

Localization of the Parathyroid Adenoma in Mibi-Negative Cases: The Value of a Dedicated Sonologist

Sir,

Once the diagnosis of primary hyperparathyroidism (PHPT) has been established, localization of the abnormal gland becomes a priority. Sestamibi (MIBI) scintigraphy combined with the single photon emission computed tomography (SPECT) is the initial test of choice in all cases, as it is the best test to screen both the cervical and mediastinal lesions and has the highest positive predictive value of the available imaging techniques.^[1] Additional imaging modalities that have also been used successfully include ultrasound (US), 4D-CT, and 11C-methionine PET-CT.^[2] US is highly sensitive in experienced hands and is inexpensive, non-invasive, and reproducible in the operating room. However, the accuracy of US is operator dependent, and needs a skillful eye to pick up small adenomas, “hidden adenomas,” and intra-thyroidal lesions. US combined with MIBI offers the best sensitivity (up to 95%) and positive predictive value in localization of the abnormal gland.^[3] Doubtful lesions and intra-thyroidal lesions can be assessed with needle aspirate parathyroid hormone (PTH) which can accurately localize an intra-thyroidal parathyroid adenoma.^[4]

We have been performing MIBI and US in all our patients with PHPT in our institution from 2015 till date. We have a single person reading all the MIBI scans (author, Sunil HV) and one operator performing the US (author, Subramanian Kannan). US was performed using a 8–12 Hz probe of a Samsung sono-ACER3 machine. A Dual-Phase 99mTc-Sestamibi protocol with early (10–30 min after

injection) and delayed (1.5–2.5 h after injection) high-count images of neck and thorax were obtained after intravenous injection of 15–20 mCi of 99mTc-Sestamibi. Delayed SPECT computed tomography (SPECT CT) images were also acquired on most occasions to aid better localization. We retrospectively reviewed our records of patients who had undergone surgery for PHPT from January 2015 to August 2018 to study our cases in which MIBI was negative.

We had 38 patients with PHPT who were operated 2015 onwards. MIBI and US was done in all patients except three patients (two of them had pancreatitis during pregnancy and one presented with neck mass on the CAT scan) who only underwent US. The mean age of the cohort was 49 ± 15 years with 22 females. All patients (100%) had a positive localization in the US, and 28 patients (74%) were positive on the MIBI. Among those with MIBI negative (10 patients), US localized the abnormal gland in all the cases, among whom two patients had multi-gland adenomas, three had intra-thyroidal adenomas [Table 1]. One patient (AAM) with a left-sided intra-thyroidal adenoma had a positive needle tip PTH >20000 and underwent left hemithyroidectomy. One patient (R) with bilateral thyroid nodules with Bethesda 3 on cytological assessment had cellblock stained positive for PTH and underwent total thyroidectomy. In another patient (S) who had multiple small (4–6 mm) intra-thyroidal lesions, US could not localize which of these thyroid nodules corresponded to the parathyroid adenoma. However, US gave a guiding plan on “what to do next” when the intro-operative PTH (IOPTH) did not drop below 80% of the baseline value. All our patients

Table 1: Clinical summary of MIBI-negative patients

Initials	Presentation	Age	Gender	US Localise	Location of parathyroid adenoma	Comment
R	Pulmonary Hypertension	46	F	Y	BLINTTHY	Bilateral nodules in both lobes; Pre-op FNAC localised both nodules positive for PTH on IHC and she underwent total thyroidectomy
TG	PHPT	38	M	Y	RTINF	Single adenoma [Figure 1]
S	PHPT	27	F	Y	LTSUP	Single adenoma
T	Elevated Alk Phos	27	M	Y	RTINF	Single adenoma
C	PHPT	57	F	Y	RTSUP & RTINF	Multiple adenomas right superior and inferior adenomas
SP	Pancreatitis	32	M	Y	LTSUP	Single adenoma [Figure 2]
N	PHPT	70	F	Y	RTSUP	Single adenoma
AAM	PHPT	70	M	Y	LT	Left sided Intrathyroidal single adenoma with Needle tip PTH>20000
KC	Osteoporosis	58	F	Y	LTINF	Single adenoma
S	Brown Tumor	52	F	Y	LT	Multiple sub-centimeter thyroid nodules resulting in total thyroidectomy and left sided intra-thyroidal adenoma; Patient had hypoparathyroidism

