Ga-67 Citrate and Tc-99m MDP Uptake in the Lung and Stomach Associated with Hypercalcemia

Myung-Hee Sohn, M.D., Seok Tae Lim, M.D., Young Jin Jeong, M.D., Dong Wook Kim, Ph.D., Hwan-Jeong Jeong, M.D., and Chang-Yeol Yim, M.D.

Departments of 1Nuclear Medicine and 2Internal Medicine, and the 3Research Institute of Clinical Medicine, Chonbuk National University Medical School and Hospital, Jeonju, Korea

Ga-67 scintigraphy demonstrated increased uptake in the lungs and stomach in a 26-year-old man with hypercalcemia. A primitive neuroectodermal tumor was confirmed by bone marrow examination. Tc-99m MDP uptake in the same locations as Ga-67 revealed by bone scintigraphy was consistent with metastatic calcification. Although the mechanism of Ga-67 uptake in metastatic calcification is not understood, the presence of an inflammatory process is suggested. (Nucl Med Mol Imaging 2009;43:436-439)

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Figure 1. A 28-year-old man presented with a 2-week history of lethargy, fever, and weakness in both lower legs. The laboratory findings showed anemia and acute renal failure with hypercalcemia (total calcium, 18.1 mg/dL; normal range, 8.4-10.2 mg/dL). The phosphate level (6.5 mg/dL; normal range, 2.5-4.5 mg/dL) was also elevated. The parathyroid hormone (0.01 pg/ml; normal range, 11-62 pg/ml) and 1,25(OH)2 vitamin D3 levels (3.1 ng/ml; normal range, 10-55 ng/ml) were decreased. Parathyroid hormone-related protein (PTHrP) was elevated (31.2 pmol/l; normal range, <1.3 pmol/l). Results of a subsequent bone marrow examination revealed a primitive neuroectodermal tumor. (A) Anterior and posterior whole body scintigraphy images performed 48 hours after injection of 185 MBq (5 mCi) Ga-67 showed abnormally increased uptake in the lung (thick arrow) and stomach (thin arrow). Three days later, a Tc-99m MDP bone scintigraphy was performed. (B) Anterior and posterior whole body images demonstrated increased uptake in the same sites as those revealed by the Ga-67 scintigraphy. The findings on bone scintigraphy were consistent with metastatic calcifications. Although a plain radiograph and CT of the chest showed no abnormalities, (C) a CT of the abdomen demonstrated calcification in the gastric wall (arrow).

Hypercalcemia is a paraneoplastic syndrome in various type of cancers. PTHrP has been implicated in the pathogenesis of hypercalcemia. When the calcium-phosphorus product in serum exceeds the saturation point (36-40) in severe hypercalcemia, metastatic calcification can occur anywhere in the body, although the lung, stomach, and kidneys are the most common sites, reportedly because of the high intracellular pH. Calcium deposits likely first consist of amorphous forms, with later transformation into hydroxyapatite. Tc-99m MDP is known to bind to hydroxyapatite crystal, probably by chemisorption. Tc-99m MDP bone scintigraphy of metastatic calcification shows diffusely increased uptake in organs, such as lung, stomach, and kidneys. Ga-67 citrate uptake in the same locations as Tc-99m MDP associated with metastatic calcification on bone scintigraphy has been reported. Although the mechanism of Ga-67 uptake in metastatic calcification is not understood, the presence of an added inflammatory process suggested. Diffuse lung uptake of Ga-67 is a non-specific abnormality typically associated with infection, active inflammation, or tumor. However, if metastatic calcification is considered a cause of diffuse lung uptake of Ga-67, we could obviate the need for an invasive diagnostic procedure.

References