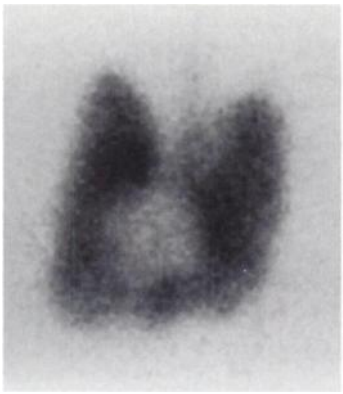

FIGURE 3. Technetium-99m-pertechnetate scan demonstrates infarction of the AFTA and shows the hyperthyroidism caused by Graves' disease.

Four cases of hyperthyroidism of the Graves' type occurring after ^{131}I therapy for a toxic AFTA have been reported (*10–13*). In one case, TSI was present at a low titer before the ^{131}I and rose after the patient became hyperthyroid from GD (*12*). In another case, TSH receptor antibodies or TSI were undetected before ^{131}I therapy, although there was a low level of thyroid peroxidase antibody (1500 U/ml) (*13*). These cases suggest that when susceptibility for GD exists in the extranodular tissue, the release of antigenic material from the ^{131}I-damaged follicular cells of the toxic adenoma stimulates an immune response that activates the TSH receptors in the extranodular tissue resulting in GD. In our patient, a similar pathogenesis could exist with autoinfarction of the autonomous nodule being the triggering mechanism.

CONCLUSION

This patient had a long-standing nontoxic AFTA and then became hyperthyroid secondary to GD after infarction of the autonomous nodule. The necessity of thyroid imaging to determine the etiology of the hyperthyroidism is discussed, as well as the possibility that the destruction of the follicular cells in the adenoma released antigenic material that evoked an immune response in the extranodular tissue causing the GD.

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Technetium-99m-MDP Uptake in Hilar Lymph Nodes in Sarcoidosis

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We describe a patient with unexplained hypercalcemia who underwent bone scintigraphy, which demonstrated marked tracer uptake within the hilar lymph nodes. The pattern strongly suggested sarcoidosis, which was subsequently confirmed by bronchoscopy-directed biopsy.

Key Words: sarcoidosis; bone scintigraphy; lymphadenopathy

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Sarcoidosis is a worldwide multisystem disorder of unknown etiology characterized by noncaseating granulomas at sites of disease activity (*1*). Although many organs of the body may be affected, the lungs are the most common sites involved (90%) and account for the greatest morbidity and mortality. There are several extra thoracic sites of involvement of sarcoidosis, including the eyes, kidneys, liver, spleen, bone marrow, skin, lymph nodes, nervous system, musculoskeletal system and others. Hypercalcemia is a rare complication (*2*).

The diagnosis of sarcoidosis is based on clinical manifestations, radiographic findings, the demonstration of noncaseating granulomas and the exclusion of other causes of granulomatous inflammation (*3*). Serum angiotensin converting enzyme (ACE), bronchoalveolar lavage, pulmonary function tests and ^{67}Ga scanning have been used in the diagnosis and management of sarcoidosis. Clinical experience has been variable regarding the accuracy of these tests for detecting activity and monitoring therapy (*1,4*). The role of high-resolution CT scanning is under evaluation (*5*). The experience with ^{99m}Tc bone-seeking agents in sarcoidosis has been limited. There are only a few reported cases of abnormal

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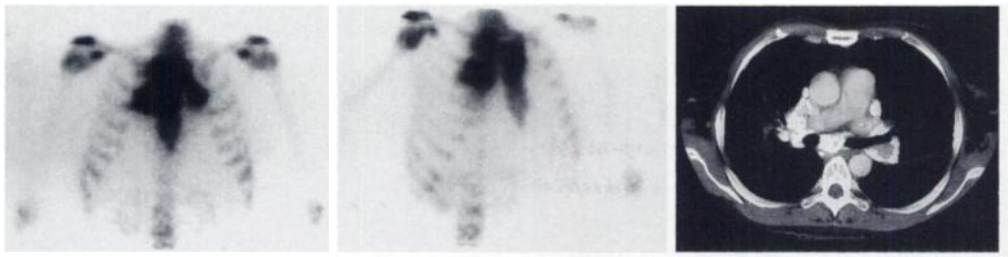

FIGURE 1. Anterior and right anterior oblique views 3 hr postinjection of ^{99m}Tc-MDP show increased uptake in the hila and superior mediastinum (left and middle panels). Chest CT scan demonstrates large calcified lymph nodes in the hila and mediastinum (right panel).

skeletal scans in patients with sarcoidosis (*6,7*). We present a patient with previously unexplained hypercalcemia whose findings on bone scintigraphy were highly suggestive of sarcoidosis.

