

CASE REPORT

# An Unusual Cause of Hot Spot on Parathyroid Imaging

<sup>1</sup>Reyaz M Singaporewalla, <sup>2</sup>Anuradha Negi, <sup>3</sup>Dominique YB Seow, <sup>4</sup>Dinesh Chinchure

**ABSTRACT**

**Background and aim:** Radiological imaging is routinely used in patients with primary hyperparathyroidism to localize the abnormal adenoma and to plan surgical approach. We report an unusual cause of false-positive localization on parathyroid sestamibi scan, i.e., not previously described in the literature.

**Case report:** A 66-year-old man with primary hyperparathyroidism showed a discrete persistent focus in the left infraclavicular area during localization using sestamibi scan. Ultrasound of the neck was negative showing only small bilateral thyroid nodules. Single-photon emission and four-dimensional computed tomography (CT) scans showed an intense focus of the tracer uptake and a 1-cm lesion near the left subclavian vein (SCV), corresponding to the infraclavicular hot spot. Initial infraclavicular exploration showed the lesion to be a collapsible saccular varix of the left SCV. Bilateral neck exploration led to the discovery of the actual right parathyroid adenoma beneath an exophytic thyroid nodule. The patient made an uneventful recovery and remains normocalcemic at 1-year follow up.

**Conclusion and clinical significance:** Hot spot on parathyroid imaging outside the line of embryological descent should be interpreted with caution. Vascular retention of injected isotope within a saccular varix of the neck vein can give rise to false-positive results on sestamibi scans. Bilateral neck exploration remains the “gold standard” procedure when localization scans either are negative or turn out to have false-positive findings.

**Keywords:** Ectopic adenoma, Parathyroid imaging, Saccular varix, Sestamibi, Subclavian vein.

**How to cite this article:** Singaporewalla RM, Negi A, Seow DYB, Chinchure D. An Unusual Cause of Hot Spot on Parathyroid Imaging. *World J Endoc Surg* 2016;8(2):164-167.

**Source of Support:** Nil

**Conflicts of Interest:** None

**INTRODUCTION**

Patients with primary hyperparathyroidism routinely undergo radiological imaging studies prior to surgery

to help in localizing the site of the abnormal adenoma.<sup>1</sup> Routine bilateral neck exploration is considered the gold standard in patients with negative localization studies.<sup>2</sup> Neck ultrasound and parathyroid sestamibi scans are the standard imaging studies done in most patients.<sup>1,3</sup> The accuracy of these localization scans is variable. In presence of thyroid nodules, the ability of these scans to pick up the parathyroid adenoma is impaired. False-positive hot spots with sestamibi parathyroid scans can occur in patients with thyroid nodules.<sup>4</sup> We describe an unusual and an interesting cause of false-positive localization on parathyroid imaging that is not previously described in the literature.

**CASE REPORT**

A 66-year-old man was noted to have hypercalcemia during routine investigations. Endocrine work-up confirmed the diagnosis of primary hyperparathyroidism. Ultrasound of neck showed the presence of multiple bilateral thyroid nodules with no suspicious parathyroid adenoma. Parathyroid sestamibi scan (Fig. 1) detected a discrete persistent focus of tracer localization in left upper chest. Single-photon emission computed tomography (SPECT) correlation demonstrated an intense focus of tracer uptake corresponding to the infraclavicular nodular opacity near the left subclavian vessels (Fig. 2). Contrast-enhanced computed tomography (CT) scan (Fig. 3) reported a well-defined 1-cm infraclavicular lesion abutting the left subclavian vein (SCV) underneath the pectoral muscles. This was suspected to be an ectopic parathyroid adenoma. Initial left infraclavicular surgical exploration confirmed this “lesion” to be a collapsible saccular varix of the left SCV (Fig. 4). The subsequent bilateral neck exploration showed the actual 300-mg right superior parathyroid adenoma (Fig. 5, arrow) hidden beneath an exophytic thyroid nodule. After removal of the adenoma, the patient recovered uneventfully with normal calcium and parathyroid hormone (PTH) levels at 6 months’ follow up.