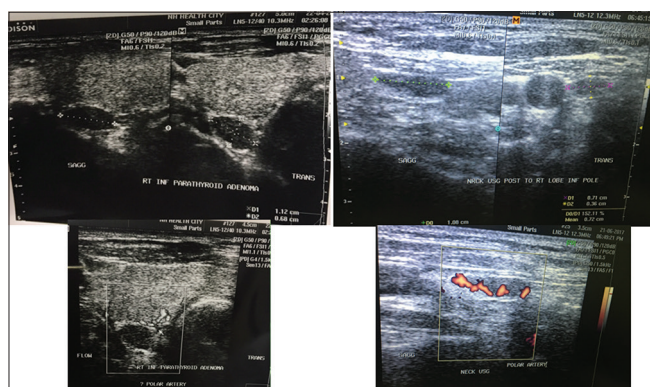


Figure 1: Ultrasound appearance of parathyroid adenomas in MIBI-negative patients

have been rendered eucalcemic on follow up at 6 months. One patient (S) (who underwent total thyroidectomy) developed permanent hypoparathyroidism.

In our institution, US helped localizing parathyroid adenomas in all our MIBI-negative patients. While there are multiple options of imaging in patients with PHPT who are MIBI negative, we feel US is an important, non-invasive imaging step in PHPT. Unlike the nuclear imaging or cross-sectional imaging which give a binary localizing result as adenoma present or absent, the US report by a dedicated sonologist can give a map of the suspected lesions present within the thyroid gland and outside the thyroid gland [Figure 3]. In order of likely possibility of parathyroid adenoma, the sonologist can give the surgeon an exploratory plan for localizing the diseased gland. This helps with the operative plan if the IOPHT did not drop as expected. Our approach of using MIBI + US + IOPHT in all the patients with PHPT during parathyroid exploration provides a balanced approach between

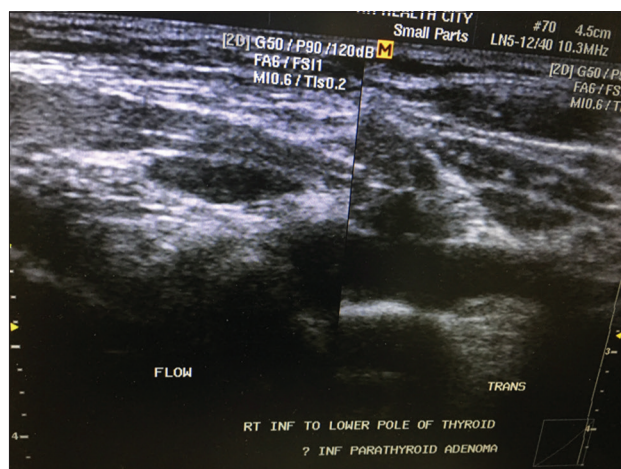


Figure 2: Ultrasound appearance on patient who was pregnant and presented with pancreatitis and was diagnosed with primary hyperparathyroidism

focal gland exploration which may miss multi-gland disease and avoid routine 4-gland exploration which has a risk of permanent hypoparathyroidism.

Dedicated sonologist with experience in parathyroid imaging can effectively localize the abnormal gland in all MIBI-negative cases and in most cases chart a road map for the surgeon intra-operatively. All patients with PHPT should have a neck US by a dedicated sonologist before surgery.

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Nil.

Conflicts of interest

There are no conflicts of interest.

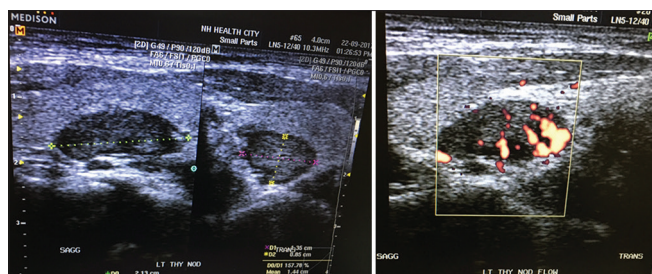


Figure 3: Ultrasound appearance of intra-thyroidal parathyroid adenoma

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