

Clinical Case Seminar

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Abnormal ^{99m}Tc -MIBI Uptake in left lung mimicking a neoplastic lesion in a young woman with nodular goiter. A rare pitfall of ^{99m}Tc -MIBI.

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Abstract

^{99m}Tc -MIBI scintigraphy is a useful diagnostic tool in patients affected by thyroid disease, as already described. We report on a young female patient with a thyroid nodule that largely occupied the right lobe. The nodule showed suspicious findings at thyroid ultrasound thus fine needle aspiration-cytology was performed. The result was conclusive for a class III nodule (i.e. indeterminate lesion), according to Bethesda system. Laboratory evaluations demonstrated an euthyroidism state but serum TSH level was in the lower part of normal range. The patient underwent thyroid scintigraphy performed using both ^{99m}Tc -pertechnetate and ^{99m}Tc -MIBI. The nodule was “cold” at ^{99m}Tc -pertechnetate but showed increased MIBI uptake (^{99m}Tc -MIBI > ^{99m}Tc -pert.) at qualitative analysis. However, quantitative evaluation according to Wash-out index method was consistent with a benign lesion. At MIBI-scintigraphy a well defined and intense tracer uptake was noted into left thorax suspected to be a focal lung lesion. Targeted Computed Tomography did not show any lung lesion. However, the patient referred on an important car accident occurred six months before in which she have reported a severe contusive left lung trauma. At the time of car accident, a Computed Tomography study had shown an irregular opacification in the lingular division, caused by left chest contusion. Presently, the patient is regularly followed for her thyroid disease and, mainly, no evidence of lung disease is noted. The present case confirms the usefulness of ^{99m}Tc -MIBI in the work-up of cold thyroid nodules but highlights as an important contusive lung trauma should be taken into account as potential pitfall at ^{99m}Tc -MIBI scintigraphy. Morpho-functional imaging can improve the diagnostic performance of functional imaging alone.

Case Report

We present a 34-year-old woman who was referred to our University Hospital because of a sudden, painless enlargement of the right thyroid lobe.

Thyroid ultrasound showed a nodule that largely occupied the lobe and presented suspicious findings.

Fine needle aspiration-cytology (FNAC) was performed and the result was reported as class III nodule,

according to Bethesda system(1). At the time of initial diagnosis, serum FT3 and FT4 levels were within normal ranges but TSH level was in the lower part of normal range (1.03 mIU/ml, normal range: 0.27-4.2). In order to exclude a hot nodule, patient underwent ^{99m}Tc -pertechnetate thyroid scintigraphy obtained 20 minutes after tracer administration (2). Planar image showed a “cold” nodule that occupied the right lobe (Fig. 1, Panel A). Immediately after thyroid scintigraphy, we performed a ^{99m}Tc -MIBI scan of the neck-chest regions to evaluate mitochondrial function of the thyroid nodule (Fig.1, Panel B, C). The utility of ^{99m}Tc -MIBI scintigraphy in patients affected by differentiated thyroid cancer or thyroid nodular disease with indeterminate cytology has already been described (3-9).

At visual analysis (qualitative evaluation), planar images showed increased MIBI uptake into cold nodule (^{99m}Tc -MIBI $>$ ^{99m}Tc -pert.) in early image (Fig.1, Panel B) that decreased in late image (Fig. 1, Panel C) (white arrows).

On MIBI images, quantitative analysis was also performed according to the method already proposed by Campenni(8) (i.e. Wash-out Index) (Fig 1, Panels D, E).

MIBIWOind was $>19\%$ and the patient did not undergo total thyroidectomy, as already described (7-9).

Surprisingly, images showed a well-defined and intense (target to background ratio: 3.4:1) MIBI uptake into left thorax consistently with a lung lesion (Fig 1, Panels B-E). Single photon emission tomography (SPET) of the chest was performed 60 minutes after tracer administration using the same gamma-camera that has been already employed for planar images. Tomographic images confirmed an abnormal MIBI uptake located in left lung (lingular division) (Fig. 2, black arrows). The patient did not complain of any symptom or sign consistent with neoplastic or inflammatory disease.

Thorax computed tomography (CT) without contrast media administration was obtained a few days later MIBI scan to define the morphological characteristics of MIBI abnormal uptake.

The CT study did not show any lung lesion (Fig.3, Panel A, B). In particular, no focal lesion was appreciated in the lingular division of left lung, but the patient remembered an important contusive left lung trauma due to a car accident occurred six months before.

At the time of car accident, the patient had undergone CT study that had shown slight left pleural effusion (Fig. 3, Panel C, black and white arrow-head) and, mainly, an irregular opacification (15 mm in maximum diameter) in the lingular division (Fig. 3, Panel D, black arrow-heads), directly caused by left chest contusion.

At present, the patient is followed for her benign thyroid disease and the last FNAC (performed

on the same nodule one years ago) was conclusive for a class II nodule, according to Bethesda system (1), confirming MIBI scan result. In addition, no evidence of lung disease was noted at CT study performed some days after FNAC study.

