CASE REPORT

Double Whammy Sestamibi

Anish Cherian,* Pooja Ramakant,* Deepak Abraham,* Paul M.J.**

Introduction

Primary hyperparathyroidism (PHPT) is a rare clinical entity. It can be a debilitating disease. The most common cause of PHPT is a single parathyroid adenoma. The only curative treatment modality is surgery. Minimally invasive parathyroidectomy has become the gold standard approach for a single adenoma and hence the reliance on preoperative localization methods has increased. Technetium 99m sestamibi scan is one such localization method. We report a case of false positive sestamibi scintigraphy due to a hurthle cell adenoma of the thyroid. This case highlights the potential limitations of technetium scintigraphy in preoperative localization and the management of such patients.

Case Report

A 52 year old gentleman presented with a history of fatigue and low back pain. He also complained of a recent episode of hematuria associated with right loin pain. Evaluation for these symptoms detected a calculus in the right proximal ureter. Biochemical parameters were consistent with primary hyperparathyroidism - serum calcium 11.5mg/dl (normal 8.3-10.4mg/dl), Serum phosphorous 1.5 mg/dl (normal 2.5-4.6mg/dl), parathormone (PTH) 253.7pg/ml (normal 8-74pg/ml) and 24hour urine calcium 368mg (normal <240mg). An ultrasound (USG) of the neck showed a 16 X 6.5 mm oval hypoechoic well defined lesion with thin echogenic rim and feeding artery inferior to the lower pole left lobe of thyroid and ^{99m}Tc Sestamibi scan revealed persistence of tracer in the region of the left inferior parathyroid at 90 minutes – concordant imaging (figure 1 and 2). He underwent a focused left inferior parathyroidectomy under local anesthesia excising a 1.3x1cm lesion weighing 980mg. The lesion was adherent to the thyroid with difficulty in separating it from the thyroid. Intraoperative PTH (IOPTH) is not routinely performed at our institution and hence was not done. Postoperatively he was found to have persistent hyperparathyroidism (table 1). Histopathology revealed a hurthle cell adenoma of the thyroid with no parathyroid tissue. Two weeks later the ^{99m}TcSestamibi was repeated.

Post-operative day	S. Calcium (mg/dl)	S.Phosphorous (mg/dl)	PTH (pg/ml)
1	11.0	2.8	268.9
2	10.5	-	275
5	11.0	-	-

Table 1: Depicting the postoperative biochemical parameters after the first operation

