

# Incidental Detection of Follicular Thyroid Carcinoma in $^{68}\text{Ga}$ -PSMA PET/CT Imaging

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Prostate-specific membrane antigen (PSMA) is a type II transmembrane protein. It has been shown to be expressed in various solid malignant neoplasms. We report a case of a prostate cancer patient who underwent  $^{68}\text{Ga}$ -PSMA PET/CT imaging. There is a large thyroid nodule in the right thyroid gland, which had intense PSMA accumulation. Follicular thyroid lesions can be seen on  $^{68}\text{Ga}$ -PSMA PET/CT imaging.

**Key Words:**  $^{68}\text{Ga}$  PET/CT; incidentaloma; follicular thyroid lesion

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The expanding use of  $^{18}\text{F}$ -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%–74% (1). Prostate-specific membrane antigen (PSMA) is a type II transmembrane protein with high expression in prostate carcinoma cells (2). PSMA ligand  $^{68}\text{Ga}$ -HBED-CC (Glu-NH-CO-NH-Lys-(Ahx)-[ $^{68}\text{Ga}$  (HBED-CC)]) ( $^{68}\text{Ga}$ -PSMA PET/CT) has been shown to be expressed in various solid malignant neoplasms such as neuroendocrine tumors, renal cell carcinoma, breast cancer, and differentiated thyroid cancer (3).

## CASE REPORT

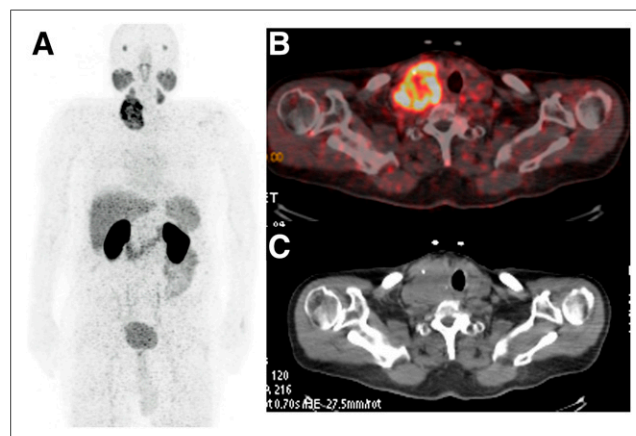
We report a case of a 72-y-old male patient who underwent  $^{68}\text{Ga}$ -PSMA PET/CT imaging for prostate cancer evaluation with a Gleason score of 4 + 4. No recurrent or metastatic lesion for prostate cancer was detected. However, a large thyroid nodule in right thyroid gland, which had intense PSMA accumulation on the peripheric side of the nodules, was seen (Fig. 1A; multiple image projection). On CT slices and fusion images, a nearly 4-cm thyroid nodule was seen (Figs. 1B and 1C). Thyroid ultrasound and fine-needle aspiration biopsy was performed, and follicular lesion of undetermined significance

was reported. This PSMA-positive thyroid nodule was determined to be a malignant thyroid nodule using ultrasound imaging and clinical data. Our patient did not want to undergo surgery.

We also performed  $^{68}\text{Ga}$ -PSMA PET/CT imaging in a 62-y-old prostate cancer patient with a thyroid nodule. Slightly increased uptake in the left thyroid gland on the  $^{68}\text{Ga}$ -PSMA image was seen (Fig. 2A). Our patient underwent surgery, and his pathology result was Hürthle cell angioinvasive follicular thyroid cancer with a 0.4-cm diameter. Papillary thyroid cancer on the right thyroid gland (0.5 cm) was also reported in the pathology results. However, on PSMA imaging there was no increased activity on the right thyroid gland.

## DISCUSSION

$^{68}\text{Ga}$ -PSMA can be used for PET/CT-based staging of prostate cancer. PSMA expression can be seen on the cell membranes of endothelial cells of the tumor neovasculature in several other cancers such as renal cell carcinoma, colon carcinoma, neuroendocrine tumors, melanoma, or breast cancer (3,4). It is important to be aware of thyroid incidentalomas in  $^{68}\text{Ga}$ -PSMA imaging to avoid scan misinterpretation. Fine-needle aspiration biopsy of PSMA-avid thyroid lesions should be considered to exclude a primary thyroid neoplasm.



