

APPROACH TO A PATIENT WITH CLINICALLY AND BIOCHEMICALLY ACTIVE PRIMARY HYPERPARATHYROIDISM DESPITE NEGATIVE SESTAMIBI 99MTC

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Abstract

Introduction: Primary hyperparathyroidism (PHPT) resulting from increased parathyroid hormone (PTH) secretion. In 80% of cases the cause is a solitary adenoma. It occurs more often in women. The gold standard in the diagnosis of PHPT is MIBI 99m Tc scintigraphy. **Patient presentation.** A 35-year-old woman is referred to outpatient clinic due to high values of PTH, calcium and frequent recurring nephrolithiasis. From the laboratory analysis we show: PTH 317 pg/ml, Ionized calcium 1.71 (1.16 to 1.31 mmol/L); phosphates 0.73mmol/L; Vitamine D3 18.68 ng/ml. The patient is referred for neck ultrasound and bone densitometry (DEXA). A hypochoic nodule with dimensions of 0.69x0.63x0.67 cm is visualized on ultrasound under the right lobe of the thyroid gland. In the DEXA scan, osteopenia is detected (T-score -2.2). Sestamibi scintigraphy was performed in two repetitions where no adenoma of the parathyroid gland was detected. The patient is referred for neck computed tomography (CT); a small nodule suspicious for parathyroid adenoma is visualized. Due to the clinical manifestation and the constant high values of hypercalcemia, the patient is referred for parathyroidectomy. After the operation, a few days later, the values of PTH (63.5 pg/ml) and ionized calcium (1.18 mmol/L) were normal. **Conclusion.** Sestamibi scintigraphy is rarely negative during clear clinical and biochemical signs. The sensitivity of Sestamibi is 80-100%, and in cases where it is negative, especially when the volume of the nodule in PHPT is small, additional analyzes such as neck CT, 18FCholine PET/CT enable the decision-making of the definitive treatment – parathyroidectomy in PHPT.

Keywords: Hyperparathyroidism, 99MTC, endocrinology.

1. Introduction

Primary hyperparathyroidism (PHPT) is relatively common endocrine disorder resulting secretion of high levels of parathyroid hormone by enlarged parathyroid (PT) gland. The diagnosis of PHPT is based on symptoms and signs (frequent and recurrent lithiasis), laboratory findings (high level of PTH, high total and ionized Calcium and low level of phosphates). Few diagnostic methods can be used including neck ultrasound, 4-dimensional CT, and 18 F-Fluorocholine PET scan. The sensitivity of cervical US for parathyroid adenoma is around 89.7% and that of 99mTc-methoxyisobutylisonitrile (99mTc-MIBI) 71.8%, and their combined use has a sensitivity of 92.3% [1]. Cervical US is widely accepted as one of the initial diagnostic methods of choice for localization of HPT, followed by 99mTc-MIBI scintigraphy. The 99mTc-MIBI SPECT/CT technique is among the preferred scintigraphic methods for localizing hyper functional parathyroid gland, especially in ectopic locations [2] is the current standard method for detecting HPT [3] and is the conventional first-line presurgical imaging method. If the results of SPECT/CT parathyroid scintigraphy are equivocal or negative, an alternative investigation using a hybrid PET/CT technique is

recommended [4,5]. Our aim is to present a case of patient with pHPT and negative ^{99m}Tc-MIBI scan.

