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Technetium-99m-Sestamibi Uptake in Myeloma

Bruce K. Adams, Abdulbasier Fataar and Mohammad A. Nizami

Department of Nuclear Medicine, University of Cape Town and Groote Schuur Hospital, Cape Town, South Africa

A number of reports describe how $^{99\text{m}}\text{Tc}$ -sestamibi detects benign and malignant primary and metastatic tumors. We report abnormal $^{99\text{m}}\text{Tc}$ -sestamibi uptake in nine sites in a 53-yr-old patient with histologically and biochemically proven IgG kappa-secreting myeloma. The $^{99\text{m}}\text{Tc}$ -sestamibi study was undertaken for an unrelated hyperparathyroidism.

Key Words: technetium-99m-sestamibi; myeloma

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Although $^{99\text{m}}\text{Tc}$ -sestamibi was originally developed as a myocardial imaging agent it has been found to have many other useful applications. It has been used to detect benign tumors as well as several primary malignancies and metastatic tumors including: brain tumors (1,2), benign and malignant thyroid (3-5) and parathyroid tumors (6,7), breast carcinoma (8), lung carcinomas (9,10), non-Hodgkin's lymphoma (11), Burkitt's lymphoma (12), renal cell carcinoma (12), nasopharyngeal carcinoma (13), carcinoid tumor (14), pancreatic Vipoma (15), ectopic ACTH-producing tumor (16), acoustic schwannoma (17), malignant thymoma (12) and osteosarcoma (18).

Moreover, ^{201}Tl -chloride uptake in the bone marrow of a patient with nonsecretory myeloma has been described (19). We report a case of $^{99\text{m}}\text{Tc}$ -sestamibi uptake in myeloma.

CASE REPORT

A 53-yr-old woman presented with a 1-mo history of mild confusion, abdominal cramps, vomiting and constipation. Physical examination revealed an ill lady with pallor and dehydration. She was confused with a depressed level of consciousness. Radiological examination revealed lytic lesions in the left frontal region of the skull, the upper thoracic vertebrae and the lateral aspect of the left clavicle.

The laboratory findings were: total serum calcium 3.31 mmol/liter (normal 2.1-2.6), ionized calcium 1.46 mmol/liter (normal 1.1-1.2), alkaline phosphatase 201 U/liter (normal 30-70), parathormone 120 pg/ml (normal 10-55), inorganic phosphate 1.2 mmol/liter (normal 0.8-1.4), serum urea 19.9 mmol/liter (normal 1.7-

6.7) and creatinine 217 mmol/liter (normal 75-115). The hemoglobin was 9.9 g/dl.

Other investigations including chest radiographs, mammography, intravenous pyelography, renal ultrasound, gastroscopy and sigmoidoscopy were all reported as normal. Ultrasound of the neck showed a lesion in the inferior pole of the left thyroid lobe.

Technetium-99m-sestamibi scintigraphy was performed in an attempt to detect possible parathyroid pathology. The patient received an intravenous injection of 500 MBq $^{99\text{m}}\text{Tc}$ -sestamibi. Anterior images of the neck were taken 15 min and 2 hr after injection using a gamma camera fitted with a low-energy, high-resolution collimator. Because the images showed multiple abnormal foci in the chest additional anterior images of the chest and skull were taken for 200 sec. The patient's condition deteriorated during the scanning procedure and she was returned to the intensive care unit before views of the spine could be obtained.

The $^{99\text{m}}\text{Tc}$ -sestamibi scan (Fig. 1) demonstrated diffusely increased uptake in the region of the inferior pole of the left thyroid lobe at 15 min postinjection, which was still visible at 2 hr. Figure 2 shows a number of abnormal foci in the anterior ribs, the lateral aspect of the left shoulder and clavicle and left frontal region of the skull. The latter two lesions corresponded to lytic areas on the radiographs, and the skull focus to a large frontal defect on CT. The neck was explored surgically. Parathyroid hyperplasia was discovered and three of the glands were removed.

A needle biopsy was taken of the skull lesion and histological examination was positive for myeloma. Urine examination revealed Bence-Jones protein with excessive amounts of IgG kappa light chains. A diagnosis of IgG kappa-secreting myeloma was made. The patient developed a polyneuropathy and her renal function deteriorated rapidly. Her condition continued to deteriorate despite assisted respiration and dialysis. She died as a result of her illness 2 mo later.

DISCUSSION

Although $^{99\text{m}}\text{Tc}$ -sestamibi is used chiefly for myocardial imaging, like its counterpart, ^{201}Tl -chloride, it is gaining recognition as a tumor imaging agent. The mechanism by which it concentrates in malignant tissue is not clear. Technetium-99m-sestamibi is sequestered in the cytoplasm and mitochon-

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For correspondence contact: B.K. Adams, MD, Department of Nuclear Medicine, Groote Schuur Hospital, Observatory 7925, Cape Town, South Africa.

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