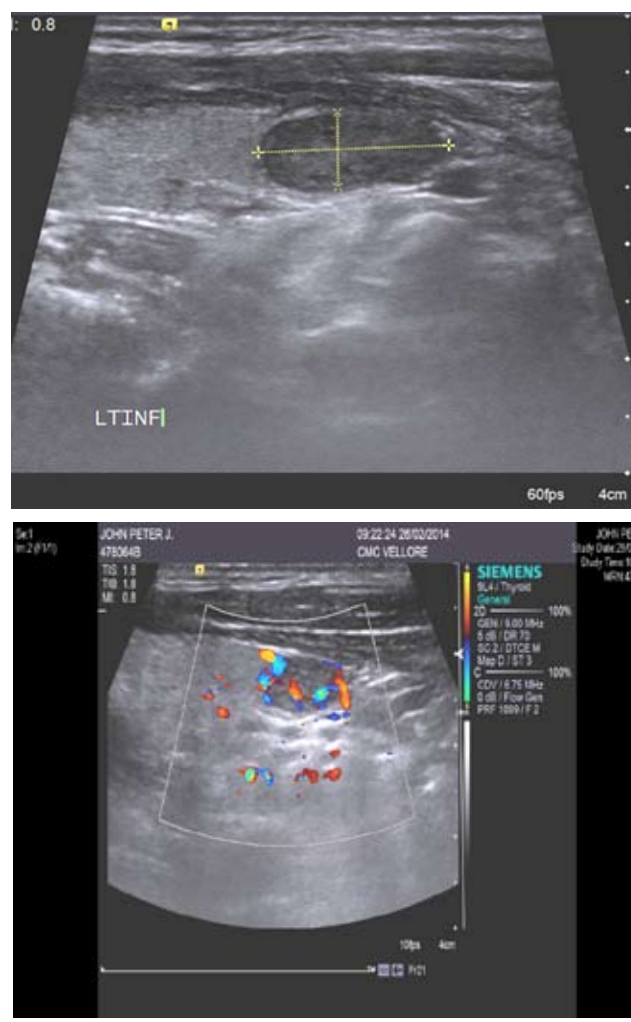

Figure 1: Depicting a hypoechoic lesion with internal vascularity in the region pole the lower pole of the thyroid

** *Professor of Endocrine Surgery*

* *Assistant Professor / Associate Professor, Christian Medical College, Vellore.*

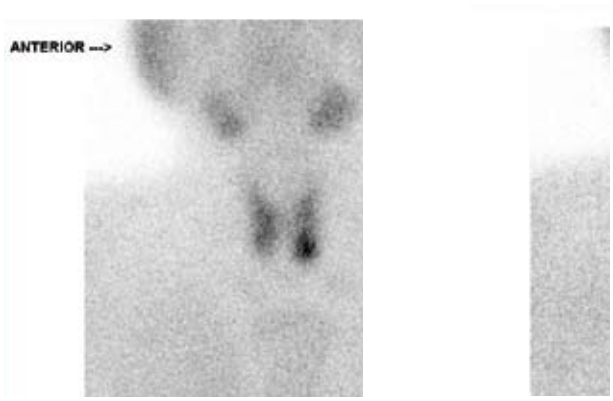

Figure 2:
^{99m}Tc Sestamibi scan depicting persistence of tracer accumulation in the region of left inferior parathyroid gland at 90 minutes

There was a persistence of tracer in the region of the right inferior parathyroid at 90 minutes (figure 3). No lesion was seen on repeat USG of the neck. Our department policy is to proceed with bilateral cervical exploration if preoperative imaging is discordant hence he underwent a bilateral neck exploration three month after the first operation. Intraoperatively the right inferior parathyroid and left superior parathyroid glands were enlarged weighing 510mg and 100mg respectively. These were removed. The left inferior parathyroid gland was not visualized in its normal position or in probable ectopic sites (thyrothymic tract, superior horn of thymus or within the carotid sheath). The right superior parathyroid gland appeared the most normal and was left insitu. Additionally a cervical thymectomy was performed. Postoperatively the PTH dropped to 3.9pg/ml and he was normocalcemic (calcium – 8.7mg/dl). The final histopathology revealed hyperplasia of both the excised parathyroid glands and thymic tissue with no specific lesion. At six month follow up he still complained of low back pain. The corrected calcium was 9.6 mg/dl and PTH 64ng/ml.

Discussion

The causes for primary hyperparathyroidism are parathyroid adenoma (~80%), hyperplasia (10-15%) or carcinoma (<1%)(1). The diagnosis of PHPT is based on biochemical parameters – hypercalcemia and an elevated parathormone (PTH) with a fall in serum phosphorous(1). The management of this condition is surgical excision of the offending parathyroid gland. Prior to this the gland must be localized. The most common imaging modalities used for localization are ultrasonogram of the neck and ^{99m}Tc Sestamibi scan(2). When both these imaging modalities identify the lesion at the same side and site (concordant imaging), one can confidently proceed with focused parathyroidectomy. ^{99m}Tc sestamibi consists of lipophilic cationic molecules which by passive diffusion into the cell are concentrated in the mitochondria. The abnormal parathyroid gland retains the marker - due to increased mitochondrial activity, for a longer period of time as compared to the thyroid. This promotes localization of the parathyroid adenoma(3). Sestamibi has been regarded as the single best imaging modality for parathyroid adenoma localization with a sensitivity of 90.7%(4). Nevertheless, this technology has its limitations. This imaging modality provides only a two-dimensional planar image, thyroid nodules can also mimic abnormal parathyroid glands causing false-positive results and it is less sensitive in the diagnosis of small parathyroid glands and multigland disease(5,6).