CASE REPORT

A previously healthy 35-yr-old woman presented with abdominal pain due to hypercalcemia-induced acute pancreatitis. The serum calcium was 14.9 mg/dl (normal 8.6–10.2). Since she was consuming calcium carbonate tablets for symptoms of severe ulcerative gastritis, the diagnosis of milk alkali syndrome was proposed. Renal insufficiency (creatinine 4.9 mg/dl) and hypercalcemia improved after vigorous intravenous hydration and total parenteral nutrition. Four months later, she was again found to have hypercalcemia (calcium 12.7 mg/dl) and renal insufficiency. The patient was hospitalized for evaluation and treatment. She complained only of fatigue. There was no history of fever, respiratory problems or weight loss.

Physical examination was unremarkable. Serum vitamin D, PTH and ACE levels were normal. Erythrocyte sedimentation rate was 112 mm/hr (normal 0–20 mm/hr). Chest radiographs revealed low lung volumes and prominence of both hila. CT of the abdomen showed medullary nephrocalcinosis. Radiographic bone survey revealed a small lucency with a sclerotic border in the left frontal bone. To evaluate the bone survey findings and to search for evidence of bony metastatic disease, skeletal scintigraphy was performed. There was intense uptake of ^{99m}Tc-MDP within both hila (Fig. 1). Uptake within the skull and within the remainder of the skeletal and soft-tissue structures was normal. A CT scan of the chest was next obtained to evaluate the hilar uptake of MDP. The CT scan demonstrated marked calcification involving all nodal groups of the mediastinum and hila and interstitial pulmonary disease (Fig. 1). Transbronchial biopsies were performed and showed noncaseating granulomas consistent with sarcoidosis. Cultures of the biopsy specimens were negative for fungi and acid-fast bacilli. Repeat ACE levels were elevated at 74.4 μ/ml (20.0–50.0 μ/ml). Treatment with glucocorticoids was begun.

DISCUSSION

The most striking aspect of this case is that the diagnosis of sarcoidosis was suggested by the bone scan, which showed uptake in hilar lymph nodes, simulating that of gallium scanning. Extra-osseous localization of bone-seeking agents has been found in muscular sarcoidosis, nephrocalcinosis secondary to sarcoidosis, tumoral calcinosis associated with sarcoidosis and myocardial sarcoidosis (*8–12*). One case has been reported in which ^{99m}Tc-Sn PYP localized in both lung bases in a patient with known sarcoidosis (*13*). We believe that uptake of ^{99m}Tc-MDP into hilar lymph nodes affected with sarcoidosis is extremely uncommon. The distribution of ^{99m}Tc-MDP uptake in this case resembles the lambda pattern frequently described with ^{67}Ga scanning (*14*) (gallium scanning was not performed in this patient). Although the mechanism of uptake is uncertain, this extra-osseous localization may be related to the interaction of ^{99m}Tc-labeled diphosphates and phosphonate anionic complexes with the calcium deposited in the involved lymph nodes.

This patient presented with a combination of features rarely due to sarcoidosis, namely hypercalcemia-induced pancreatitis. Hypercalcemia is associated with increased plasma levels of 1,25-dihydroxyvitamin D, which is believed to originate from activated mononuclear phagocytes at the site of granuloma formation. Cultured pulmonary alveolar macrophages from patients with sarcoidosis are capable of metabolizing 25-hydroxyvitamin D to 1,25-hydroxyvitamin D. This is extremely uncommon in patients with other types of granulomatous pulmonary disease (*1,15*). Renal manifestations of sarcoidosis are also rare and include hypercalcemic nephropathy as occurred in this patient.

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