**DISCUSSION**

The purpose of localization imaging in primary hyperparathyroidism is to aid surgeons in planning surgery and to carry out a focused removal of the localized parathyroid adenoma without the need to explore the

<sup>1</sup>Senior Consultant, <sup>2</sup>Associate Consultant, <sup>3</sup>Medical Officer <sup>4</sup>Consultant

<sup>1</sup>Department of Surgery, Khoo Teck Puat Hospital, Singapore

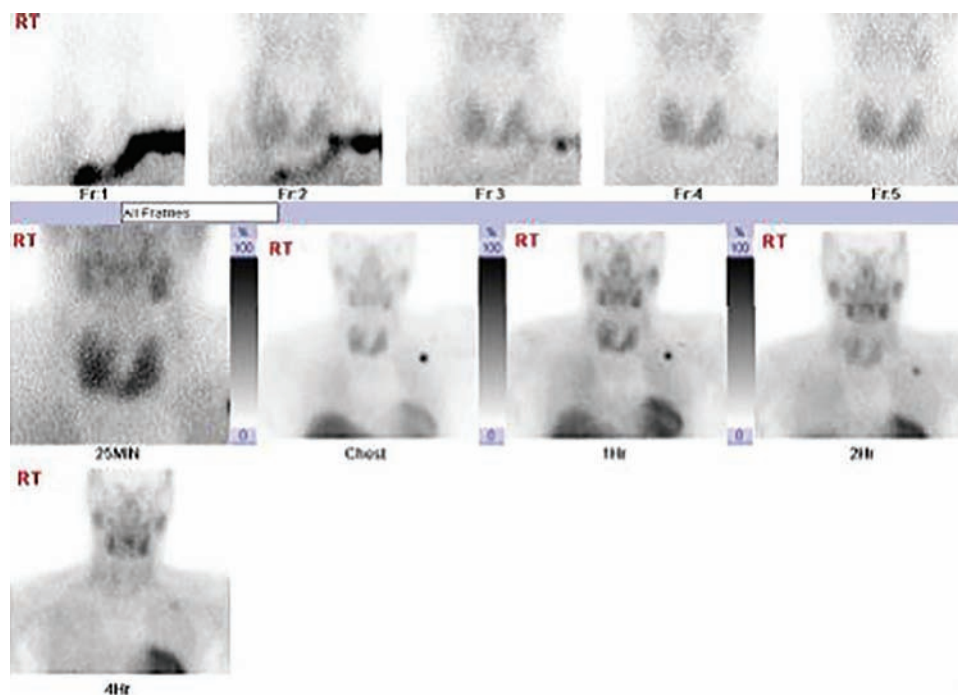
<sup>2</sup>Department of Endocrinology, Khoo Teck Puat Hospital, Singapore

<sup>3</sup>Department of General Surgery, Khoo Teck Puat Hospital Singapore

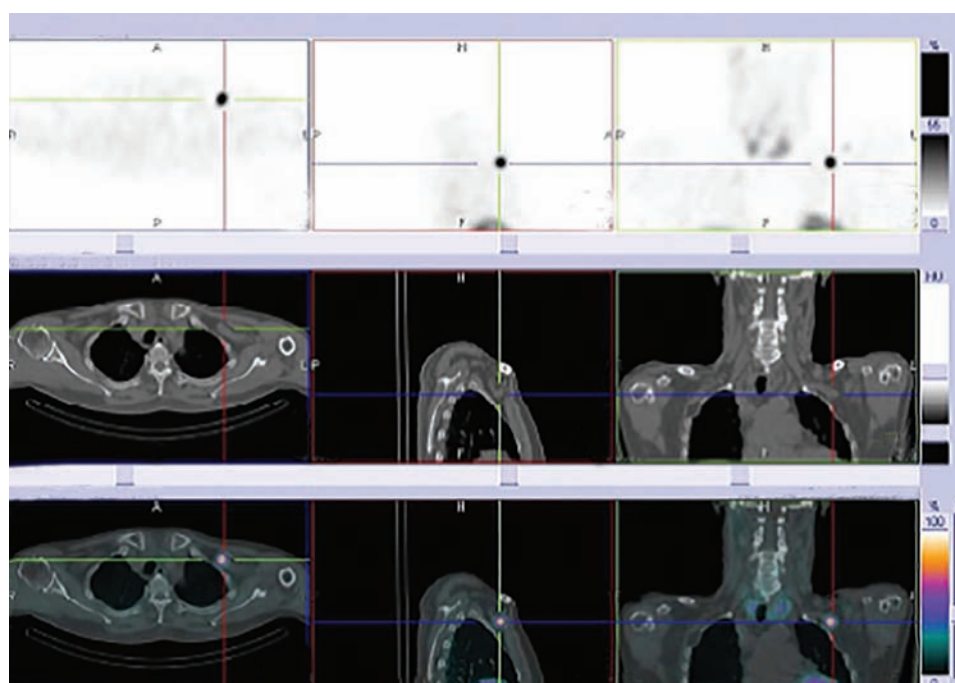
<sup>4</sup>Department of Diagnostic Radiology, Khoo Teck Puat Hospital Singapore

