

Negative ^{99m}Tc -MIBI uptake in a parathyroid carcinoma: A case report

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ABSTRACT

A 34 year old woman with malaise, polyuria and nocturia as well as nausea and vomiting referred to perform a thyroid scan due to right thyroid lobe mass. The scan showed a cold nodule in the right thyroid lobe. Serum calcium of 16.9, serum phosphorus of 1.8 and PTH of 1156 were noticed in laboratory tests. Parathyroid scan with ^{99m}Tc -MIBI showed no abnormal tracer activity in the neck and mediastinum in planar and SPECT images. The patient underwent surgery and histopathology confirmed parathyroid carcinoma. To extent of our knowledge, this is one of few cases of negative ^{99m}Tc -MIBI uptake parathyroid carcinoma were reported.

Key words: ^{99m}Tc -MIBI; Parathyroid carcinoma; SPECT/CT; Scintigraphy

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INTRODUCTION

Parathyroid carcinoma is an uncommon endocrine malignancy accounting for 0.5% to 5% of cases of primary hyperparathyroidism [1]. It usually presents with severe hypercalcemia and its symptoms, as well as markedly elevated PTH. Palpable neck mass was also reported in 30-70 % of cases [2]. Men and women are equally involved and most patients present in their fifth decade of life [3]. Different imaging modalities such as ultrasonography, ^{99m}Tc -hexakis-2-methoxyisobutylisonitrile (^{99m}Tc -MIBI) scintigraphy, computed tomography (CT) and magnetic resonance imaging (MRI) are used to evaluate parathyroid lesions [4, 5]. Recently, there were some reports of promising role of ^{11}C -methionine PET for evaluation of patients with primary hyperparathyroidism [6].

Parathyroid scan with ^{99m}Tc -MIBI SPECT/CT is one of the best techniques for detection and accurate localization of the parathyroid lesions and also, it may help to find ectopic parathyroid tissue in the neck and mediastinum [3, 7]. For detection of parathyroid carcinoma, the sensitivity of ^{99m}Tc -MIBI scintigraphy in combination with neck ultrasound is about 95% [8]. ^{99m}Tc -MIBI dual phase parathyroid scintigraphy can help to differentiate parathyroid carcinoma from benign parathyroid disorders. Intense radiotracer uptake was noted in almost all of the malignant parathyroid tumors, with no remarkable difference in early and delayed images. This pattern is more frequent in malignant lesions [9].

CASE PRESENTATION

We reported a 34 year old woman, presented with malaise, polyuria and nocturia as well as nausea and vomiting. She also suffered a weight loss. Electrocardiogram revealed tachycardia. On physical examination, there was a mass in the right thyroid lobe. The patient underwent a thyroid scintigraphy. 20 minutes after intravenous injection of 3 mCi (111 MBq) of ^{99m}Tc -pertechnetate, a static image was performed in anterior view from the neck and mediastinum (Figure 1). The scan showed a focal zone of decreased tracer uptake in the right lobe, corresponding to the palpable nodule.

Laboratory tests showed serum calcium of 16.9 mg/dl and serum phosphorus of 1.8 mg/dl. Serum parathormone (PTH) level was 1156. Neck ultrasonography revealed a 2*3 cm mass containing cystic areas, suggestive of a parathyroid adenoma. For further evaluation, a parathyroid scintigraphy was performed. Ten minutes after intravenous injection of 20 mCi (740MBq) ^{99m}Tc -MIBI, a static image in anterior view (5 minutes per view time) was obtained from neck and mediastinum demonstrating no abnormal tracer activity in planar image (Figure 2).

In SPECT mode, images were obtained (2 hours post injection), in 32 projections, with matrix size of

128*128. (25 seconds per frame). Similar to the planar images, parathyroid mass showed no evidence of tracer activity in SPECT images (Figure 3).



Fig 1. Thyroid scintigraphy of the patient.



Fig 2. Tc-99m MIBI planar scintigraphy of the patient.

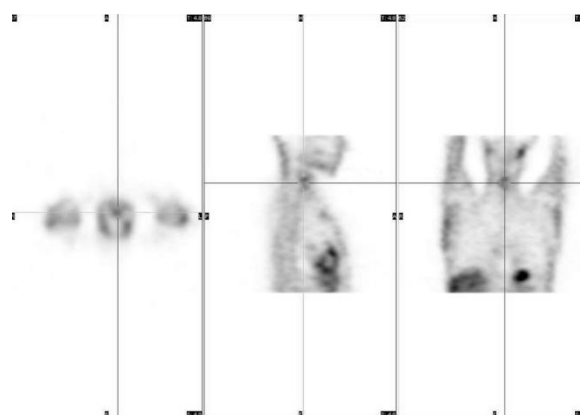


Fig 3. Tc-99m MIBI SPECT images of the patient.

The patient underwent surgical removal of the neck tumor which was proved to be parathyroid carcinoma in histopathological examination. PTH of the patient returned to normal after surgery.

DISCUSSION

Mechanism of sestamibi uptake in hyperfunctional parathyroid tissue is not completely clear, however the size of abnormal gland is the most important factor in detection of the lesion [7, 10, 11]. Intensity of abnormal ^{99m}Tc-MIBI uptake can also influence the abnormal parathyroid detection rate, which is related to mitochondrial hyperactivity [12, 13]. One of the other factors which can cause false negative results is expression of plasma membrane P-glycoprotein (PGP) [14]. The most plausible cause of false negative results in our case is most likely due to overexpression of PGP as the size of the lesion was large and should be readily visible even with minimal uptake. To extent of our knowledge, only a few cases of parathyroid carcinoma with negative ^{99m}Tc-MIBI uptake are reported. Pelizzo et al. reported 2 cases of parathyroid carcinoma with negative scintigraphy (^{99m}TcO₄/²⁰¹Tl or ^{99m}TcO₄/MIBI) [15]. Traub-Weidinger et al. reported one patient with negative ^{99m}Tc-MIBI SPECT/CT and positive ¹¹C-methionine PET/CT, who had undergone surgery for parathyroid carcinoma. ¹¹C-methionine showed recurrence of parathyroid carcinoma in this patient [6]. This case is a rare presentation of negative ^{99m}Tc-MIBI uptake in parathyroid carcinoma.

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