Conclusion

In conclusion, our case confirms the utility of quantitative MIBI-scintigraphy using *WOind* method already proposed by Campenni(8) in the work-up of cold thyroid nodules with indeterminate cytology, in order to identify patients with benign lesions thus reducing the number of unless surgery.

Finally, an important contusive lung trauma should be taken into account as potential pitfall at ^{99m}Tc -MIBI scintigraphy. Morpho-functional imaging can improve the diagnostic performance of functional imaging alone.

Figure 1. Panel A: ^{99m}Tc -pertechnetate thyroid scintigraphy was obtained 20 minutes after tracer administration (111 MBq) using dual headed gamma-camera [Brightview-X (Philips, Cleveland, USA)] equipped with Low Energy High Resolution Parallel-hole collimators (LEHRPAR). Planar image (anterior projection; frame counts, 100 Kcounts; magnification, 1; matrix, 256x256; energy peak, 140 ± 20 KeV) showed a “cold” nodule that occupied the right lobe. No tracer uptake was appreciated into thorax.

Panel B,C: ^{99m}Tc -MIBI thyroid scintigraphy was performed 10 (early image) and 60 minutes (late image) after tracer administration (370 MBq) using the same gamma-camera employed to obtain ^{99m}Tc -pertechnetate scintigraphy. Planar images (anterior projection, frame time: 10 minutes; magnification 1, matrix 256x256) showed increased MIBI uptake into cold nodule (^{99m}Tc -MIBI $>$ ^{99m}Tc -pert.) in early image (B) that decreased in late image (C) (white arrows; qualitative analysis). At quantitative MIBI analysis, *WOindx* was $>19\%$ (D, E) (red and yellow circles). A well-defined and intense MIBI uptake consistent with a lung lesion was appreciated into left thorax (B-E).

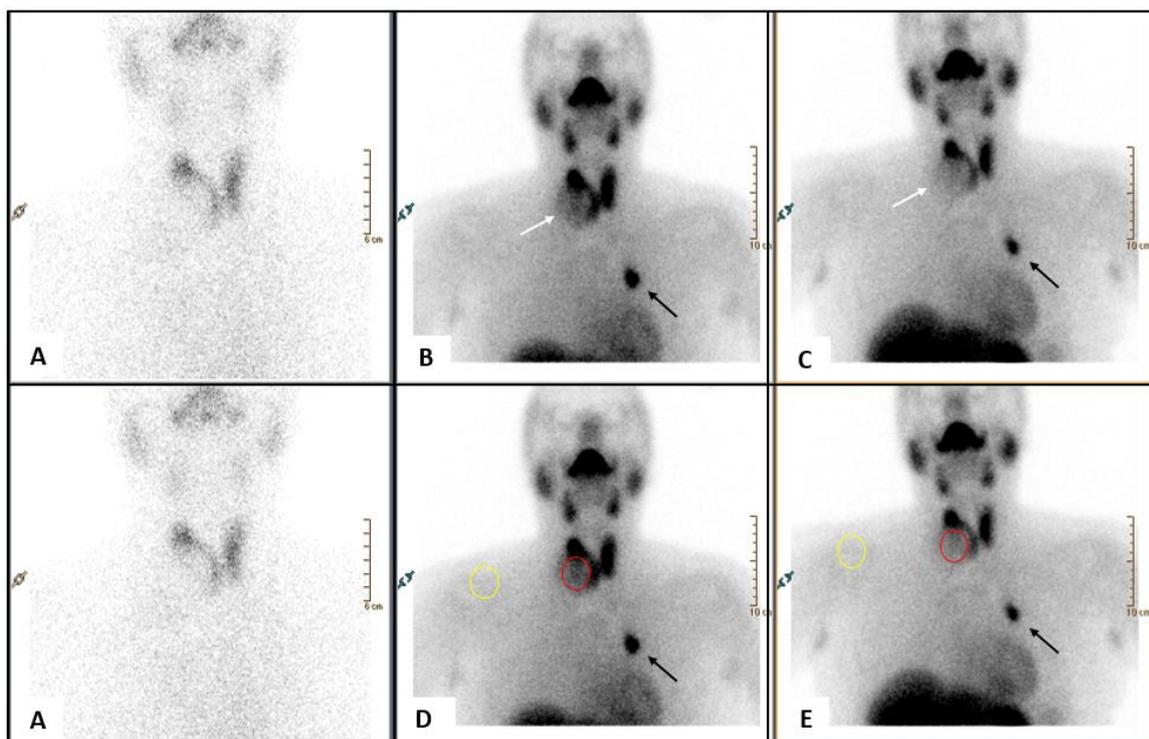


Figure 2.Single photon emission tomography of chest (magnification 1.4; matrix 256x256; acquisition modalities, step and shoot; angular range, 3 degrees; frame time, 30 seconds). Axial (A), coronal (B) and sagittal images (C) confirmed an abnormal MIBI uptake located in left lung (lingular division) (black arrows).

