Case 4: 27 yr-old woman with history of kidney stones and hyperparathyroidism.

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Hyperparathyroidism

27-yr old woman with history of kidney stones.

Background

Primary hyperparathyroidism (PHPT), i.e. autonomous hyper-production of parathyroid hormone (PTH), is caused in 80%-90% of the patients by a single adenoma.

Pre-operative imaging localization of parathyroid adenoma(s) is critical for successful surgery, especially for minimally invasive parathyroidectomy.

An optimized protocol based on planar imaging with dual-phase, dual-tracer scintigraphy (^{99m}Tc-Sestamibi/$^{99m}TcO_4^-$), plus an early SPECT/CT study, can make the use of intra-operative measurement of parathyroid hormone unnecessary .

Clinical data

Blood chemistry: serum PTH 156 pg/mL;
Calcium 11.27 mg/dL.

Neck US: no abnormal findings in areas that could harbor parathyroid adenomas.

Rationale for examination

Planar dual-phase, dual-tracer parathyroid scintigraphy (^{99m}Tc-Sestamibi and $^{99m}TcO_4^-$), plus SPECT/CT early after ^{99m}Tc-Sestamibi is able to:

- **identify a solitary adenoma with high sensitivity and, based on the SPECT/CT study, even in cases of ectopic localizations (about 20% of the cases);**
- **provide accurate anatomic localization of parathyroid adenoma(s) and thus make intraoperative PTH measurement (IQPTH) unnecessary during minimally invasive radioguided parathyroidectomy.**

Parameters of the examination

- Intra-venous injection of 740 MBq ^{99m}Tc-Sestamibi.

- 10 minutes post-injection: acquisition of 10-min static images of the neck and chest (matrix 128×128, zoom 1.33).

- Static acquisitions followed by a SPECT/CT study (matrix 128×128, zoom 1.33, step-and-shoot protocol of 30s/3°step).

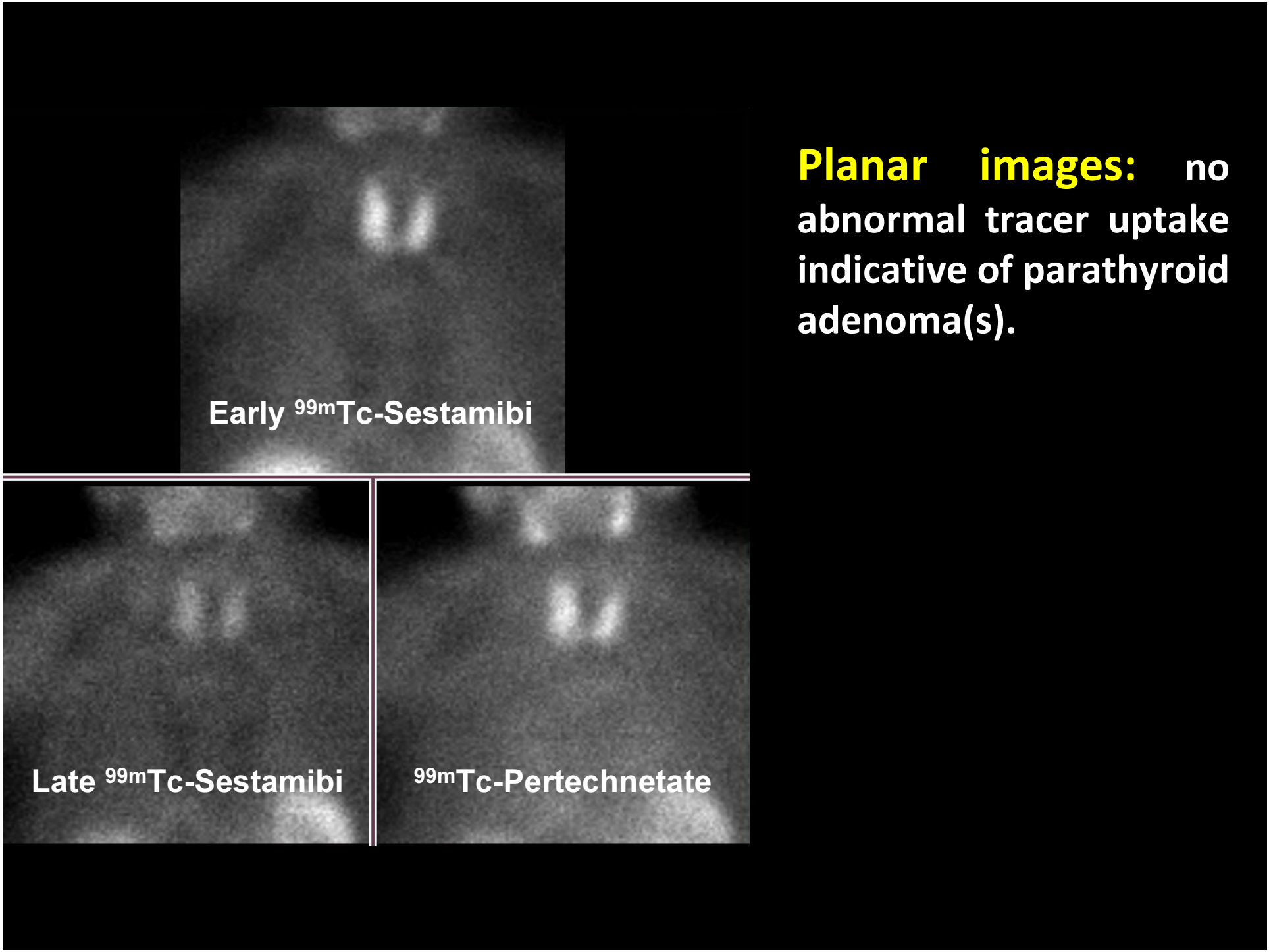
- Additional planar acquisitions 150 minutes after injection of ^{99m}Tc-Sestamibi.