2. Case presentation

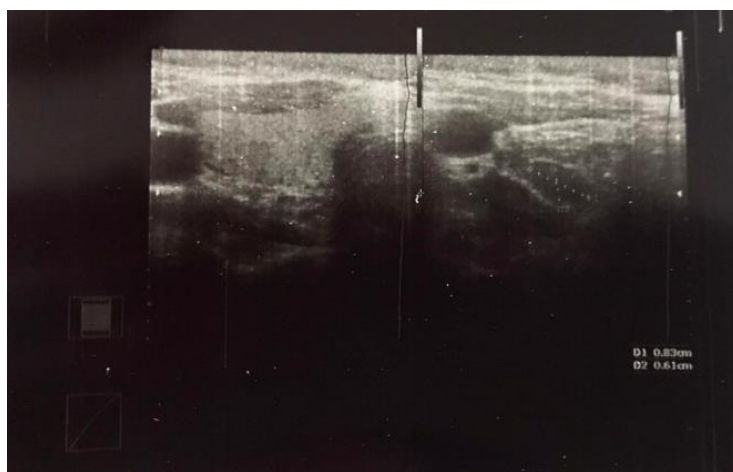
A 35-year-old woman is referred to outpatient clinic due to high values of PTH, calcium and frequent recurring nephrolithiasis. The patient reported nausea and the presence of stones in her kidney. In the last 5 years she underwent lithotripsy two times but the kidney stones keep continuously forming. The patient reported that her mother suffered from the same condition. She has no comorbidities, she does not take any medications and has no reported allergies. In 2007 she suffered an ectopic pregnancy which resulted in the removal of the left fallopian tube. She was also diagnosed with hydronephrosis stage. II. She is a nonsmoker and does not consume alcohol. On the physical exam the patient appeared alert, oriented, cooperative, and afebrile. The palpation of the thyroid gland revealed no enlarged masses. Cardiopulmonary compensated with blood pressure 110/82 and pulse of 90/min. Blood work was done, and it revealed the following. PTH 317.9 pg/ml; Ionized calcium 1.71 mmol/L; Inorganic phosphates 0.73 mmol/L.

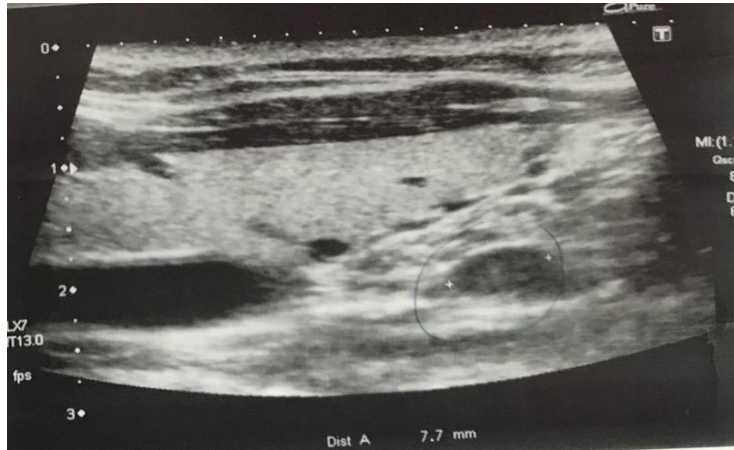
β-Cross L 0.397; Vit D3 18.68 ng/ml.

Table 1. Laboratory findings patient presentation

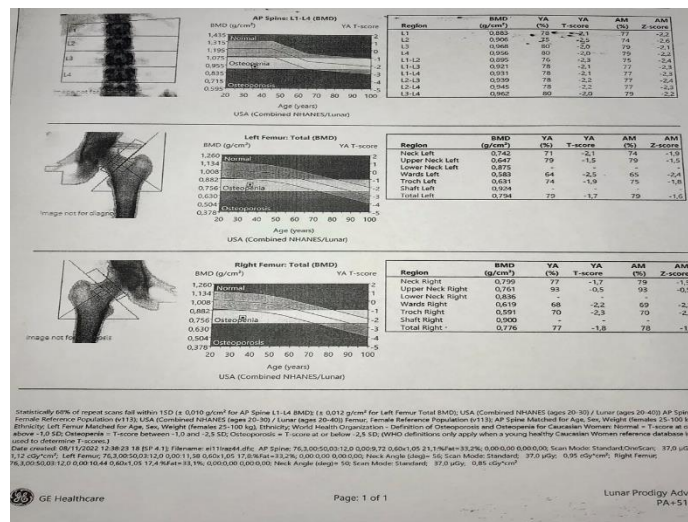
Ionized calcium in serum	1.71 mmol/L	1.10-1.40 mmol/L
PTH	317.9 pg/ml	15-65 pg/ml
Inorganic phosphates	0.73 mmol/L	0.8-1.4 mmol/L
β-Cross L	0.397 ug/L	<0.299 ug/L
Vit D3	18.68 ng/ml	30-100 ng/ml

