

Detection of ectopic parathyroid adenoma by early Tc-99m sestamibi imaging

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Localization of Tc-99m sestamibi (MIBI) by parathyroid adenomas (PA) is well known. Typically the radionuclide washes out slowly from the PAs located in the neck. Rapid washout from some PAs has been reported. Various hypotheses have been postulated for slow and rapid clearance of MIBI from PAs, located in the neck. However, the washout of MIBI from ectopic parathyroid adenoma (EPA) is not well reported. We present a case of EPA with rapid washout of MIBI. Hence, early MIBI imaging plays an important role in the evaluation of EPA.

Key words: ectopic, parathyroid adenoma, sestamibi, clearance

INTRODUCTION

EPA causing primary hyperparathyroidism (PHP) is well known. Eighty-five percent of the cases of PHP are due to the adenoma.¹ However, in about 10% of cases, parathyroid adenomas can present in ectopic locations.¹ Mediastinum is one of the most common locations for EPA. EPAs are usually small and difficult to localize and often times require SPECT imaging.^{2–4} Various imaging modalities are performed to localize parathyroid adenomas responsible for primary or persistent hyperparathyroidism. Ultrasound, CT, MRI, and MIBI scintigraphy are the commonly used imaging modalities for this purpose.^{5–18} Recently PET and SPECT with CT fusion imaging are showing more promise in difficult cases.^{3,19} MIBI is an extensively used radionuclide in scintigraphy imaging. Other radionuclides used in scintigraphy include thallium-201 and Tc-99m tetrofosmin.^{14,20}

EPAs are detected either in the preoperative work up of patients who present with hypercalcemia or in post parathyroidectomy patients with persistent hypercalcemia.

The purpose of this case report is to show the rapid clearance of MIBI from the EPA and to demonstrate the usefulness of early imaging in the diagnosis of EPA.

CASE REPORT

The patient is a 57-year-old white female with history of bilateral nephrolithiasis who presented with elevated serum calcium and intact parathyroid hormone (PTH). PHP was clinically suspected and a Tc-99m MIBI study was requested. The early and delayed planar MIBI study performed demonstrated no persistent focal activity in the neck and thyroid bed but a focal area of increased radiotracer uptake in the left upper chest on early images (Fig. 1). An EPA was suspected and a follow-up MRI was recommended. However, the patient underwent a standard neck exploration with dissection up to the aortic arch and left inferior parathyroidectomy. The surgery was terminated after extensive deep areolar tissue search and the initial frozen section pathology of one of the specimens identified parathyroid tissue. However, the final histopathology of the removed left parathyroid gland demonstrated no hyperfunctioning adenoma, and the patient continued to have hypercalcemia postoperatively. A repeat MIBI scan was performed which re-demonstrated a focal area of increased radiotracer uptake in the left chest in the early images. A follow-up MRI demonstrated a left lung mass and a CT was recommended. The CT demonstrated a 2.3 × 1.2 cm mass in the anterior mediastinum suspicious for parathyroid adenoma.

The patient underwent another exploratory surgery of the chest with median sternotomy which localized the mass in the anterior mediastinum that was excised and had a weight of 3.1 grams. The histopathology was consistent with the parathyroid adenoma. The patient's calcium levels normalized after the second operation.

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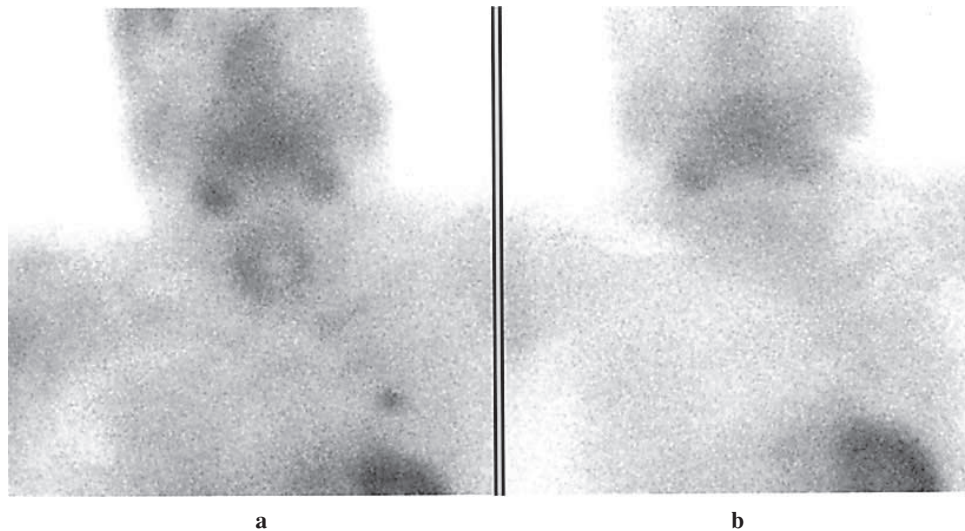


Fig. 1 Tc-99m sestamibi early (a) static image of anterior neck and chest demonstrating a focal area of increased uptake in left chest and delayed image (b) demonstrating washout from EPA.

DISCUSSION

EPA is a common cause of unsuccessful surgery with persistent hypercalcemia.¹⁵ Accurate localization of the EPA is warranted for a successful re-operation. Failure rate after standard initial neck exploration surgery is 5 to 10%.¹⁶ Several causes have been identified for the failure rate including a multi nodular goiter, poor surgical technique, pathological misdiagnosis and ectopic glands. New localization and surgical techniques have been developed including preoperative injection of a radionuclide and intraoperative localization with a gamma probe, intraoperative measurement of PTH, video and robot assisted mediastinal surgery and pin hole SPECT.^{16,17,21–24}

MIBI scintigraphy has been widely used in the preoperative localization of parathyroid adenomas including the ectopic glands. SPECT imaging is often required to localize ectopic glands. Immediate and two hour delayed images of the neck and chest are routinely performed in the evaluation of PHP. MIBI localizes both in the thyroid and parathyroid glands initially. On delayed images MIBI washes out from thyroid and normal parathyroid glands with persistent radioactivity in hyperfunctioning parathyroid adenoma located in neck. Rapid washout has been reported from some parathyroid adenomas located in the neck.^{25,26} However, the washout mechanism from EPA is not well described.

The MIBI radiotracer uptake and clearance by parathyroid adenomas are not well known.^{18,25–29} Increased gland metabolism with cells rich in mitochondria and cell proliferation index have been suggested.^{18,26} The sensitivity and specificity depend on the size and cellularity of the glands and PTH level.^{28,29} Adenomas weighing more than one gram have greater than 95% sensitivity. Adenomas as small as 0.3 gram are detectable by the localization

studies.

Hyperfunctioning parathyroid adenomas located in neck and EPA typically demonstrate delayed washout.^{2–17,30,31} However, rapid washout of MIBI from PA located in neck has also been reported.^{25–27,32} Hence early imaging played an important role in those cases. The uptake and clearance mechanism of MIBI from EPA is usually similar to PA. However, the concept of early washout from EPA has not been raised in the previous reports. Hence, we demonstrate from this case report the importance of early MIBI imaging in the diagnosis of EPA.

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