**Corresponding Author:** Reyaz M Singaporewalla, Consultant Department of General Surgery, Khoo Teck Puat Hospital Singapore, Phone: +656558000, e-mail: reyazm@yahoo.com





**Fig. 1:** Sestamibi parathyroid scan showing isolated delayed hot spot in the left infraclavicular region

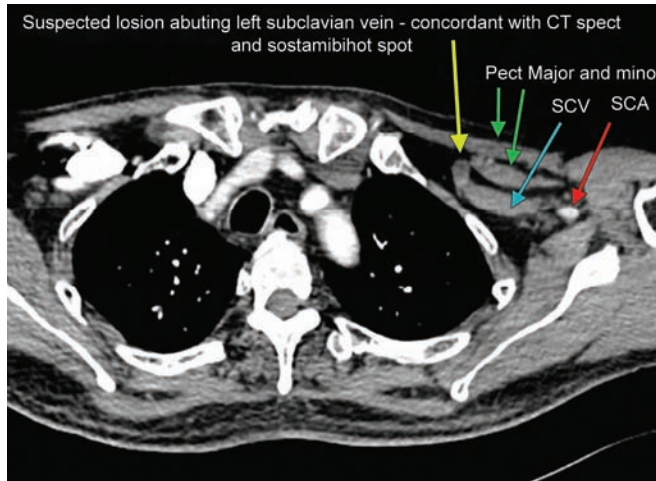


**Fig. 2:** Correlation of hot spot seen in sestamibi and CT-SPECT scan

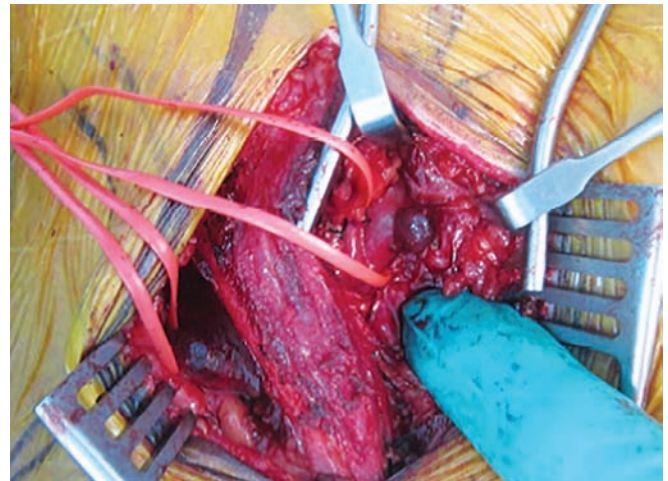
remaining parathyroid glands.<sup>5,6</sup> The availability of intraoperative PTH assay is a useful adjunct in deciding if further neck exploration is warranted.<sup>7</sup> It is well known that the presence of thyroid nodules often makes it difficult to detect small parathyroid adenomas on neck ultrasound and sestamibi scans.<sup>8</sup> In presence of negative localization, it is a routine practice to counsel patients for a bilateral neck exploration. False-positive sestamibi scans have been reported previously and in

most cases they are due to the presence of concomitant thyroid nodules.<sup>9</sup>

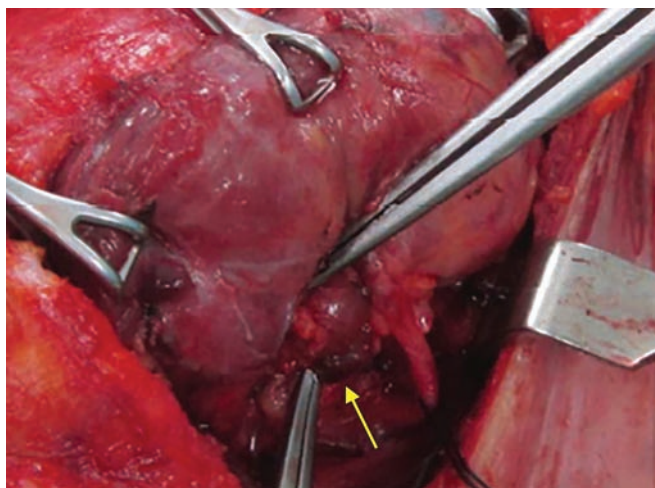
Occasionally, the sestamibi scan picks up an ectopic adenoma in the neck or in the mediastinum that may change the plan of surgery. In our patient, the presence of an isolated persistent uptake in the left infraclavicular area after 4 hours and a corresponding hot spot in the SPECT scan led to a possibility of this being an ectopic parathyroid adenoma. The presence of a “well-defined



