

Unusual visceral distribution of technetium-99m-methylene diphosphonate in a case of hypercalcemia of malignancy

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ABSTRACT

We report a case of 18-year-old boy who presented with vomiting, backache, and fever for 1-month, diagnosed to have anaplastic large cell lymphoma of urinary bladder with hypercalcemia and metastatic calcification in multiple viscera. His computed tomography scan was suggestive of soft tissue lesion in the urinary bladder and multiple lytic skeletal lesions. Bone scan showed unusual visceral uptake in lungs, liver, spleen, and myocardium in addition to osseous lesions. The clinical laboratory test revealed functional impairment of visceral organs. The patient died 3 months later.

Keywords: Altered bone scan tracer distribution, hypercalcemia, metastatic calcification

A 18-year-old boy presented with fever and backache for 1-month, diagnosed to have anaplastic lymphoma kinase-positive primary anaplastic large cell lymphoma (ALCL) of urinary bladder with hypercalcemia and metastatic calcification in multiple viscera. Laboratory studies revealed leukocytosis, low hemoglobin, hypercalcemia, hyponatremia, hypokalemia, low $t\text{CO}_2$, high anion gap, raised blood urea nitrogen, hypoalbuminemia, raised serum creatinine, as well as elevated bilirubin, alkaline phosphatase and gamma glutamyl transferase. A contrast-enhanced computed tomography scan showed mass lesion in the posterior wall of urinary bladder suspicious for neoplasm with multiple lytic skeletal lesions in pelvis and dorsolumbar vertebrae. In this context, the patient was referred for a bone scan to assess the extent of osseous involvement. Planar imaging was performed 4 h after injection of 25 mCi of $^{99\text{m}}\text{Tc}$ -methylene diphosphonate ($^{99\text{m}}\text{Tc}$ -MDP) which showed heterogeneous increased uptake in multiple pelvic bones, skull, right clavicle,

and few dorsal vertebrae [Figures 1 and 2]. In addition, tracer uptake was also seen in lungs, heart, liver, and spleen [Figure 1]. Thin-layer chromatography of the reconstituted $^{99\text{m}}\text{Tc}$ -MDP kit showed $<3\%$ of free pertechnetate, suggesting good labeling. Furthermore, bone scans of other patients injected with the same preparation of radiopharmaceutical on the same day did not reveal any visceral uptake in either of them. A chest X-ray obtained at that time showed scattered small specks of calcification. He received 3 cycles of chemotherapy. However, he clinically deteriorated and succumbed to death after 3 months.

ALCL accounts for 2% of adult and 10–15% of pediatric/adolescent non-Hodgkin lymphomas. ALCL rarely originates as a bladder neoplasm, and to date, only eight cases of ALCL have been reported to show involvement of the urinary bladder.^[1] Metastatic calcification of visceral organs is often associated with chronic renal failure, secondary hyperparathyroidism,^[2] primary hyperparathyroidism, and hypervitaminosis D. Hypercalcemia is reported to occur in 10–20% of patients with malignancies due to extensive destruction of bone by skeletal metastases, increased bone

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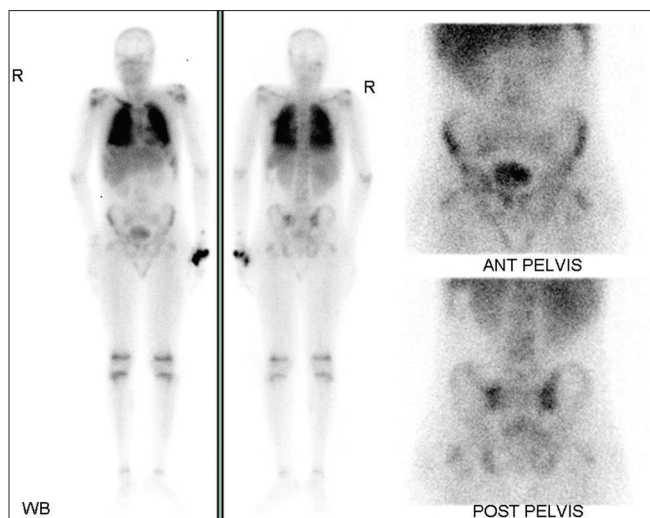


Figure 1: Planar images of bone scan: Increased uptake in multiple pelvic bones, skull, right clavicle, and dorsal vertebrae. In addition, tracer uptake was seen in lungs, heart, liver, and spleen

resorption by osteoclasts and tumor cells.^[3] Unfortunately, cancer-related hypercalcemia has a poor prognosis, as it is most often associated with disseminated disease. Bone scan has been a valuable tool in detecting metastatic calcification of visceral organs in hypercalcemia.^[4] The increase in the ion-product of calcium and phosphate appears to be an important factor in the precipitation of the substances in the soft tissues.^[5] A $(Ca) \times (P)$ product of 58–60 is considered as the saturation point above which spontaneous precipitation may occur. In hypercalcemic patients, the initial visceral deposit has been shown to be brushite ($CaHPO_4 \cdot 2H_2O$), which is subsequently transformed to apatite ($Ca_{10}(PO_4)_6(OH)_2$).^[6] Tc-99m-labeled phosphate or diphosphonate compounds are known to bind to the hydroxyapatite crystals by chemisorption. Calcium has a predilection for depositing in the kidneys, lungs, and stomach. A higher pH in the extracellular fluid of these organs was proposed as a contributing factor. In our patient with lymphoma and hypercalcemia, calcification was also present in multiple organs, which may be related in part to the high ion-product of calcium and phosphate. In conclusion, metastatic calcification is usually associated with hypercalcemia in malignant patients. It may result in a physiological disturbance in multiple viscera. Bone scan is a

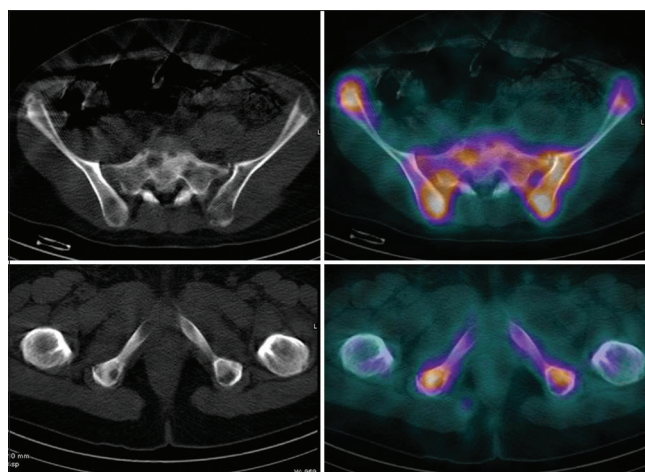


Figure 2: Single-photon emission computed tomography images of pelvis: Increased uptake in multiple pelvic bones with lytic lesions on the corresponding low dose computed tomography images

simple and sensitive modality in the detection of metastatic calcification.

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Conflicts of interest

There are no conflicts of interest.

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