

# Mediastinal Parathyroid Adenoma and Brown Tumors

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## Abstract

In this report, we describe a rare case of brown tumor and mediastinal parathyroid adenoma. This report emphasizes the value of radionuclide scintigraphy in the setting of persistent disease following parathyroid surgery.

**Keywords:** Brown tumor, parathyroid adenoma, Tc-99m MIBI

## Introduction

Parathyroid adenomas are the cause of hyperparathyroidism in about 85% of patients suffering from this disease; and specifically these may arise as a complication of secondary hyperparathyroidism in patients with chronic renal failure, with the loss of feedback auto-regulation mechanism on any of the hyperplastic glands (tertiary hyperparathyroidism).<sup>[1]</sup> Chronic bone resorption induced by excessive parathormone (PTH) may produce cystic bone lesions throughout the skeleton, called osteitis fibrosa cystica that may present as pathological fractures or as brown tumors with a reported prevalence of 0.1%.<sup>[2,3]</sup>

Parathyroid scintigraphy with 99mTc-Sestamibi is an important tool to identify the location of the culprit gland increasing the surgical success and decreasing the time of the procedure.<sup>[4]</sup> It is particularly useful in post-operative patients with persistent or recurrent hyperparathyroidism, in whom re-exploration may be technically difficult and where the possibility of existence of ectopic parathyroid tissue may be very high.

## Case Report

A 59-year-old female with chronic kidney disease and undergoing hemodialysis for nine years, presented with persistently raised parathormone levels and bone pain even after she was submitted to a total parathyroidectomy about a year ago for severe secondary hyperparathyroidism with renal osteodystrophy and intractable bone pain. She was referred for a parathyroid scintigraphy with 99mTc-Sestamibi with the intention to identify a supernumerary and/or ectopic gland.

The scan was performed following administration of 740 MBq (20 mCi) of 99mTc-Sestamibi. Planar images of the neck and mediastinum were acquired at 5, 30, 60 and 120 min, and SPECT/CT images were performed at 120 min with a Siemens Symbia SPECT Camera.

A focus of intense MIBI uptake was detected in the anterior mediastinum on all planar images obtained at 5, 10, 60 and 120 min [Figure 1]. The SPECT/CT scan confirmed the presence of a Tc-99m MIBI avid soft tissue nodule adjacent to the ascending aorta (size 23 × 17 mm) [Figure 2a]. Histopathological examination confirmed this to be parathyroid adenoma. The SPECT/CT images also revealed multiple expansive septate cystic lesions in the ribs showing minimal MIBI uptake [Figures 2 b-d] consistent with "brown tumors".

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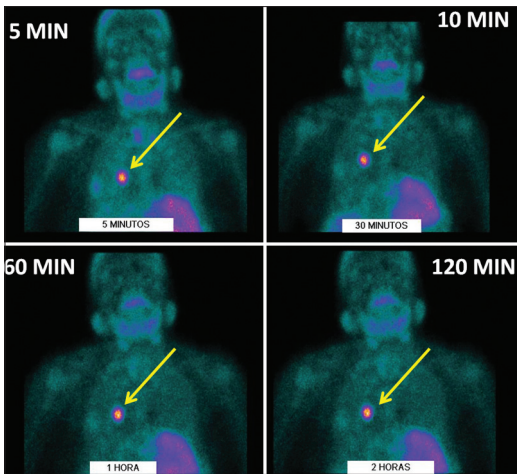