**Fig. 3:** Contrast-enhanced computed tomography scan showing suspicious lesion (yellow arrow) abutting the left SCV (blue arrow) beneath the pectoral muscles (green arrow). Left subclavian artery (SCA) is marked with red arrow



**Fig. 4:** Infraclavicular exploration showed a collapsible saccular varix of the left SCV at the site of imaging hot spot



**Fig. 5:** Neck exploration showed a 300-mg right superior parathyroid adenoma (arrow) hidden beneath an exophytic thyroid nodule

lesion” close to the left SCV on contrast-enhanced CT also made it difficult to rule out the possibility of it being an ectopic adenoma. The absence of intravenous (IV) contrast filling the “lesion” adjacent to the SCV led us to believe that this maybe a solid nodule. The lack of other differentials in diagnosing this lesion led us to perform an initial infraclavicular surgical exploration to confirm the findings. The surgical team had already counseled and consented the patient to proceed with a bilateral neck exploration if the infraclavicular exploration was negative. The possibility that this “hot spot” could be due to vascular retention of the injected isotope within the subclavian saccular varix never crossed our minds preoperatively. On hindsight, the observation that the site of tracer uptake and hot spot was in the infraclavicular location adjacent to the left SCV should have made us to suspect a false-positive imaging result. This location is neither in

the usual anatomical pathway of descent of parathyroid glands nor in the well-documented positions for ectopic parathyroid adenomas.<sup>10</sup> There are no published reports of similar cases in the English literature. It is important for both endocrine surgeons and radiologists to be aware of such false-positive parathyroid localization scans and keep in mind vascular retention of isotope within a varix as a differential diagnosis. This case also reinforces an important learning point, which is often forgotten in the modern era of high-tech imaging, that bilateral neck exploration remains the “gold standard” when localization scans are negative or turn out to have false-positive findings in patients with primary hyperparathyroidism.

## REFERENCES

1. Johnson NA, Tublin ME, Ogilvie JB. Parathyroid imaging: technique and role in the preoperative evaluation of primary hyperparathyroidism. *AJR Am J Roentgenol* 2007 Jun;188(6):1706-1715.
2. van Heerden JA, Grant CS. Surgical treatment of primary hyperparathyroidism: an institutional perspective. *World J Surg* 1991 Nov-Dec;15(6):688-692.
3. Lumachi F, Zucchetta P, Marzola MC, Boccagni P, Angelini F, Bui F, D'Amico DF, Favia G. Advantages of combined technetium-99m-sestamibi scintigraphy and high-resolution ultrasonography in parathyroid localization: comparative study in 91 patients with primary hyperparathyroidism. *Eur J Endocrinol* 2000 Dec;143(6):755-760.
4. Isik S, Akbaba G, Berker D, Tutuncu YA, Ozuguz U, Aydin Y, Peksoy I, Guler S. Thyroid-related factors that influence preoperative localization of parathyroid adenoma. *Endocr Pract* 2012 Jan-Feb;18(1):26-33.
5. Arici C, Cheah WK, Ituarte PH, Morita E, Lynch TC, Siperstein AE, Duh QY, Clark OH. Can localization studies be used to direct focused parathyroid operations? *Surgery* 2001 Jun;129(6):720-729.
6. Minisola S, Cipriani C, Diacinti D, Tartaglia F, Scillitani A, Pepe J, Scott-Coombes D. Imaging of the parathyroid glands

- in primary hyperparathyroidism. *Eur J Endocrinol* 2016 Jan;174(1):D1-D8.
7. Irvin GL III, Dembrow VD, Prudhomme DL. Clinical usefulness of an intraoperative "quick parathyroid hormone" assay. *Surgery* 1993 Dec;114(6):1019-1023.
  8. Erbil Y, Barbaros U, Yanik BT, Salmaslioğlu A, Tunaci M, Adalet I, Bozbora A, Ozarmağan S. Impact of gland morphology and concomitant thyroid nodules on preoperative localization of parathyroid adenomas. *Laryngoscope* 2006 Apr;116(4):580-585.
  9. Whitcroft KL, Sharma A. Sestamibi scintigraphy for parathyroid localisation: a reminder of the dangers of false positives. *BMJ Case Rep* 2014 Mar 11;2014.
  10. Phitayakorn R, McHenry CR. Incidence and location of ectopic abnormal parathyroid glands. *Am J Surg* 2006 Mar;191(3):418-423.