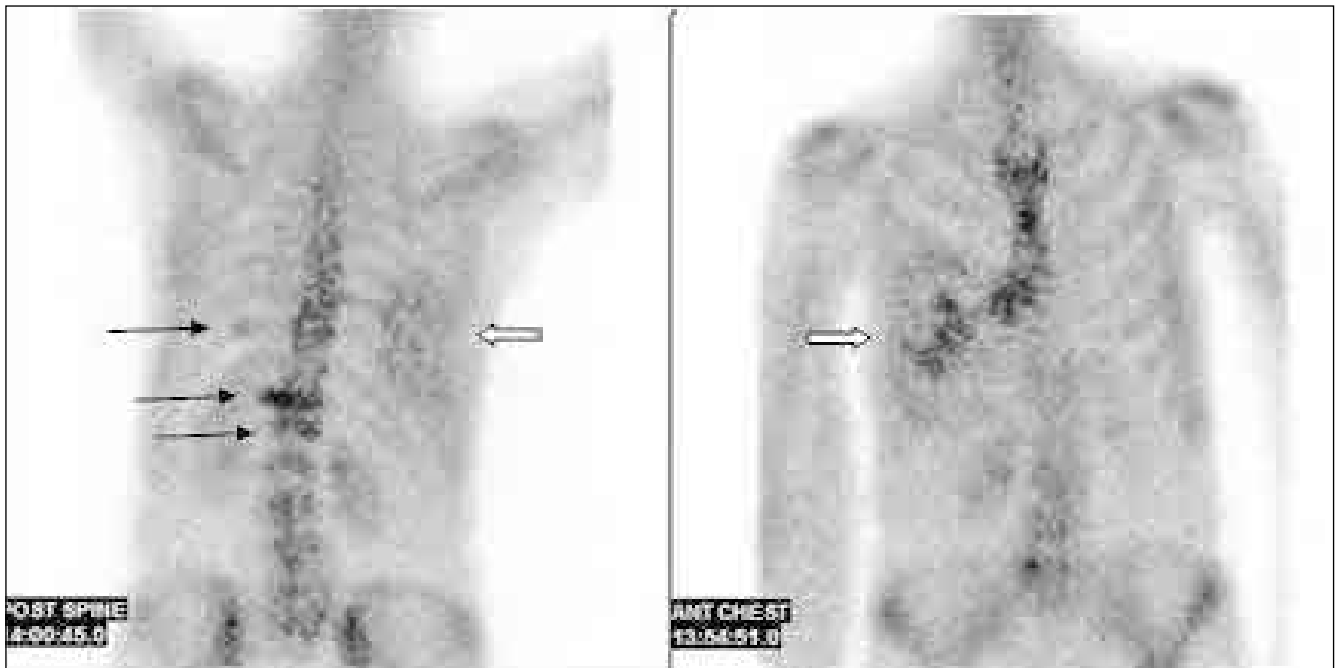


Figure 1 ^{99m}Tc -MDP bone scan of the patient showing bone metastases involving the 12th dorsal vertebra, the 1st lumbar vertebra and left 11th rib posteriorly (black arrows) with enhance and non-homogenous liver tracer accumulation due to hepatic metastases (white arrows)



Figure 2 Abdominal ultrasound showing multiple hyperechoic liver metastases (white arrows)

All previous investigations since 2006 including abdominal ultrasound and bone scans were negative for liver metastases. Laboratory investigations, including liver function tests were also normal. The patient

developed symptoms of backache, right-sided chest pain and headache one year after completion of radiotherapy to spine. The patient was therefore referred from the oncology department for bone scanning after a follow-up visit for breast carcinoma management in 2008 to rule out the presence of skeletal metastases. Bone scanning was performed three hours after intravenous administration of 740 MBq of ^{99m}Tc -MDP using a single-headed gamma camera (SOPHY) equipped with a low-energy high-resolution collimator with a symmetric 20% energy window setting around the 140 keV photopeak.

The MDP bone scan showed bone metastases involving the 12th dorsal and the first lumbar vertebrae, the left 11th rib posteriorly. In addition, there was increased non-homogenous tracer uptake also noted in the liver (Figure 1). Abdominal ultrasound was performed (using TOSHIBA nemio 20) to screen for secondary deposits in the liver. Multiple hyperechoic lesions were seen in both

lobes of the liver, which were consistent with metastases, presumed secondaries from the known breast carcinoma (Figure 2).

Discussion

Radionuclide bone scanning is a sensitive technique for detecting changes in bone metabolism. It is commonly employed in the detection of skeletal metastases in various malignancies. Extraosseous uptake of ^{99m}Tc -MDP is occasionally seen on bone scans [2,8,9]. Common sites include the kidneys and the urinary bladder (normal tracer excretion), the breasts, the uterus (physiologic activity), thyroid, stomach (unlabelled tracer), primary and metastatic tumours, benign tumours, lungs, liver, spleen, inflammatory conditions of soft-tissues, scars, injection sites, infarction, burns, wounds and so on [2].

Soft-tissue uptake unexpectedly encountered in the right upper quadrant of the abdomen in patients undergoing a bone scan represents uptake of the radiopharmaceutical in the liver, which may be due to various factors, including poor radiopharmaceutical quality, hepatotoxicity from recent methotrexate therapy, hepatic necrosis, malignant pleural effusion, inflammatory carcinoma of right breast, or liver metastases from various cancers, including colonic carcinoma, oat cell carcinoma and breast carcinoma [6, 8].

Although radiochromatography was not performed for the prepared radiopharmaceutical, there was no liver uptake seen on the other bone scans performed with the same batch of the radiopharmaceutical on the same day. There was no history of hepatotoxicity or for that matter, any other liver disease, nor did the patient had a recent radionuclide study to account for the liver uptake. A subsequent abdominal ultrasound revealed metastatic deposits in both lobes of liver which appeared to be the cause of the liver uptake of ^{99m}Tc -MDP on the bone scan.

The aetiology of nonosseous ^{99m}Tc -MDP uptake can be grouped into metastatic calcification, dystrophic calcification, metabolic uptake, compartmental sequestration and spurious or artefactual uptake [2]. Metastatic calcification is soft-tissue deposition of ^{99m}Tc -MDP due to hypercalcaemia. It can be seen with increased secretion of parathormone, destruction of bone, vitamin-D related disorders and renal failure. Aluminium intoxication secondary to chronic dialysis and milk-alkali syndrome due to excessive calcium intake are less common causes.

The pathophysiology of increased extraosseous uptake of ^{99m}Tc -MDP involves extra cellular fluid expansion, enhanced regional vascularity, increased permeability and elevated tissue calcium concentration. These factors may be related to the occasional MDP uptake in liver metastases in general [02]. It is hypothesized that diphosphonate binds to acid phosphatase, an enzyme present in high concentrations in bone, lactating breast and breast carcinoma [10]. Another possible mechanism includes alteration in cellular metabolism of calcium. After disruption in cell membrane the bone agent enters the cell and is either deposited with calcium on mitochondria or replaces other anions and attaches to calcium, which has already been fixed in that site [11].

Conclusion

Incidental soft-tissue uptake of ^{99m}Tc -MDP is occasionally seen during bone scintigraphy. Description of such findings has become an integral part of the bone scan report. Recognition and proper interpretation of such finding requires identification of the organ involved and appreciating the significance of the uptake. Identification of MDP uptake in liver metastases from breast carcinoma is an important clue to progressive disease.

References

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