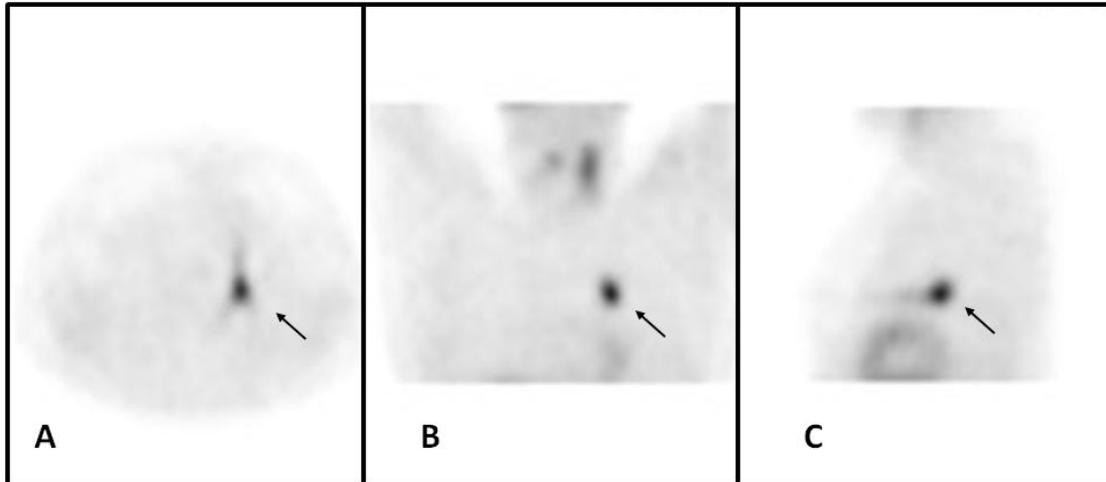
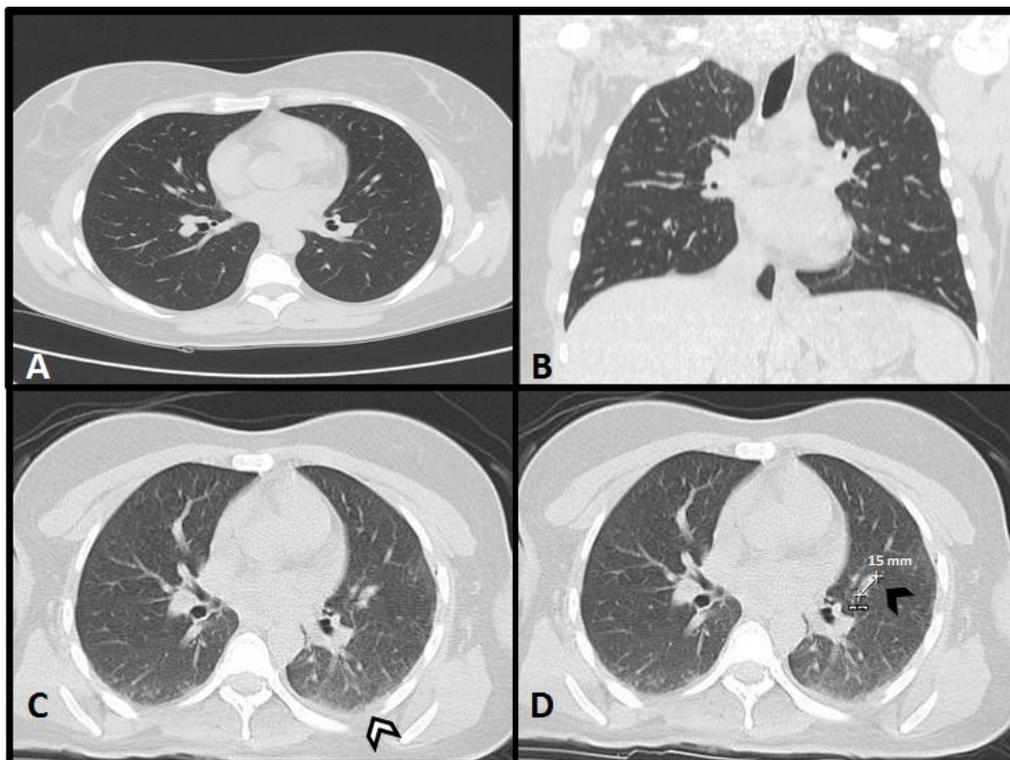


Figure 3.Thorax computed tomography (CT) was obtained using a 16-slice TC scanner (Brilliance 16; Philips Medical Systems, Eindhoven, Netherlands). The study was also compared with the thorax CT obtained with the same scanner at the time of car accident (C, D).

Panel A, B: Axial (A) and coronal (B) images (thickness: 3mm; increment: 1,5; Collimation: 16x1,5; Pitch: 0,938; kV: 120; mAs/slice: 200), obtained without contrast media administration, did not show any lung lesion.

Panel C, D: Axial images (thickness: 3mm; increment: 1,5; Collimation: 16x1,5; Pitch: 0,938; kV: 120; mAs/slice: 200) had shown slight left pleural effusion (C, black and white arrow-head) and, mainly, an irregular opacification (15 mm in maximum diameter) in lingular division (D, black arrow-heads), directly caused by left chest contusion.



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