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Case report

Cervix carcinoma and incidental finding of medullary thyroid carcinoma by 18F-FDG PET/CT — clinical case

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Abstract

Thyroid nodules are encountered in clinical practice during the diagnostic procedures or patients' follow-up due to other diseases quite far from the thyroid gland with prevalence 4–50% in general population, depending on age, diagnostic method and race. The prevalence of thyroid nodules increases with age and their clarification should be done for their adequate treatment. An 18F-FDG PET/CT was done with a PET/CT scanner (Philips Gemini TF), consisting of dedicated lutetium orthosilicate full ring PET scanner and 16 slice CT.

The PET/CT scan of the whole-body revealed on the CT portion a hypodense nodular lesion in the left lobe of the thyroid gland with increased uptake of 18F-FDG on the PET with SUV_{max} 10.3 and demonstrated a complete response to the induction therapy of the main oncological disease of the patient — squamous cell carcinoma.

This clinical case demonstrates that whole-body 18F-FDG-PET/CT has an increasingly important role in the early evaluation of thyroid cancer as a second independent malignant localization. Focal thyroid lesion with high risk of thyroid malignancy was incidentally found on 18F-FDG PET/CT.

KEY words: PET/CT, 18F-FDG, hypodense nodular lesion, medullary thyroid cancer

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Introduction

Asymptomatic thyroid nodules are often encountered in clinical practice and its prevalence is 4–50% in general population depending on age, diagnostic methods and race. The prevalence of thyroid nodules increases with age. Thyroid incidentalomas are characterized as focal not palpable intrathyroidal new nodular lesions detected by imaging modalities during study for non-thyroidal disease. These nodules are usually not palpable and benign, with an associated risk of cancer ranging from 1.5–10% [1, 2].

Positron emission tomography (PET/CT) using 18F-fluorodeoxyglucose (FDG) is increasingly performed for staging and for exact localization of metastatic disease in patients with various kinds of malignancies [2–5]. The FDG PET/CT provides the advantages of the two modalities; the anatomic information is provided by the spiral CT and the functional information by the FDG PET. This combined approach has resulted in a significant improvement in both anatomic localization and diagnostic accuracy [6, 7].

The uptake of FDG in the normal thyroid gland is usually not visualized on FDG-PET [8, 9].

Focal or diffuse FDG uptake in the thyroid gland could be seen as an incidental finding. Some studies have reported that the incidence of thyroid incidentalomas with increased FDG uptake is 1.2–2.3% on PET examinations [7, 8, 10, 11].

Subject of our study was to evaluate treatment response with a whole-body 18F-FDG PET/CT in a 61 year old female with squamous cell cervix carcinoma, pT2pN1M0. After the induction therapy, radical laparohysterectomy with colpo-urethro-cystectomy, lymphadenectomy bilateral in the pelvis, para-aortal and presacral lymph nodes, chemotherapy and radiotherapy were performed.

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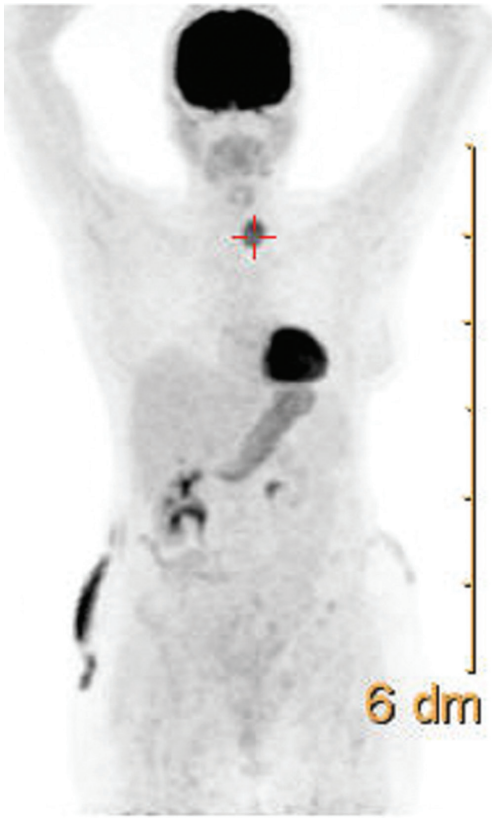

Figure 1. Physiologic uptake of the 18F-FDG-PET true-out the body in the heart, right kidney after the surgery and hypermetabolic increased uptake of the 18F-FDG in the left anterior part of the neck base

