

# Unilateral Pulmonary Uptake from Breast Cancer Shown in a Technetium-99m-Methylene-Diphosphonate Bone Scan

Intidhar EB\*, Hela C, Aida M Ihsen S

Department of Nuclear medicine, salah Azaiez institute, tunis, Tunisia

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## 2. Keywords

Bone scan; Extraosseous uptake; Lung; Hyper calcemia

## 1. Abstract

Extraosseous uptake of <sup>99m</sup>Tc phosphates is seen in primary tumors such as neuro blastoma and metastatic tumor such as hepatic metastasis, benign tumor, inflammation and other clinical entities. We report a case of a 40 years old woman with breast carcinoma classified T4d N1 Mx which underwent bone scintigraphy after the intravenous injection of 740 MBq of technetium-99m methylene-diphosphonate (<sup>99m</sup>Tc-MDP) showing unexpected diffuse uptake throughout the left lung. Abnormal lung uptake of bone-avid agents can be observed in various cases such as pulmonary alveolar microlithiasis, inflammation, Pneumocystis carinii pneumonia, and various tumoral lesions like breast cancer. This unexpected discovery needs more radiological investigations and should alert the clinician to the gravity disturbances phosphate metabolism and lead to the systematic search for malignant hyper calcemia almost always associated with such disturbances.

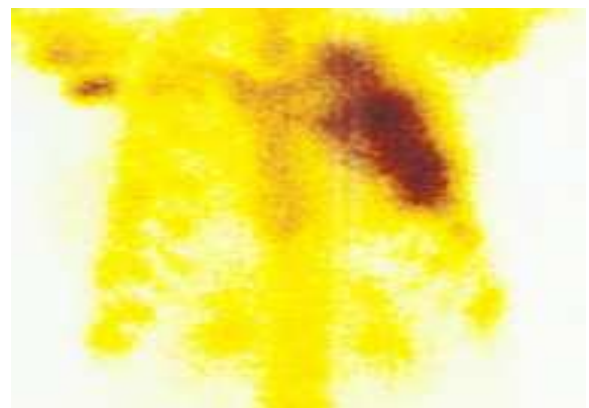
## 3. Background

Bone scintigraphy is widely considered as an important technique able to investigate various pathological conditions of the skeletal system and its use is embedded in national and international guidelines. Many unexpected extraosseous uptakes have been reported in literature: although several causes can be addressed, still the majority of cases do not recognize a clear pathological entity [1]. This phenomenon can be due to a huge variety of pathophysiological mechanisms, such as an alteration in calcium metabolism, as it often happens in many systemic diseases, extracellular fluid expansion and enhanced regional Vascularity and permeability [2,3]; lung has been reported to be the most frequently site, followed by myocardium, chest wall. Spleen, lymph nodes, kidney, stomach, retro peritoneum, adrenal gland, and pelvic cavity [4-9]. We present here a cases of unexpected <sup>99m</sup>Tc-oxidronate (HDP) lung uptake in patient undergoing bone scan. Subsequently, we perform a review of the existing literature about extraosseous uptakes.

## 4. Case Report

40 year old lady, known case of breast infiltrating duct carcinoma, classified T4d N1 Mx which underwent bone scintigraphy for staging. The patient had no history of other diseases and she

was on well-being at the observation. No symptoms were reported. Whole body scan and multiple spot views were performed, after the intravenous injection of 740 MBq of technetium-99m methylene-diphosphonate (<sup>99m</sup>Tc-MDP). The planar images showed an expected tracer uptake in the left upper chest (Figure 1), in keeping of extrososseous uptake in the lung. The X-ray failed to reveal any pathology in the chest. To further assess, biochemical assay and blood analysis was performed, revealed an increased value of serum calcium (19 mgs/dl; normal range: 8.5-11.0 mg/dl). The patient was referred to medicine to treat the hyper calcemia.



**Figure 1:** Bone scan showed the bone scan showed an increased uptake in the upper left lung.

\*Corresponding Author (s): EL BEZ Intidhar, Department of Nuclear medicine, salah Azaiez institute, tunis, Tunisia, E-mail: elbez.intidhar@yahoo.fr

## 5. Discussion

Although, bone scanning is a test primarily concerned with skeletal abnormalities, Uptake in non osseous, non urologic tissues is occasionally found on the images [1,2]. Etiologies of true radiopharmaceutical soft-tissue uptake can be subdivided into 4 categories: metastatic calcification, dystrophic calcification, metabolic uptake, and compartmental sequestration [2]. Metastatic calcification refers to Calcium deposition in previously normal tissues subjected to disorders of calcium and phosphorus metabolism, but may occur with normal levels [2,9]. It may be seen with increased secretion of parathyroid hormone, massive bone destruction in widespread bone metastases, vitamin D-related disorders, and renal failure, which leads to secondary hyperparathyroidism [2,4]. The common sites of calcification include the lungs, gastric mucosa, and kidneys [4]. The lung is the organ most frequently involved by metastatic calcification which can be localized in apical zones or diffused throughout the lung [3]. The main differential diagnosis is lung dystrophic calcification. Dystrophic calcification consists of calcium deposition in damaged tissue secondary to histologic disruption caused by trauma, ischemia or cellular necrosis or in the enzymatic necrosis of fat in the presence of normal calcium metabolism [2,3,4]. Pulmonary metastatic calcification is probably under-diagnosed, the patients usually being asymptomatic [5]. The clinical symptoms of metastatic calcification are non-specific and thus the diagnosis may be overlooked [4]. Clinical manifestations are various and can include a pulmonary restrictive syndrome, diffusion abnormalities, hypoxaemia and respiratory failure [5]. Early diagnosis and early therapy offer the best chance for cure or palliative therapy [6]. Plain chest radiograph is of little value in diagnosing metastatic pulmonary calcification because of its lack of specificity and sensitivity [3,4,7]. This diagnosis can be confirmed by scanning with bone scintigraphy or high-resolution CT [7]. Bone scintigraphy is one of the most useful methods for detecting metastatic calcification as it can illustrate systemic deposits. Uptake of radiotracer can usually be found in the lungs, kidneys, stomach, heart, liver, thyroid, and skeletal muscle. Some cases of pulmonary metastatic calcification demonstrated by bone scintigraphy are not readily identified on CT scan. Conversely, if the calcified tissue is already end-stage and 'burnt out', no active extraction of radiotracer will occur on scintigraphy assessment, and metastatic calcification may only be detected by plain radiography. Plain film radiography and CT findings reflect the amount of calcium deposit in the tissue, while bone scintigraphy depicts the active process of calcium phosphate mobilization. Therefore, the use of both CT and bone scintigraphy offers greater accuracy in reaching the diagnosis [4]. Additional use of hybrid Single-Photon Emission Computed Tomography (SPECT)-Computed Tomography (CT)

helps in proper anatomical localization of abnormal uptake noted on planar bone scintigraphy and improves the quality of interpretation. SPECT-CT increases the sensitivity of bone scintigraphy by detecting additional lesions, and also increases specificity by the exclusion of sites of physiological tracer uptake [8].

## 6. Conclusion

The incidental diagnosis of pulmonary metastatic calcifications on planar bone scintigraphy should lead to the systemic search of calcium metabolism disturbances, renal failure, and further radiological investigations. Early diagnosis and early therapy offer the best chance for cure or palliative therapy.

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