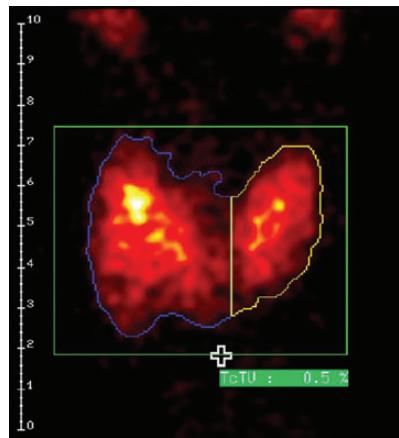
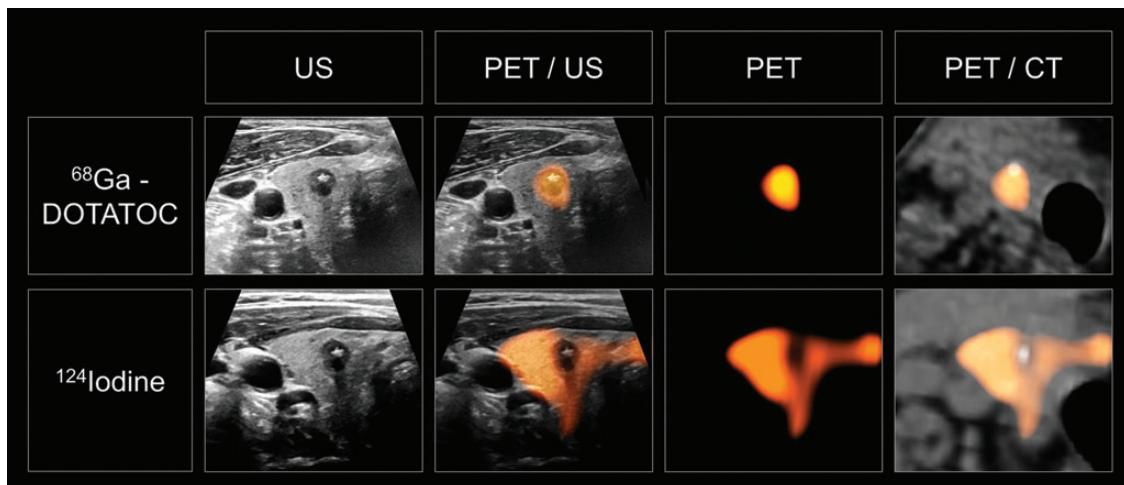


*Image of the Month***Diagnosis of Small Medullary Thyroid Carcinoma via PET/Ultrasound (US) Fusion****Figure 1.****Figure 2.**

A euthyroid 72-year-old woman (TSH 1.1 mU/l) was referred to our institution for second-reading diagnostics. A small (maximum diameter 9 mm), hypoechoic nodule with central macrocalcification had been incidentally found within the thyroid. $^{99\text{m}}\text{Tc}$ -PT scintigraphy had shown normal uptake with moderate maxima (right > left) in the upper parts of both thyroid lobes but no sign of hypofunctionality (Fig. 1). The basal calcitonin level, however, was 123.0 pg/ml and therefore a medullary thyroid cancer was suspected.

We performed a ^{124}I -PET/CT to assess the functional state of the thyroid incidentaloma and found that the nodule was clearly hypofunctional. We also performed a ^{68}Ga -DOTATOC-PET/CT to assess the somatostatin receptor (SSTR) status and exclude metastatic spread, with findings of moderate SSTR positivity in the nodule, but absence of pathologic expression within the body. Nonetheless, the exact localization of metabolic findings was hindered due to the poor spatial resolution and soft-tissue contrast of the CT; therefore, PET/ultrasound fusion imaging was performed.

To allocate the metabolic findings within the thyroid, we used a magnetic navigation system (VNav, GE Healthcare, Milwaukee, WI, USA) to perform live fusion of metabolic/functional images acquired through PET and morphologic images obtained with ultrasound (PET/US) (Fig. 2). Fusion images of PET, US and CT clearly depicted the thyroid nodule as ^{68}Ga -DOTATOC-positive (top row) and ^{124}I -negative (bottom row) (Fig. 2: transversal sectional images from left to right: ultrasound, PET/US fusion, PET and PET/CT). Post-thyroidectomy and simultaneous neck dissection histology proved that the thyroid incidentaloma was a medullary thyroid cancer. Following total thyroidectomy, the calcitonin levels fell below the limits of detection.

In summary, we were able to (1) exactly spatially correlate the ultrasonographic findings with PET and CT and (2) unambiguously characterize the intrathyroidal incidentaloma as lacking thyroid metabolism (which was not seen on standard $^{99\text{m}}\text{Tc}$ -PT scintigraphy) and presenting somatostatin receptors using PET/US fusion technique.

Dr. Ernesta Palombo-Kinne is gratefully acknowledged for language assistance with the manuscript.

Martin Freesmeyer¹, Henning Dralle² and Thomas Winkens¹

¹Clinic of Nuclear Medicine, Jena University Hospital, Jena

²Clinic of General, Visceral and Vascular Surgery, Halle University Hospital, Halle/Saale, Germany

doi:10.1093/jjco/hyt175