Clinical vignette

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VIA MEDICA

Brown adipose tissue mimicking mediastinal parathyroid adenoma on a sestamibi scan

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Introduction

Brown adipose tissue (BAT) plays an important role in human thermoregulation, especially during childhood and, to a lesser degree, in adults. Metabolic activity of BAT visualized by fluorine-18 fluorodeoxyglucose (F18-FDG) is a common benign finding in a positron emission tomography (PET).

Increased uptake of technetium-99m-labeled methoxy-isobutyl-isonitrile (^{99m}Tc-sestamibi) by BAT is a less known phenomenon; however, its prevalence is estimated at up to one third of all sestamibi studies.

We present a patient with focal BAT activity in sestamibi scan that was initially assumed to be a mediastinal parathyroid adenoma.

Case report

A 50-year old woman with hyperparathyroidism and a suspicion of a parathyroid adenoma was referred to our Department for a sestamibi scan.

The patient received intravenous injection of 740 MBq of ^{99m}Tc-sestamibi. The scan was performed in supine position, with neck extended. Early phase images of the neck area were acquired 15 minutes after tracer injection in anteroposterior and both anterior-oblique (31°) projections with x1.6 zoom. Another anteroposterior projection with no zoom was centered on the mediastinum (Fig. 1).

The images showed a small focus of tracer accumulation below and adjacent to the lower pole of the right thyroid lobe. Increased, asymmetrical tracer uptake was also seen in the upper mediastinum, with slight tracer activity on the right side, and marked, focal activity on the left side. Of note, there was a slight, symmetrical tracer uptake in both supraclavicular regions. Since both foci of increased tracer uptake were located in areas where parathyroid adenomas are highly likely to occur, the delayed phase imaging was performed using single photon emission computed tomography/computed tomography (SPECT/CT) technique.

In the spot adjacent to the thyroid indicated by planar images, SPECT/CT showed a 7 millimeter, soft tissue mass located inferoposterior to the right thyroid lobe, with tracer uptake significantly higher than in the thyroid. In the upper mediastinum, no soft tissue lesions or enlarged lymph nodes were detected; however, increased tracer accumulation was seen in the adipose tissue surrounding arteries of the aortic arc (Fig. 2). Linear tracer activity in the supraclavicular areas also corresponded to adipose tissue.

The lesion adjacent to the thyroid was diagnosed as a parathyroid adenoma, and sestamibi accumulation in the adipose tissue was considered to be a physiological, metabolic activity of BAT.

Conclusions

As a rule, nuclear medicine physicians are familiar with the characteristics of F18-FDG accumulation in BAT. The knowledge of BAT sestamibi uptake is not as common, albeit equally important. If the BAT metabolic activity follows the typical, symmetrical pattern, it can be interpreted fairly easily. On the other hand, asymmetric sestamibi uptake in BAT can suggest a focal lesion and thus lead to a false-positive diagnosis, especially on planar images.

Presented case demonstrates both the importance of familiarity with physiological variants of sestamibi uptake and the significance of SPECT/CT technique in the parathyroid imaging.

