Incidental Detection of Follicular Thyroid Carcinoma in Ga-68 PSMA PET/CT Imaging

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Running Title: Incidental thyroid uptake in Ga-68 PSMA PET
Abstract:
Prostate specific membrane antigen (PSMA) is a type II transmembrane protein. It has been shown to be expressed in the various of solid malignant neoplasm. We report a-case of prostate cancer patient who underwent Ga-68 PSMA PET/CT imaging. There is a large thyroid nodule in right thyroid gland which has intense PSMA accumulation. Follicular thyroid lesions can be seen Ga-68 PSMA PET/CT imaging.

Key words: Ga-68 PET/CT, incidentaloma, follicular thyroid lesion
Introduction:
The expanding use of Florine-18 fluorodeoxyglucose positron emission tomography (F18-FDG PET) has led to the identification of increasing numbers of patients with an incidentaloma in the thyroid gland. The risk of malignancy in these thyroid incidentalomas can be 27.8% to 74% (1). Prostate specific membrane antigen (PSMA) is a type II transmembrane protein with high expression in prostate carcinoma cells (2). PSMA ligand Ga68-HBED-CC (Glu-NH-CO-NH-Lys-(Ahx)-(68Ga (HBED-CC) (Ga-68 PSMA PET/CT) has been shown to be expressed in the various of solid malignant neoplasm such as neuroendocrine tumors, renall cell carcinoma, breast cancer and differentiated thyroid cancer (3).

Case Report:
We report a case of 72-year-old male patient who underwent Ga-68 PSMA PET/CT imaging for prostate cancer evulation with Gleason score 4+4. There is no recurrent or metastatic lesion for prostate cancer was detected. However there is a large thyroid nodule in right thyroid gland which has intense PSMA accumulation on the peripheric side of the nodules was seen (Figure 1a, Multiple image projection (MIP). On CT slices and fusion images there is nearly 4 cm thyroid nodule was seen (Figure 1b, 1c). Thyroid ultrasound and fine needle aspiration biopsy was performed and FLUS (follicular lesion of undetermined significance) was reported. With ultrasound imaging and clinical datas this nodule was thought as malign thyroid nodule. He did not want to go operation.

We performed Ga-68 PSMA PET/CT imaging in a 62-year-old another prostate cancer patient with thyroid nodule. Slightly increased uptake in the left thyroid gland on Ga-68 PSMA image was seen (Figure 2a). He went to operation and his pathology result was hurthle cell angioinvasive follicular thyroid cancer with 0,4 cm diameter. There is also 0,5 cm papillary thyroid cancer on right thyroid gland was reported in pathology result. However in PSMA imaging there was no increased activity on the right thyroid gland.

Discussion:
Ga-68 PSMA can be used for positron emission tomography (PET)/CT-based staging of prostate cancer. PSMA expression was also shown on the cell membrane of endothelial cells of tumour
neovascuclature in a number of other cancers such as renal cell carcinoma, colon carcinoma, neuroendocrine tumours, melanoma or breast cancer (3, 4). It is important to be aware of thyroid incidentalomas in Ga-68 PSMA imaging to avoid scan misinterpretation. Fine needle aspiration biopsy of PSMA-avid thyroid lesions should be considered to exclude a primary thyroid neoplasm. It is problematic to distinguish benign follicular nodules from follicular carcinomas. Tc-99m MIBI and F-18 FDG PET/CT images were performed to predict malignant thyroid nodules (5). Ga-68 PSMA imaging might be useful to distinguish follicular thyroid lesions.

**Conclusion:**
Follicular thyroid lesions can be seen Ga-68 PSMA PET/CT imaging. It is important to be aware of thyroid incidentalomas in Ga-68 PSMA imaging to avoid scan misinterpretation.

**Conflicts of interest:** None
References


Figure Legends:

**Figure 1a MIP:** Multiple image projection (MIP) of Ga-68 PSMA imaging of a 72-year-old patient with prostate cancer. Large thyroid nodule in the right thyroid gland has intense PSMA accumulation on the peripheral side of the nodules is seen. **Figure 1b and 1c:** Fusion and CT images of the patient, there is nearly 4 cm thyroid nodule which has PSMA accumulation is seen.
Figure 2a, b, c: Ga-68 PSMA PET, CT, and fusion images of a 62-year-old patient with prostate cancer. Slightly increased uptake on the nodule in the left thyroid gland is seen.
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