**FIGURE 1.** (A) Multiple image projection of  $^{68}\text{Ga}$ -PSMA imaging of 72-y-old patient with prostate cancer. Large thyroid nodule in right thyroid gland has intense PSMA accumulation on peripheric side of nodules. (B and C) Fusion and CT images, respectively, of patient. Nearly 4-cm thyroid nodule, which has PSMA accumulation, is seen.

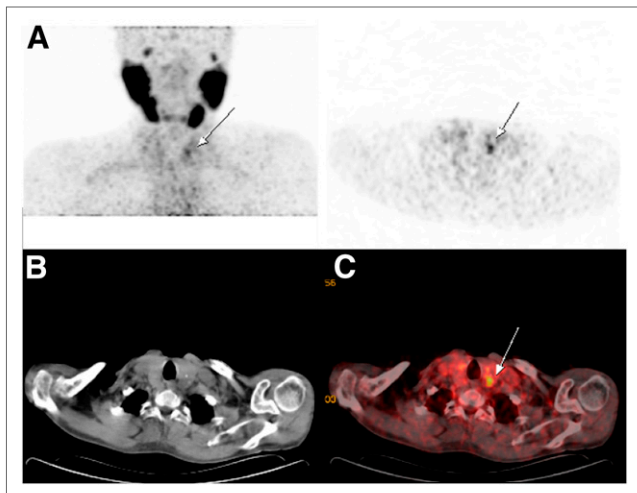
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**FIGURE 2.**  $^{68}\text{Ga}$ -PSMA PET (A), CT (B), and fusion images (C) of 62-y-old patient with prostate cancer. Slightly increased uptake on nodule in left thyroid gland is seen.

It is problematic to distinguish benign follicular nodules from follicular carcinomas.  $^{99\text{m}}\text{Tc}$ -methoxyisobutylisonitrile and  $^{18}\text{F}$ -FDG PET/CT images were obtained to predict malignant thyroid nodules (5).  $^{68}\text{Ga}$ -PSMA imaging might be useful to distinguish follicular thyroid lesions.

## CONCLUSION

Follicular thyroid lesions can be seen on  $^{68}\text{Ga}$ -PSMA PET/CT imaging. It is important to be aware of thyroid incidentalomas in  $^{68}\text{Ga}$ -PSMA imaging to avoid scan misinterpretation.

## DISCLOSURE

No potential conflict of interest relevant to this article was reported.

## REFERENCES

1. Chun AR, Jo HM, Lee SH, et al. Risk of malignancy in thyroid incidentalomas identified by fluorodeoxyglucose-positron emission tomography. *Endocrinol Metab (Seoul)*. 2015;30:71–77.
2. Afshar-Oromieh A, Avtzi E, Giesel FL, et al. The diagnostic value of PET/CT imaging with the  $^{68}\text{Ga}$ -labelled PSMA ligand HBED-CC in the diagnosis of recurrent prostate cancer. *Eur J Nucl Med Mol Imaging*. 2015;42:197–209.
3. Verburg FA, Krohn T, Heinzel A, Mottaghy FM, Behrendt FF. First evidence of PSMA expression in differentiated thyroid cancer using [ $^{68}\text{Ga}$ ]PSMA-HBED-CC PET/CT. *Eur J Nucl Med Mol Imaging*. 2015;42:1622–1623.
4. Chang SS, Reuter VE, Heston WD, Bander NH, Grauer LS, Gaudin PB. Five different anti-prostate-specific membrane antigen (PSMA) antibodies confirm PSMA expression in tumor-associated neovasculature. *Cancer Res*. 1999;59:3192–3198.
5. Sager S, Vatankulu B, Erdogan E, et al. Comparison of F-18 FDG-PET/CT and Tc-99m MIBI in the preoperative evaluation of cold thyroid nodules in the same patient group. *Endocrine*. 2015;50:138–145.