As seen in the table 1, the PTH levels are almost 5 times higher than the referent values. Also, the Vitamin D3 levels were low. Because of these results the patient was given oral Furosemide 40 mg/daily, oral Vit D3 1 2000 IU/day, tablets Fosavance one a week, 3L fluids daily. The patient was then scheduled for an ultrasonography and also a DEXA scan. The ultrasound confirmed the existence of a hypo echogenic node inferiorly-posterior under the right lobe of the thyroid gland with dimensions 0.69x0.63x0.67.

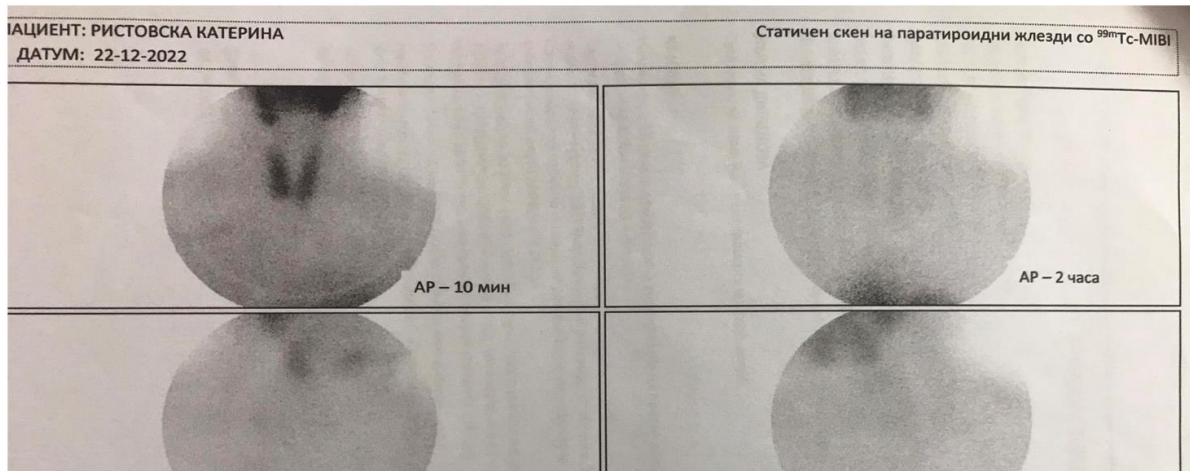




The DEXA scan revealed mild osteopenia in L1-L4-2.1 SD; LK-1.7 SD; DK1.8 SD.

