

A critical evaluation of imaging findings in parathyroid adenoma

Paratiroid adenomunda görüntüleme bulgularına kritik bir bakış

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Summary

A 39-year-old woman with clinical and laboratory evidence of primary hyperparathyroidism underwent separate day dual tracer parathyroid scintigraphy. Tc-99m MIBI scintigraphy revealed an intense focus at the lower pole of the right thyroid lobe on the early and late images. Thyroid scintigraphy demonstrated a hypoactive nodule in the lower pole of the right thyroid lobe. Findings of ultrasound examination corresponded with those of thyroid and parathyroid scintigraphies by showing a hypoechogenic thyroid nodule in the lower pole of the right thyroid bed. The patient underwent surgery and parathyroid adenoma localized on right lower pole of the thyroid gland extending posterior to anterior was removed. The authors report on a large parathyroid adenoma falsely leading to a thyroid nodule both on ultrasonography and thyroid scintigraphy.

Key words: Parathyroid scintigraphy, Tc-99m MIBI, parathyroid adenoma

Özet

Klinik ve laboratuvar bulguları primer hiperparatiroidizmi destekleyen 39 yaşında bayan hastaya farklı gün çift ajan paratiroid sintigrafisi uygulandı. Tc-99m MIBI sintigrafisinde erken ve geç imajlarda tiroit sağ lob alt polde yoğun aktivite tutulumu saptanırken, tiroit sintigrafisinde aynı lokalizasyonda hipoaktif nodül ile uyumlu görünüm saptandı. Ultrasonografik değerlendirmesi tiroit sağ lob alt polde hipoekoik tiroit nodülü şeklindeydi. Bu bulgular ışığında yapılan operasyonda tiroit sağ lob alt polünde posteriordan anteriora uzanım gösteren kitle lezyonu çıkarıldı. Patolojik tanı paratiroid adenomu ile uyumluydu. Bu olguda büyük paratiroid adenomunun ultrasonografi ve tiroit sintigrafisinde tiroit nodülü izlenimi vererek yanıltıcı olabileceği vurgulanmıştır.

Anahtar sözcükler: Paratiroid sintigrafisi, Tc-99m MIBI, paratiroid adenomu

Introduction

Tc-99m MIBI (Technetium-99m-methoxyisobutylisonitrile) is a lipophilic, monovalent cationic isonitrile compound that localizes in parathyroid and thyroid tissue depending on blood flow and intracellular mitochondrial concentration. Therefore, Tc-99m MIBI is widely used for the pre-operative localization of abnormal parathyroid tissue in patients with primary hyperparathyroidism. The technique is based on the fact that Tc-99m MIBI washes out more rapidly from the thyroid gland than from abnormal parathyroid tissue (1, 2). However existence of concomitant nodular thyroid disease decreases the diagnostic specificity of Tc-99m MIBI scintigraphy.

The solution of this problem is to perform dual tracer subtraction with Tc-99m MIBI and Tc-99m pertechnetate in combination with other imaging modalities (3, 4). Recently, to differentiate a parathyroid adenoma from a thyroid adenoma it might be advisable to perform the pertechnetate scan on a separate day (5). The authors suggest that a large parathyroid adenoma may cause a defective area in thyroid scintigraphy and falsely lead to Tc-99m MIBI avid thyroid lesion.

Case Report

A 39-year-old woman was presented with fatigue and muscle weakness. These symptoms were present for about 2 years. She had borderline hypercalcemia (10.3 mg/dl) and slight hypophosphatemia (2.6 mg/dl).

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Makalenin geliş tarihi : 26.10.2006; kabul tarihi : 19.01.2007

Serum parathormone level was elevated (142 pg/ml). She was referred to our center for parathyroid imaging. The protocol we used was single-tracer, dual phase scintigraphy, followed by thyroid scintigraphy on a separate day. Dual-phase and dual tracer images were evaluated by visual subtraction. Early and late parathyroid images were obtained on the 20th minute and 2nd hour after intravenous injection of 20 mCi Tc-99m MIBI with gamma camera equipped with pinhole and low energy parallel-hole collimators. The Tc-99m MIBI scintigraphy demonstrated a focus of intense uptake in the lower pole of the right lobe on the early 20 minute image as well as persistent retention of the tracer in the same area on the late image (Figure 1).

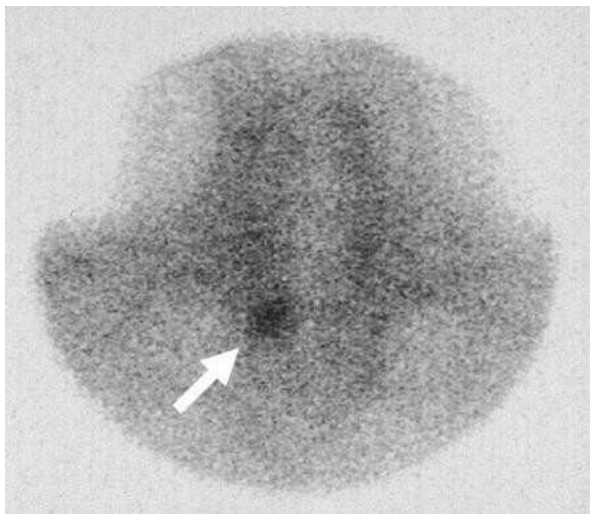


Figure 1. Late anterior Tc-99m MIBI image demonstrates prominent uptake in the right lower lobe of the thyroid gland.

