J of Nuclear Medicine Technology, first published online February 4, 2016 as doi:10.2967/jnmt.115.170993

**Ectopic Parathyroid Adenoma in the Carotid Sheath**

Christopher D Sanders

Jared D Kirkland

Ely A Wolin

David Grant USAF Medical Center, Travis AFB, California

Corresponding author:

Christopher Davin Sanders

101 Bodin Circle, Fairfield CA 94535

707-423-7231/7182

707-423-9184 Fax

christopher.sanders.15@us.af.mil

Word Count: 750

Short Running Title: Carotid Sheath Parathyroid Adenoma

ABSTRACT:

Primary hyperparathyroidism is predominantly caused by a single parathyroid adenoma (1). Knowledge of normal and ectopic locations of parathyroid glands is crucial to help guide surgeons who plan targeted unilateral parathyroidectomy to reduce surgical time and risk. We describe a female patient with clinical primary hyperparathyroidism who underwent a failed initial parathyroidectomy, with subsequent imaging localizing an ectopic parathyroid adenoma in the carotid sheath.

Key Words: hyperparathyroidism, ectopic parathyroid adenoma, Tc99m-Sestamibi

INTRODUCTION:

Given ectopic parathyroid glands are not uncommon in the setting of primary hyperparathyroidism, preoperative localization is critical to current minimally invasive approaches of surgical excision. Knowledge of ectopic locations and appropriate imaging guidelines is imperative.

CASE REPORT:

Our patient was clinically diagnosed with primary hyperparathyroidism (PHPT) after workup for incidental hypercalcemia. Dual-phase Tc99m-Sestamibi scintigraphy with early SPECT/CT, demonstrated uptake posterior and lateral to the superior left thyroid (Fig. 1, 2). Neck ultrasound (US) was unremarkable.

Excision of the left superior parathyroid gland led to no change in intra-operative parathyroid levels. The surgeon proceeded with left hemithyroidectomy and bilateral explorative dissection, with no abnormal tissue on pathology.

Post-operative MRI did not prospectively identify a parathyroid adenoma. Repeat dual-phase parathyroid scintigraphy confirmed persistence of the adenoma. Repeat SPECT coregistered with a dedicated neck CT localized the adenoma to the left carotid sheath (Fig 3, 4).

Repeat surgery removed a pathology proven parathyroid adenoma from the left carotid sheath.

DISCUSSION:

PHPT is a clinical diagnosis, based primarily on laboratory results, usually diagnosed in the $5^{th}$-$7^{th}$ decade (1). Hypercalcemia, the primary clinical abnormality, can present with numerous symptoms including bone or abdominal pain, nephrolithiasis and psychiatric imbalances (1). Etiologies include single parathyroid adenoma, multi-glandular hyperplasia, multiple adenomas, and rarely parathyroid carcinomas (1). Surgical excision of abnormal parathyroid tissue is usually curative. Historically, bilateral cervical dissection was performed with 95% success (1). Preoperative imaging localization, however, allows for focused surgeries, reducing procedure length and risk (2).

Usually, two superior and two inferior parathyroid glands are immediately posterior to the thyroid. Ectopic parathyroid glands exist in numerous locations between mouth and diaphragm, with a frequency of 6-16% (3). Ectopia in the carotid sheath, as with our patient, is reported in <1% of cases (2).

Our institution performs a dual-phase Tc99m-Sestamibi protocol, with planar images obtained at 20 and 150 minutes, plus SPECT/CT at 20 minutes for improved localization (5). The initial exam was limited by reduced spatial resolution of the coregistered low dose cone beam CT; subsequent coregistration with high-resolution CT proved invaluable. Four-dimensional CT, along with US and MRI, can also improve preoperative localization (4).

CONCLUSION:

Because focused unilateral parathyroidectomy is curative in most cases of PHPT, with less surgical time and risk, preoperative localization is crucial. Frequently, the clinical question focuses on whether or not there is an adenoma, which is readily answered with planar scintigraphy alone. However, advanced imaging, with better anatomic localization and spatial resolution, is extremely helpful. The initial surgical failure in this case may have been prevented if the initial CT was higher resolution or if ectopia was questioned due to localization posterior and lateral to the thyroid.