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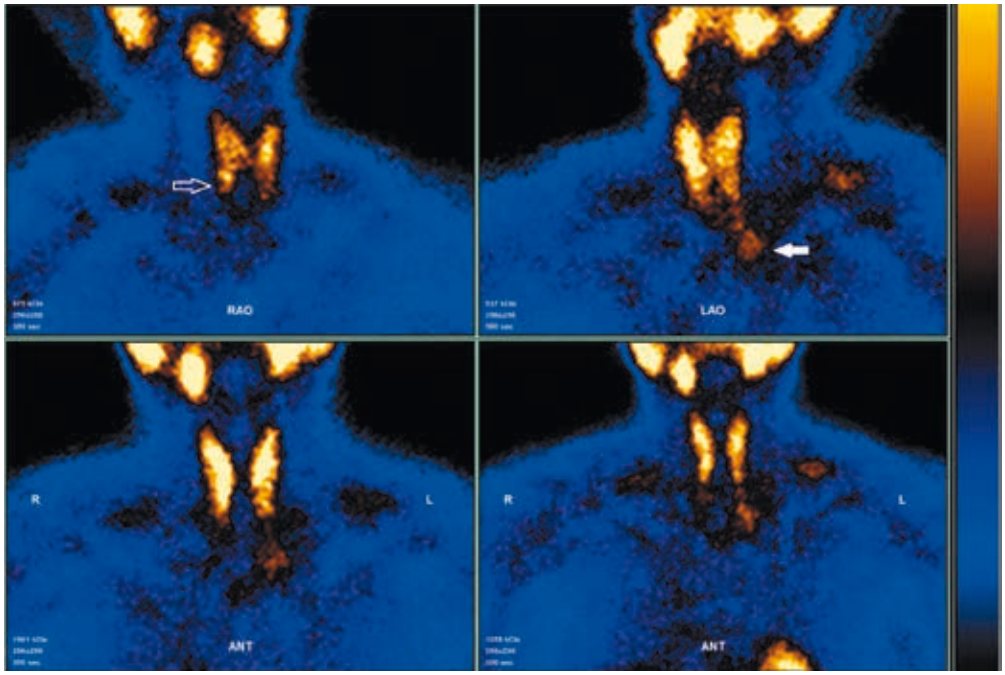

Figure 1. Early phase planar images. Parathyroid adenoma (empty arrow) and BAT (full arrow)

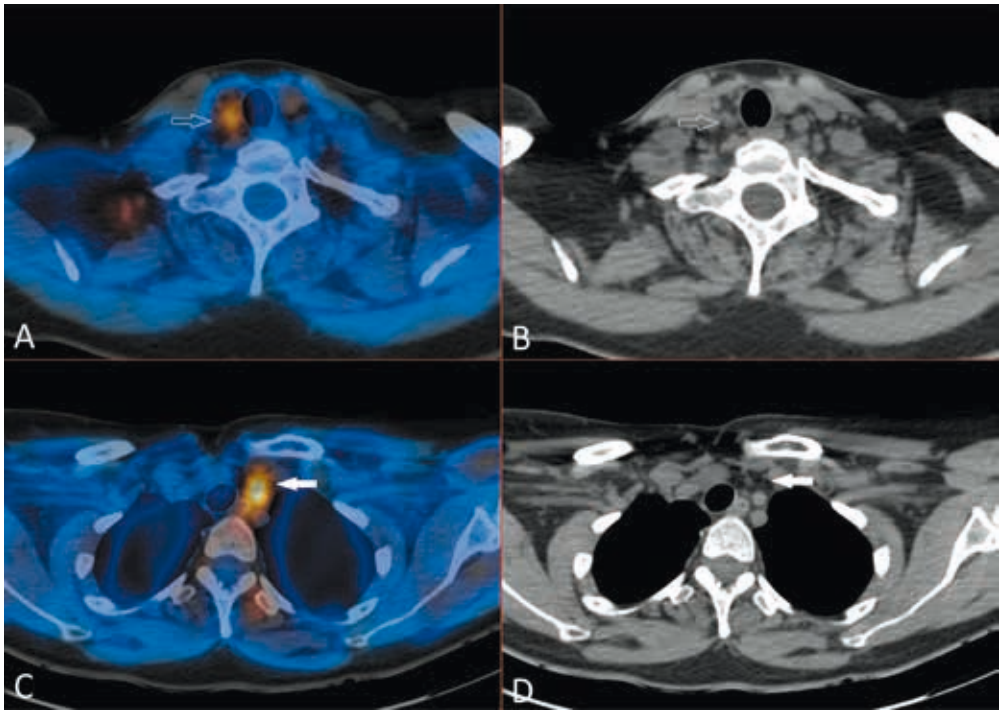

Figure 2. Delayed phase SPECT/CT at the level of lower neck **(A, B)** and upper mediastinum **(C, D)**. Parathyroid adenoma (empty arrows) and BAT (full arrows)