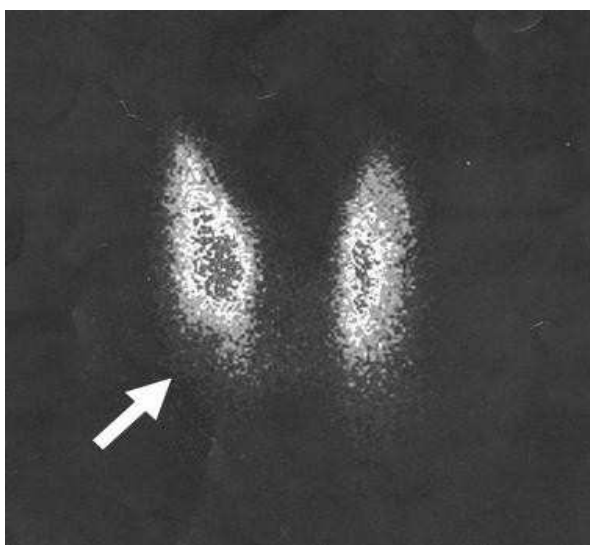


Figure 2. The thyroid image shows prominent contour abnormality in the right lower lobe of the thyroid gland.

Thyroid scintigraphy was performed in order to investigate concomitant thyroid disease on a separate day. Tc-99m pertechnetate study revealed a hypoactive nodule in the lower pole of the right thyroid lobe (Figure 2). Neck ultrasound showed a hypoechoic solid nodule of 23x16 mm localized at inferior of the right thyroid lobe. Her thyroid function tests were normal. After clinical and laboratory evaluation the case was accepted as a 'pure parathyroid adenoma'. A minimal invasive parathyroidectomy with central access was carried out and the lesion, similar to a parathyroid adenoma, 2x1.5x0.5 cm in size, was excised. The mass was found to extend from posterior to anterior in the lower pole of the right lobe. Intraoperative high resolution ultrasound revealed no other pathology of the thyroid and adjacent structures. After frozen section analysis reported a parathyroid adenoma, surgery was aborted. The result of the histopathologic examination was parathyroid adenoma. After surgery, serum calcium, phosphorus and parathormone levels were normalized.

Discussion

Tc-99m MIBI scintigraphy appears to be efficient in detecting hyperfunctioning parathyroid tissue accurately, with sensitivity rates varying from 85% to 98%. The specificity of the Tc-99m MIBI scintigraphy is limited in presence of concomitant thyroid abnormalities. It has been proposed that dual tracer and double phase technique can reduce the number of false positive results. I-123 or Tc-99m pertechnetate are used for thyroid imaging in dual tracer technique (2, 6). Tc-99m pertechnetate is preferred due to its advantage of daily availability. The aim of performing dual tracer study is to detect a concomitant thyroid nodular disease in patients with parathyroid adenoma. This is because Tc-99m MIBI alone may accumulate in both glands' adenoma, while Tc-99m pertechnetate accumulates only in thyroid adenoma. But, thyroid nodules can be Tc-99m MIBI avid regardless of their histopathologic pattern and they can either be cold or hot on Tc-99m pertechnetate scan. Tc-99m MIBI accumulate and retain in malignant thyroid tumours, which generally appear as cold nodules on Tc-99m pertechnetate scan (7).

Presented in this report; increased focal uptake of the tracer on the Tc-99m MIBI image with a corresponding hypoactive focus on the thyroid imaging is suggestive for thyroid abnormality. Ultrasound examination was corresponding with a thyroid nodule. Although the accumulation of Tc-99m MIBI is not specific for malignancy, given the fact that high MIBI uptake increases the probability of malignancy it is advisable to perform surgery in those cases immediately. In the current case, histopathologic examination confirmed that the lesion was a parathyroid adenoma.

Concomitant thyroid disease with primary hyperparathyroidism has been reported with prevalence ranging from 22% to 70%; and 3.1 %-15 % of patients with primary hyperparathyroidism are reported to have thyroid carcinoma (3). This condition can cause diagnostic dilemma for evaluation of imaging findings in parathyroid and thyroid scintigraphy. Therefore, complementary use of Tc-99m MIBI parathyroid scintigraphy, thyroid scintigraphy and high frequency ultrasonography will be beneficial and efficacious in endemic goiter areas. For radionuclide imaging, it is suggested that, the use of oblique views or SPECT Tc-99m MIBI imaging may be helpful in differentiating hot parathyroid spot from thyroid gland thereby improving the diagnostic accuracy of scintigraphic studies (8).

Ultrasound is a widely used technique for localizing and differentiating parathyroid and thyroid abnormalities with its advantage of being without ionizing radiation. The sensitivity and specificity of neck ultrasound in patients with primary hyperparathyroidism were reported to be 30-90% and 40-100%, respectively (6). However, this technique is dependent on the skill of operator and resolution of the technical equipment leading to a wide range of sensitivity rate in clinical practice.

In the current report, the authors present their clinical experience on a large parathyroid adenoma falsely leading to a thyroid nodule both on ultrasonography and thyroid scintigraphy. The complementary findings of the imaging modalities with their limitations are discussed.

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