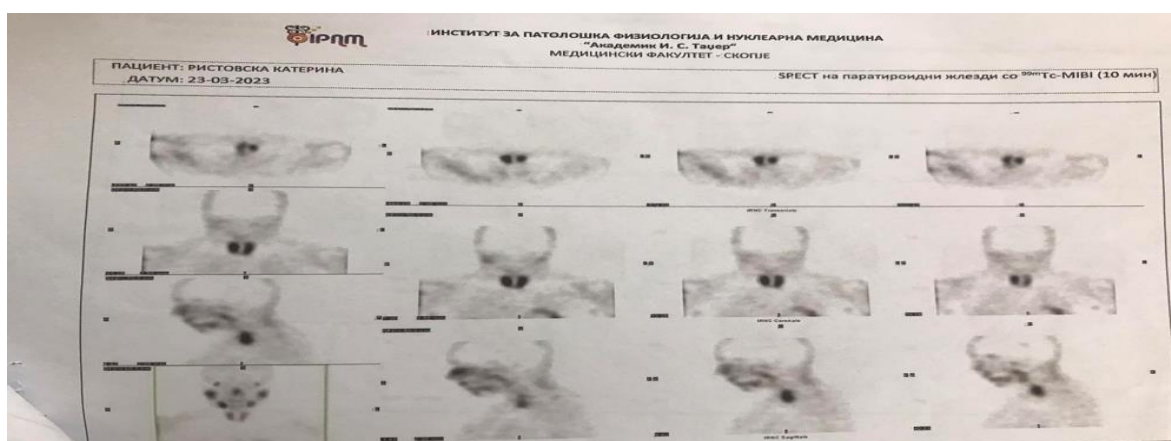


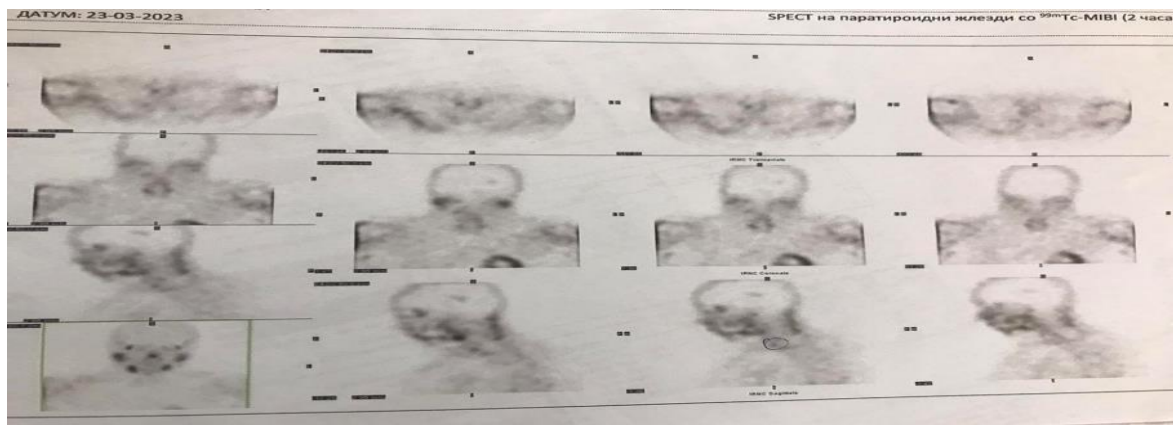
The DEXA scan was made in reference to the blood work of the patient and the disruption of the physiological hormone axis. Because of the need of the body for calcium it starts to disintegrate the calcium from the bone, ergo the osteopenia in the patient. With reference of the blood work and the ultrasonography findings the patient was suspected for a present adenoma in the parathyroid gland. To confirm our diagnosis the patient underwent a static scan of the parathyroid gland using 99m TC-MIBI. Static photo scans of the neck area are made after 10 and 120 minutes from the intravenous accumulation of 740 MBq 99mTC-MIBI. In the first phase a symmetric accumulation of the radiopharmaceutical asset in the two thyroid lobes is noticed. In the second phase a complete clearance of the radiopharmaceutical without any residuals in the neck area is present, excluding the existence of the hyperplasia of the parathyroid tissue.