DISCLOSURE:

No conflict of interest. The views expressed in this paper are those of the author(s), and do not reflect the official position of the U.S. Government, the Department of Defense, or the Department of the Air Force.

REFERENCES:

1. Johnson NA, et al. Parathyroid Imaging: Technique and Role in the Preoperative Evaluation of Primary Hyperparathryoidism. AJR. 2007;188:1706-1715.

2. Eslamy HK, Ziessman HA. Parathyroid Scintigraphy in Patients with Primary Hyperparathyroidism: 99mTc Sestamibi SPECT and SPECT/CT. RadioGraphics. 2008;28:1461-1476.

3. Roy M, et al. Incidence and localization of ectopic parathyroid adenomas in previously unexplored patients. World J Surg. 2013;37:102-106.

4. Smith JR, Oates E. Radionuclide Imaging of the Parathyroid Glands: Patterns, Pearls, and Pitfalls. RadioGraphics. 2004;24:1101-1115.

5. Greenspan BS, et al. SNM Practice Guidline for Parathyroid Scintigraphy 4.0. J Nucl Med Technol. 2012;40:111-118.

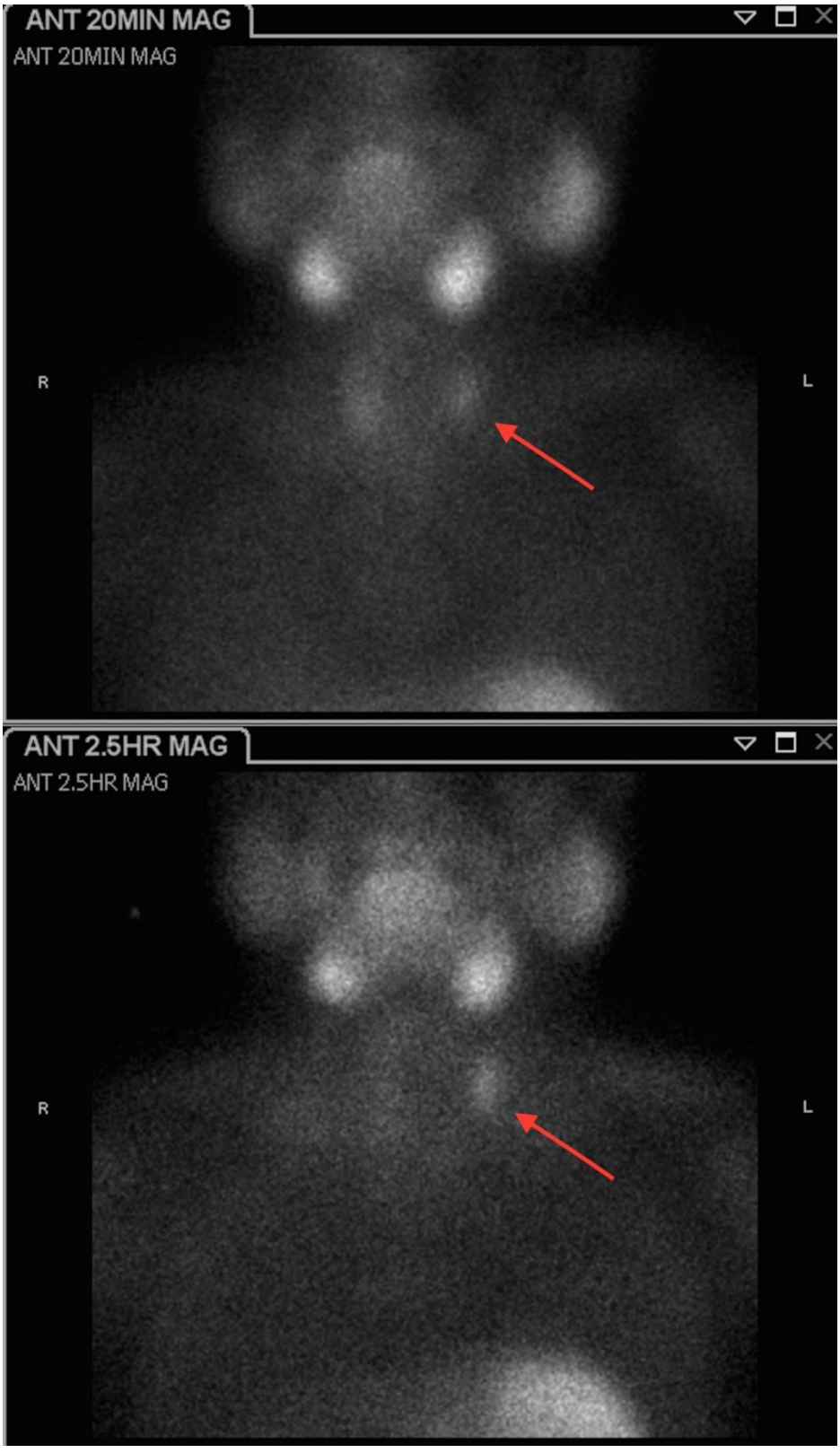


FIGURE 1. Tc99m-Sestamibi images demonstrate persistent focal uptake in the left neck.

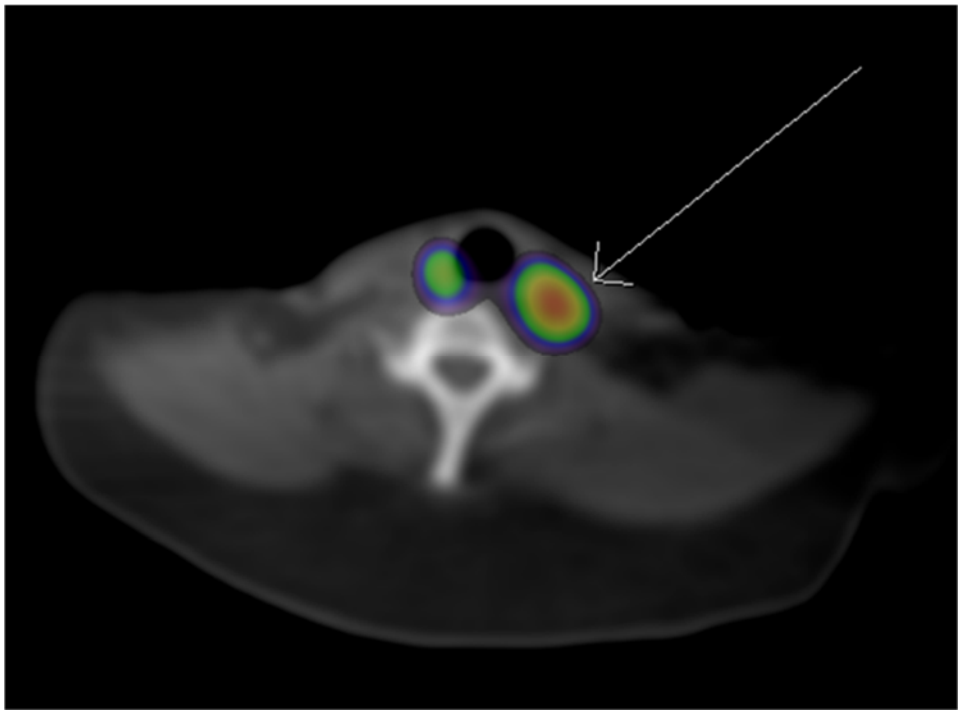

FIGURE 2. SPECT/CT data localizes uptake posterior and lateral to the superior left thyroid gland.