- Administration of 370 MBq ^{99m}Tc-pertechnetate, with subsequent acquisition of a thyroid scan.

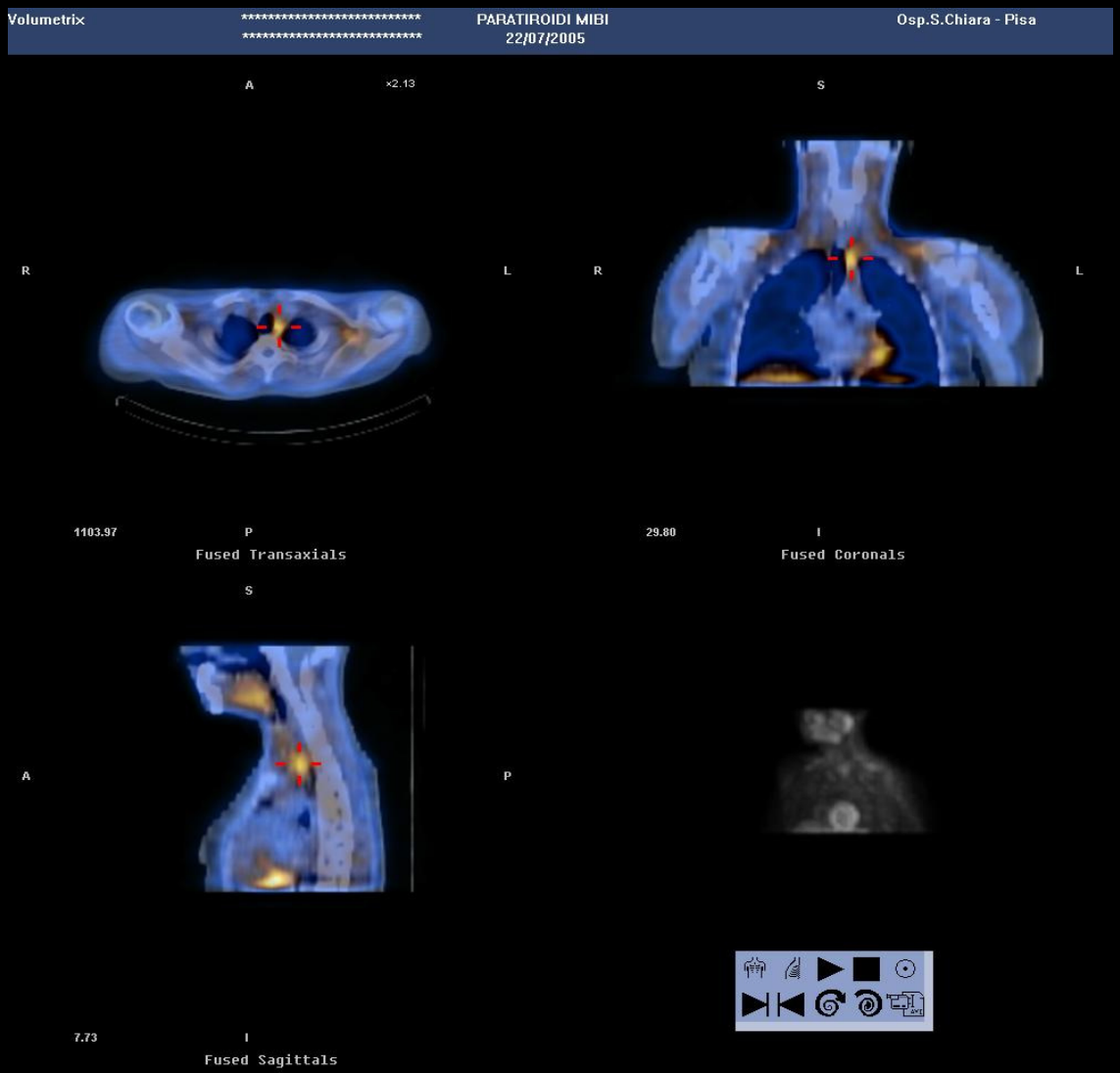
Findings

- Structured approach to image review:

  - quality: satisfactory;
  - completeness: complete
  - SPECT/CT study - for accurate anatomic localization of the parathyroid adenomas even if ectopically located.



Planar images: no abnormal tracer uptake indicative of parathyroid adenoma(s).



SPECT/CT:

parathyroid adenoma located in left para-retro-tracheal region.

Scintigraphic findings

Considering the presence of a solitary adenoma (as is the case in 80% of the patients with PHPT), the patient was advised to undergo minimally-invasive radioguided parathyroidectomy (MIRP), with the possibility of choosing either general or local anesthesia.

MIRP Technique

One week later, 74 MBq ^{99m}Tc-Sestamibi was injected 30 minutes before the start of surgery.
Through a skin incision <3 cm, dissection of the adenoma was guided by a 14-mm collimated gamma-probe (the patient chose local anesthesia).

Counts: Thyroid 79 cps
Background 25 cps
In-vivo parathyroid adenoma 40 cps
Ex-vivo parathyroid adenoma 60 cps

Discussion:

- MIRP was successfully performed without the need for IQPTH.
- Hypercalcemia did not recur during long-term post-surgical follow-up, and the patient is therefore to be considered as cured.
- An optimized scintigraphic protocol makes it possible for patients with PHPT due to a solitary adenoma to undergo minimally-invasive radio-guided parathyroidectomy without the need for IQPTH.

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