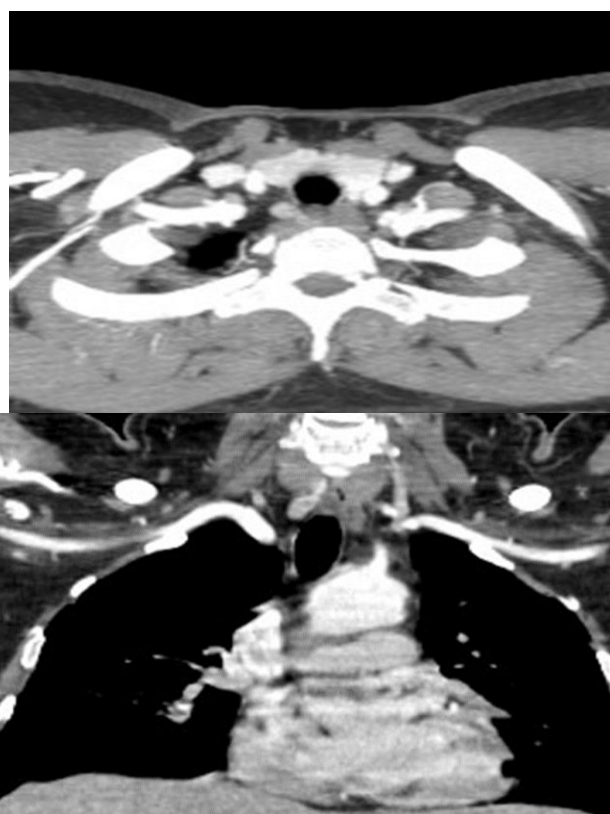
The patient is then referred to another scintigraphy to visualize our hypothesis. This time SPECT scintigraphy of the thyroid/parathyroid gland is made. The scintigraphy was done after 10 min and 120 minutes of the intravenous application of 740 MBq ^{99m}Tc MIBI. On the early scintigrams the accumulation of the radiotracer in the thyroid gland is visualized. Later, on the late scintigrams we see the rinsing of the radiotracer from the thyroid gland. Outside of the thyroid gland, underneath the inferior part of the right thyroid lobe, a tiny barely noticeable accumulation of the radiotracer is detected, which because of its extremely low intensity is considered untypical to a parathyroid hyperplasia or adenoma, but it correlates to the hypoechogenic formation with the same localization see on the ultrasound. Further examination is needed: NMR scan of head and neck, maybe fine needle biopsy of the change seen at the ultrasonography and with determination of PTH in aspirate.

Consultation after NMR and repeated ultrasonography diagnostic of parathyroid lobe- the findings are still only suspicious for tiny parathyroid adenoma under the lower half of the right thyroid lobe. Recommendation- if possible, the patient can do preoperative, ¹⁸FCholine PET/CT and/or fine needle biopsy of the change seen at the ultrasonography and with determination of PTH aspirate.





Because of the accessibility of the diagnostic tools and the financial availability, the patient underwent a 16 layered computed tomography of the neck area in a native series and series after intravenous application of the contrast. The CT revealed retro thyroid in the right prevertebral and paratracheal space the presence of a smaller node with a diameter of 6x10mm which is underneath the right outline of the thyroid lobe, and it is suspected for adenomatous altered inferior parathyroid gland.



After a thorough clinical investigation, analysis of the radiological findings and the biochemical values the patient was diagnosed with an adenoma of the parathyroid gland and was advised for a surgical treatment of the condition. The operation went smoothly with no complications in terms of bleeding, infection, and hematoma. After the operation the blood work revealed improvement of the PTH levels of 63.5 pg/ml and Ionized Ca levels of 1.18mmol/L. The patient went for regular check ups and the findings were all within the normal range, enabling the patient to get back to her regular daily activities without limitations.

4. Conclusions

It is very rare to get a negative scan if there is a glandular change. The Sestamibi scan is fairly accurate with a sensitivity of 80-100%, it does not correlate with blood PTH and calcium values. Despite the negative scan, due to the clear clinical picture and biochemical parameters, the patient was surgically treated, and the pathohistological finding confirmed the presence of an adenoma. Although the ¹⁸FCholine is far more advanced for cases like the one mentioned, demonstrating a significantly higher detection rate than the Sestamibi scan. We always have to take into consideration the availability of the potential diagnostic tools and the cost-benefit in terms of accessibility, time sensitivity and financial outcome and benefit for the patient, always putting the patient and its needs as an individual first.

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