

Parathyroid Adenoma Imaged by Ga-67 Citrate Scintigraphy: Case Report

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A preoperative Ga-67 citrate scan showed abnormal uptake in a patient with a cervical mass that subsequently proved to be a predominantly oxyphilic parathyroid adenoma.

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In this report we describe a patient in whom a preoperative Ga-67 citrate scan, performed during the initial clinical evaluation, showed abnormal uptake in a cervical mass that subsequently proved to be a parathyroid adenoma.

CASE REPORT

A 27-year-old woman was admitted to our clinics with a 3-yr history of pain in the left leg and left hip, polyuria, and nocturia. During physical examination, a firm mass, approximately 4 cm in diameter, was felt in the thyroid area without distinct separation from the middle and lower part of the right thyroid lobe. The rest of the gland seemed diffusely enlarged, mainly in the right lobe. No cervical adenopathy was felt. Laboratory analyses revealed marked hypercalcemia, with 13.7 mg calcium 100 ml (normal, 8.5–11.0), hypophosphatemia with 1.6 mg phosphate 100 ml (normal, 2.8–4.2), and alkaline phosphatase levels of 675 IU (normal, 13–45 IU). A radiographic skeletal survey showed erosion of the distal clavicular heads, generalized bony demineralization, and a pathologic fracture of the left femoral neck. In fine-detail films of the hands, severe subperiosteal bone resorption was observed, with complete destruction of the terminal tufts. A thyroid scan, done 24 hr after the administration of 200 μ Ci of I-123, showed the enlarged right lobe. The distribution of activity was homogeneous throughout the gland with neither cold nor hot nodules (Fig. 1A).

Five millicuries of Ga-67 citrate were administered

intravenously, and the patient was scanned 72 hr later on a rectilinear scanner with dual 5-in. detectors. Three independent pulse-height analyzers for each detector permitted simultaneous detection of 93-, 184-, and 296-keV photon emissions of Ga-67. The medium-energy collimator had a focal depth of 9 cm. The scan revealed abnormal accumulation of activity in the right neck region corresponding to the palpable mass (Fig. 1B). The patient underwent exploratory neck surgery the next day, 96 hr after the gallium injection. A 15.6-g adenoma (40- \times 38- \times 18-mm) of the right lower parathyroid gland was resected (Fig. 2A). Microscopically the adenoma contained at least 95% of oxyphil cells, and the remainder were chief cells. No infiltration of lymphocytes was evident. Biopsies of the remaining parathyroids demonstrated mild hyperplasia. The thyroid gland was found to be completely normal and was not excised. The surgical specimen was scanned with the equipment and technique used for the preoperative Ga-67 scan (Fig. 2B). A follow-up Ga-67 citrate scan done 10 months after surgery was normal (Fig. 3). Repeat fine-detail radiographs of

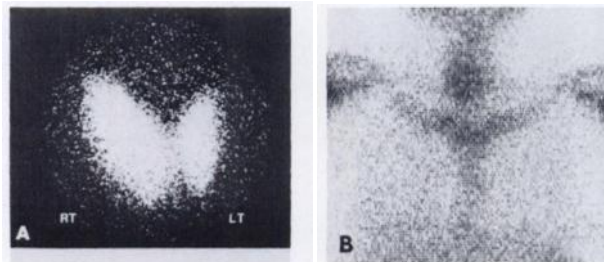


FIG. 1. (A) I-123 thyroid scan. Enlarged right lobe; no discrete nodules visible. (B) Preoperative Ga-67 citrate scan, showing area of increased uptake in right side of neck.

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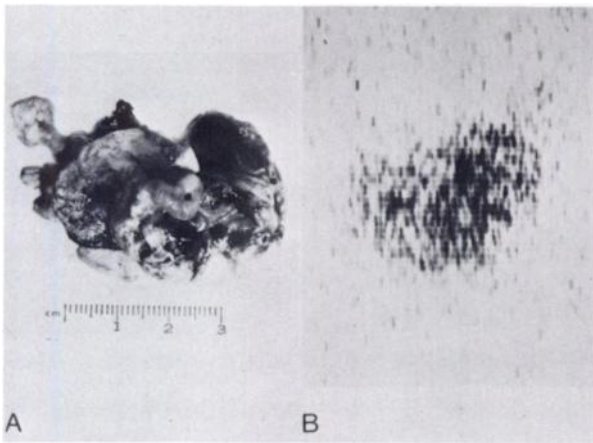


FIG. 2. (A) Resected oxyphilic parathyroid adenoma. (B) Ga-67 citrate scintiscan of the surgical specimen.

the hands, as well as serum alkaline phosphatase levels, were completely normal at this time.

DISCUSSION

Several invasive and noninvasive diagnostic procedures have been used for preoperative diagnosis of parathyroid adenomas. Catheterization of the thyroid veins for determination of parathyroid hormone concentrations, as well as highly selective arteriography, may be successful in detecting parathyroid adenomas. Occasionally, however, severe complications have occurred with these procedures (1,2). Thermography, ultrasonotomography, and the "parathyroid squeeze test" have been used in limited clinical trials (3-5).

An amino acid analog, [⁷⁵Se] selenomethionine, has been used for parathyroid scanning. Suppression of the thyroid gland before scanning is necessary, and serial scans must be performed for identification of the parathyroid glands (6,7). Thus, the need for a noninvasive and simple scintigraphic procedure for imaging of the parathyroid glands is evident. This

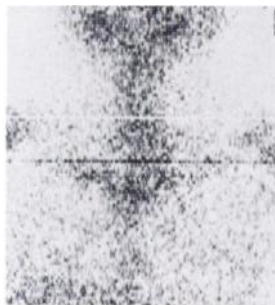


FIG. 3. Normal followup Ga-67 citrate scan done 10 months after surgery.

case report presents the preoperative detection and subsequent imaging of a parathyroid adenoma with Ga-67 citrate in a patient with a cervical mass and clinical manifestations of hyperparathyroidism.

The transport and binding of Ga-67 citrate by the plasma protein have been studied in detail. More recently, it has been suggested by Hoffer et al. (8) that an in vivo translocation of gallium-67 from transferrin to transferrin-like proteins with lower molecular weight, may occur. Multiple and different mechanisms may explain the concentration of gallium in tumors and inflammatory sites (9). Morphologic and biochemical methods have shown the uptake of gallium-67 by lysosomes or lysosome-like organelles (10).

Parathyroid adenomata, the most common cause of primary hyperparathyroidism, are usually classified according to the predominant cell population. The oxyphilic tumors were thought not to be associated with hyperparathyroid activity, but Straus and Paloyan (11) found all oxyphilic adenomas to be active secretors of parathyroid hormone, as judged by elevated serum calcium levels. Marked infiltration by lymphocytes were also evident in parathyroid glands containing oxyphilic adenomas. Ultrastructural cytoplasmic studies have demonstrated that oxyphilic cells are rich in mitochondria. The high content of cytoplasmic mitochondria in the oxyphilic cells, and the infiltration by lymphocytes, could explain the uptake of gallium-67 in oxyphilic adenomas.

Although no lymphocytes were present in our patient's adenoma, and regardless of the specific mechanisms, this case report indicates that an oxyphilic adenoma should be considered as the cause of the primary hyperparathyroidism in a patient with a cervical mass, a normal thyroid scan, and a positive Ga-67 citrate scan.

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