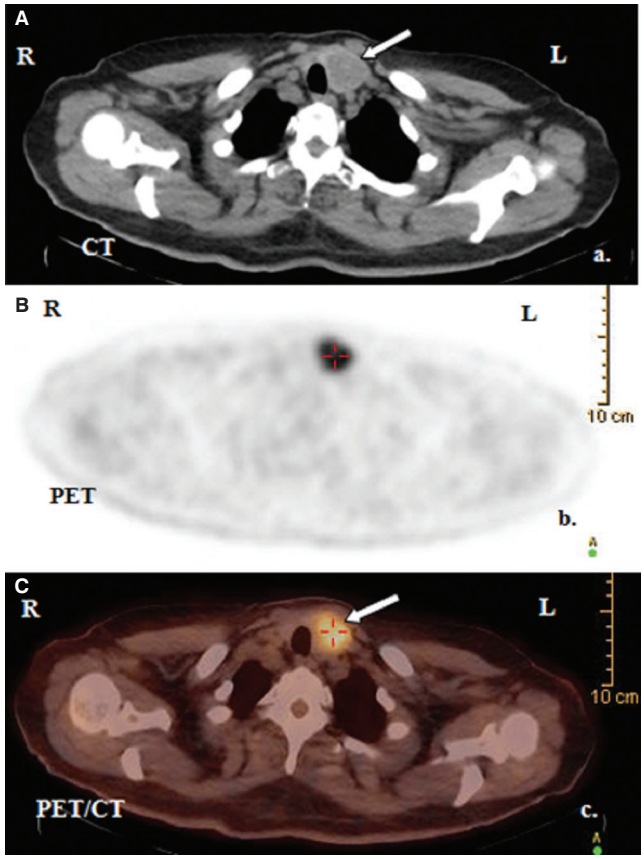

Figure 2A–C. Transaxial scan of the CT, PET and PET/CT. **A.** Hypodense nodular lesion in the left lobe of the thyroid gland (white arrow); **B.** Hypermetabolic increased uptake of the 18F-FDG in the level of the left-anterior part of the base of the neck without exact anatomical localization; **C.** Focal FDG uptake with exact anatomical localization in the left lobe of the thyroid gland on PET/CT (white arrow). Histopathological data after a FNAB under an US control verified medullar thyroid carcinoma

Case report

The whole-body 18F-FDG PET/CT images ware done applying a PET/CT scanner (Philips Gemini TF), consisting of dedicated lutetium orthosilicate full ring PET scanner and 16 slice CT. Standard patient preparation included at least 6 hours fasting and serum glucose level of less than 120 mg/dl before 18F-FDG administration. PET/CT imaging was performed 60 minute after intravenous injection of 370 MBq (10 mCi) of 18F-FDG.

At 60 minute after administration of 18F-FDG, low dose CT (50 mAs, 120 kV) covering area from scull to the proximal thighs was performed for the purpose of attenuation correction and precise anatomical localization. Thereafter, emission scan was conducted in the three-dimensional mode. Emission scan time per mm was 39 mm/sec. PET data were obtained using a high-resolution whole-body scanner with an axial field of view of 57.6 cm. The average total PET/CT examination time was 20 minutes. Standardized uptake value (SUV_{max}) was estimated for every hypermetabolic lesion.

After scatter and decay correction, PET data were reconstructed iteratively with attenuation correction and they were reoriented in axial, sagittal, and coronal slices. The row action maximum-likelihood algorithm was used for three dimensional reconstructions.

Discussion

The PET/CT whole-body scan revealed loco-regional complete therapeutic response of the squamous cell cervix carcinoma (Figure 1) and a hypodense nodular lesion in the left lobe of the thyroid gland with increased uptake of 18F-FDG with SUV_{max} 10.3 (Figure 2A–C). After the PET/CT scan of the whole body, fine needle aspiration biopsy (FNAB) was performed of the left lobe of the thyroid gland nodular lesion under ultrasound (US) control.

The result of the biopsy showed a thyroid tumor with lobular pattern. The stroma of the tumor is composed of fibrovascular tissue. Tumor cells are polygonal or slightly spindled without conspicuous nucleoli and with granular chromatin. ICH-positive immunoreactivity for synaptophysin and TTF1.