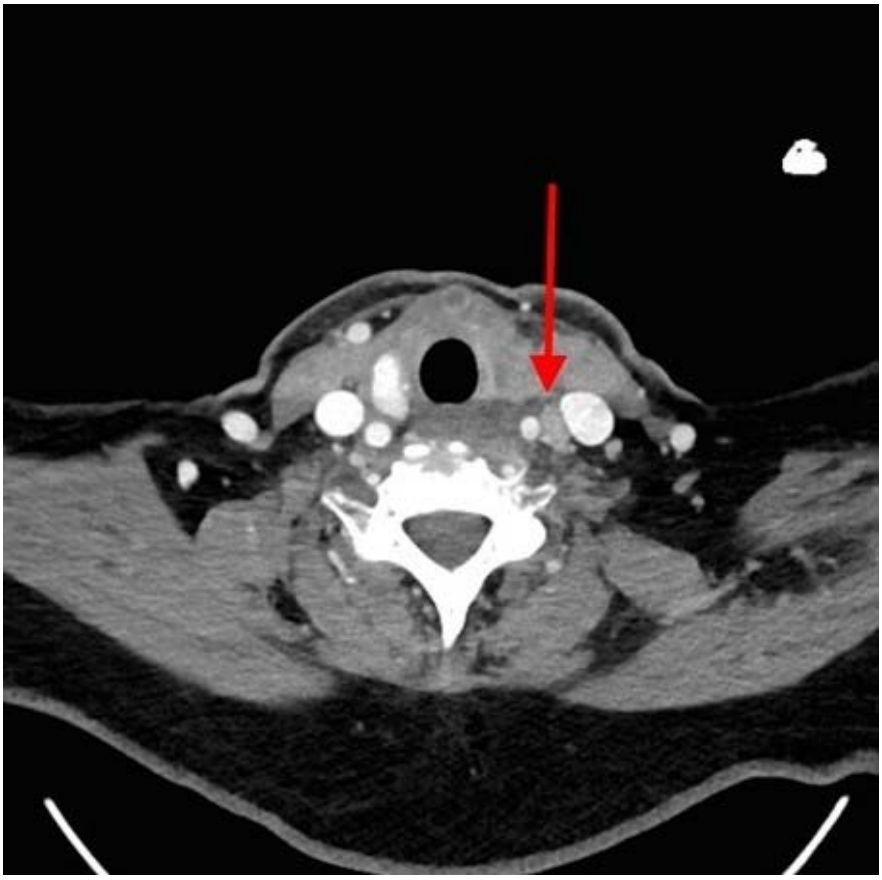

FIGURE 3. CECT demonstrates soft tissue lesion in the left carotid sheath.

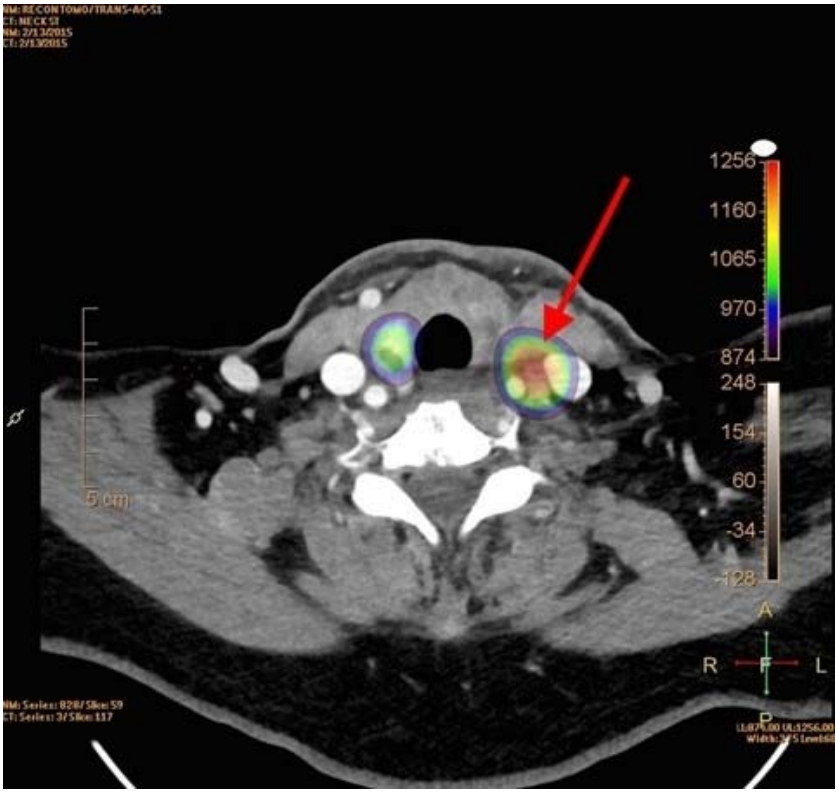


Figure 4. Fused SPECT/high-res CT localizes uptake to a soft tissue lesion in the left carotid sheath.