Ultrasound of the neck is a non-invasive, inexpensive modality but highly user dependent. Its sensitivity for parathyroid localization has been reported to be 71-80%(4). Size and location of the adenoma influence the accuracy of this modality. False positive interpretation may be due to thyroid nodules, longus colli muscle or hyperplastic lymph nodes(7). Hence USG for parathyroid localization needs to be performed by an experienced sonologist.

A combination of sestamibi and USG increases the likelihood of localizing a parathyroid adenoma, but as depicted in our patient a thyroid nodule can contribute to false positive imaging. This has serious implications as in this situation a concordant preoperative imaging leads to a focused parathyroidectomy, but failure to cure the patient. Therefore knowledge of the limitations of imaging modalities is essential and one must keep this in mind while operating. Intraoperatively a "suspected" parathyroid lesion adherent to the thyroid must prompt the surgeon to reconsider the diagnosis and to explore other possible locations for a parathyroid gland. The use of IOPTH as an adjunct to confirm the successful excision of the abnormal parathyroid is helpful in such situations.

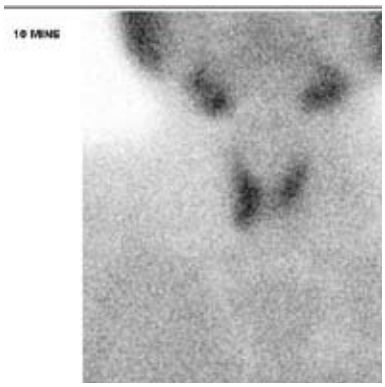

Figure 3: ^{99m}Tc Sestamibi showing persistence of tracer accumulation in region of right inferior parathyroid gland at 90 minutes

Persistent hypercalcemia is defined as hypercalcemia persisting or recurring within six months of surgery for hyperparathyroidism. The most common cause is failure to excise the offending lesion during the first operation. Other reasons include missed double adenoma, inadequate surgery for parathyroid hyperplasia, parathyroid carcinoma and parathyromatosis(8). A false positive sestamibi scan and USG neck showing a concordant lesion in the patient described above influenced the intraoperative management, leading to failure of resection of the offending lesions. This resulted in persistent hyperparathyroidism. Management of persistent hyperparathyroidism requires reconfirming the diagnosis followed by localization of the lesion with imaging modalities mentioned previously. Failure to localize the lesion with these modalities would necessitate further noninvasive imaging in the form of computerized tomography (CT scan) or magnetic resonance imaging (MRI), or invasive modalities such as selective venous sampling(9). Our patient had persistent hypercalcemia with discordant imaging. We proceeded with bilateral cervical exploration. This patient had PHPT due to parathyroid hyperplasia, which is another cause for misleading sestamibi findings. Therefore, in the background of persistent hyperparathyroidism due to suspected single gland disease, it may be prudent to consider bilateral neck exploration and examine all four parathyroids despite the preoperative localization findings.

Conclusion

Sestamibi scan is a very useful imaging modality to localize a parathyroid lesion but it has its limitations. As depicted in this case, thyroid nodules and multigland parathyroid disease can cause false positive sestamibi findings. Ultrasound of the neck for localization is user dependent. It must be performed and interpreted by an experienced sonologist. Intraoperatively, adherent planes or a hard nodule must prompt the surgeon to reconsider the diagnosis and explore other ectopic sites for parathyroid. IOPTH may be a good adjunct in such situations. Bilateral neck exploration may be warranted for patients with suspected single gland disease and persistent hyperparathyroidism despite the preoperative localization findings.

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