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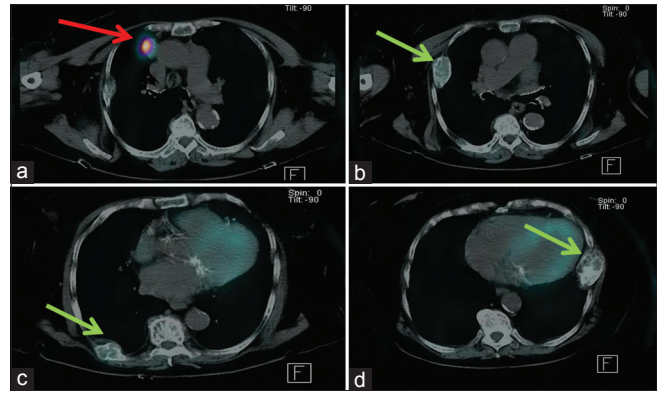


**Figure 1:** Tc-99m MIBI scans of neck and thoracic region obtained at 5, 10, 60 and 120 min showing a solitary focus of increased MIBI uptake (arrow) in the ectopic parathyroid located in the anterior mediastinum

## Discussion

In this report, we describe a rare case of brown tumor and mediastinal parathyroid adenoma. The report emphasizes the value of radionuclide scintigraphy in the setting of persistent disease after parathyroid surgery. In secondary hyperparathyroidism, immediate failure after surgery is not unusual, occurring in about 10–30% of patients. Hence imaging is mandatory prior to re-exploration in order to identify an ectopic or supernumerary gland (about 10% may have a fifth gland) that was missed at initial intervention.<sup>[1]</sup> The locations of the inferior glands are more variable, they can be found anywhere from above the carotid bifurcation to the mediastinum,<sup>[1]</sup> with approximately 9% in the last location.<sup>[5]</sup> Reviewing early and late images together with SPECT maximizes parathyroid lesion detection (sensitivity 90%, specificity 98%, accuracy 94%).<sup>[6]</sup> Hybrid SPECT/CT images provide both morphologic and functional information about an abnormality. The anatomical details of CT provide added value for the precise location of the anomalies,<sup>[1,7]</sup> as in this particular case.

Brown tumors are tumor-like lesions without autonomous growth and occur only in the more advanced stages of hyper-parathyroid bone disease;<sup>[8]</sup> particularly in patients with chronic renal failure. With increasing longevity of hemodialysis patients, such instances of hyper-parathyroidism appear to occur more and more commonly in clinical practice.<sup>[9]</sup> Brown tumors have become rare due to routine availability of facilities for routine measurement of serum Ca and PTH, allowing early diagnosis and treatment of hyperparathyroidism.<sup>[8]</sup> Microscopically they are characterized by intensely vascular fibroblastic stroma serving as a background for numerous osteoclast-like multinucleated giant cells and the cysts develop as a result of intraosseous bleeding and



**Figure 2:** Tc-99m MIBI SPECT-CT study of the chest. Cross sectional images revealed a Tc-99m MIBI avid soft tissue lesion in the anterior mediastinum adjacent to ascending aorta (image (a) red arrow), which was confirmed to be a parathyroid adenoma on histopathological examination. Multiple well-defined marginated expansile lytic lesions (Brown tumors) are noted in the ribs (images (b-d); arrows)

tissue degeneration.<sup>[3,10]</sup> The presence of hemorrhage, hemosiderin and hypervascularity leads to the brownish color, and thus the name.<sup>[3]</sup> Radiographically they appear as well-defined marginated expansile lytic lesions that may cause cortical expansion and can occur in monoostotic and polyostotic forms, commonly affecting the mandible, clavicle, ribs, pelvis, and femur.<sup>[3]</sup>

The <sup>99m</sup>Tc-sestamibi scan is less sensitive than bone scintigraphy for brown tumor detection, since it shows only large tumors.<sup>[8]</sup> The precise mechanisms for the increased uptake of <sup>99m</sup>Tc-sestamibi in a brown tumor is unknown, but seems to be related to increased cellular mitochondria, increased blood flow, increased capillary permeability, and altered potassium diffusion potentials across mitochondrial and plasma membranes.<sup>[8]</sup>

After appropriate medical or surgical treatment of the hyperparathyroidism, brown tumor may regress.<sup>[3]</sup>

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