Patient underwent thyroidectomy. Histopathological diagnosis was — medullary carcinoma of thyroid (Figure 3). After the surgery the thyrocalcitonin was normal but during the patient follow-up increased and in the sixth month reached 1832 pg/ml (ref. 0–13) and a control whole-body 18F-PET/CT was done.

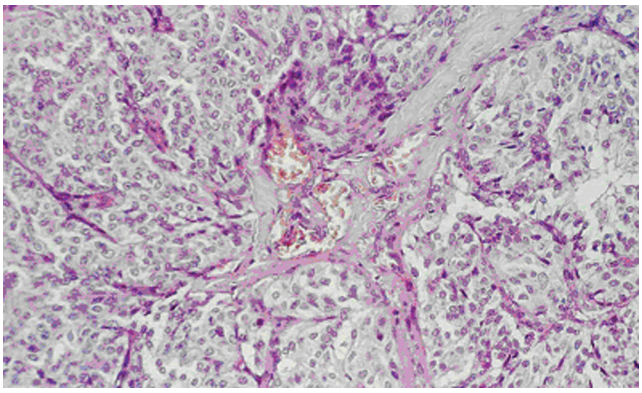

Figure 3. Fine needle aspiration biopsy — ICH-positive immunoreactivity for synaptophysin and TTF1. Diagnosis — medullary carcinoma of thyroid

On the 18F-FDG-PET hypermetabolic multiple pulmonary, bone and soft tissue metastases were visualized (Figure 4). PET/CT demonstrated a progression of the medullary carcinoma disease with the whole body aggressive metastatic involvement.

Conclusion

The current widespread usage of whole-body 18F-FDG PET/CT studies as a screening tool for evaluation of malignant tumors has resulted in an increase in the detection of incidentally found thyroid lesions.

In fact, as this technology becomes more available, the incidence of thyroid incidentalomas will likely continue to increase. Focal thyroid lesions incidentally found on 18F-FDG PET/CT have high risk of thyroid malignancies.

Whole-body 18F-FDG PET/CT is playing an increasingly important role in the evaluation of asymptomatic thyroid cancer.

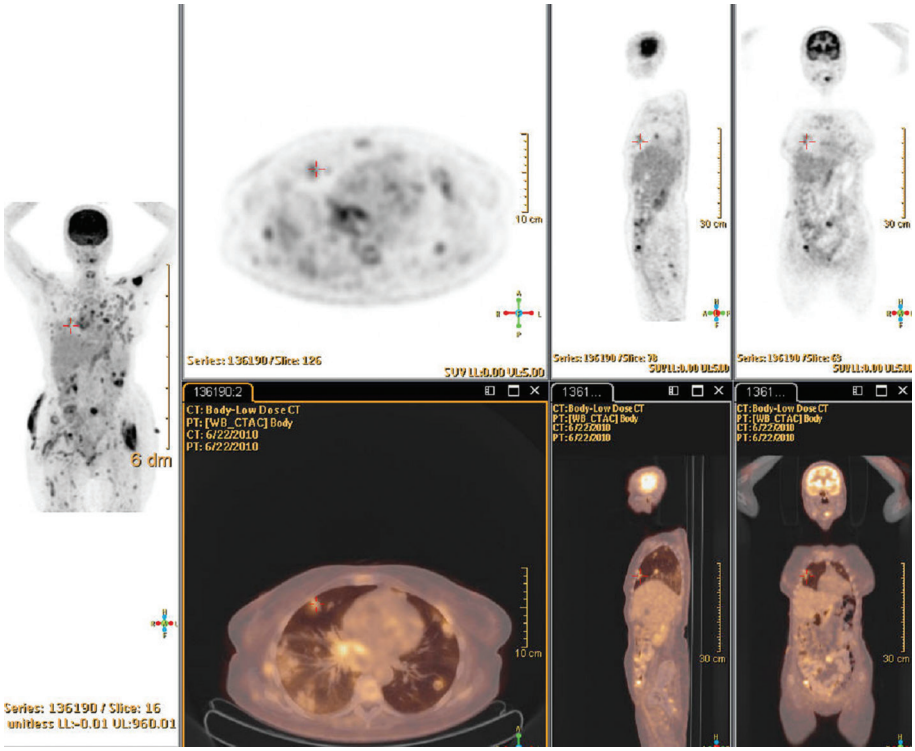

Figure 4. 18F-FDG PET/CT whole-body scan displays multiple pulmonary, bone and soft tissue metastases and a disease progression

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