

Thyroid Incidentaloma at F-18-FDG Positron Emission Tomography: A Challenge for the Clinicians

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Thyroid incidentalomas (TIs) are defined as unexpected, asymptomatic thyroid lesions that are discovered on an imaging study or during surgery unrelated to the thyroid gland. Unsuspected TIs have been demonstrated in up to 60% of patients at autopsy. With improved imaging technology and the increased use of imaging modalities, TIs are being found more and more frequently. TIs can be detected by several imaging modalities, such as neck ultrasonography (US), computed tomography (CT), magnetic resonance imaging (MRI) or Fluorine-18-Fluorodeoxyglucose positron emission tomography or positron emission tomography/computed tomography (F-18-FDG PET or PET/CT) [1]. Rates of detection for TIs are estimated to be 67% by neck US, 16% by CT and MRI, 9.4% by carotid Doppler scan, and about 2% by F-18-FDG PET or PET/CT [1].

TIs represent a challenge for the clinicians: some of these lesions are benign but the risk of malignancy in TIs might be significant [1]. The malignancy risk of TIs varies according with the imaging characteristics of the thyroid findings [1].

Sonographic features that are associated with an increased risk of malignancy include: hypoechoogenicity, punctate microcalcifications, irregular margins, a shape that is taller than it is wide, increased intranodular vascularity, and an incomplete peripheral halo [1].

The rate of malignancy for lesions detected on CT and MRI has been estimated to be between 3.9% and 11.3%; nevertheless, there are no definitive imaging features on CT and MRI that are predictive of thyroid malignancy unless neoplastic invasion of adjacent structures is demonstrated [1].

The increasing use of F-18-FDG PET and PET/CT is associated with a concomitant increase in the number of patients with TIs. The major difference between F-18-FDG PET/CT and other imaging modalities is that F-18-FDG PET/CT provides both anatomic and metabolic information about incidental lesions found in the thyroid gland. PET or PET/CT may sometimes reveal an unexpected F-18-FDG uptake within the thyroid gland, representing an area of increased glucose metabolism, in patients referred for non-thyroid diseases and this finding is defined as TI. The pattern of F-18-FDG uptake in the thyroid gland on PET imaging influences the likelihood of malignancy. A diffusely increased uptake of F-18-FDG in the thyroid gland is usually associated with benign conditions such as thyroiditis or hyperthyroidism [2,3]. Conversely, focal areas of increased uptake of F-18-FDG in the thyroid gland are of greater concern since they may represent both benign and malignant lesions [2,4].

Several single-center studies have reported data about the prevalence and the malignancy risk of focal TIs detected by F-18-FDG-PET or PET/CT with discordant results, as summarized by recent review articles [4-7].

Focal TIs are observed in about 2% of F-18-FDG PET or PET/CT studies. Moreover, focal TIs detected by F-18-FDG PET or PET/CT are associated with a significant risk of malignancy (about 35% of focal TIs are malignant), considering histopathology confirmation as reference standard. The most frequent malignant histological subtype

responsible for focal TIs at F-18-FDG PET or PET/CT is papillary thyroid carcinoma [4-7].

Based on these data, whenever a focal hot spot is detected within the thyroid gland, the F-18-FDG-PET or PET/CT report should suggest further investigation, including clinical examination, laboratory tests (such as thyrotropin and thyroid hormones assay), neck US and US-guided fine needle aspiration cytology, in order to exclude a malignancy [8].

In some articles a significant difference in standardized uptake value (SUV) between benign and malignant focal TIs at semi quantitative PET analysis was reported [4]. Nevertheless, a significant overlap about SUV was found between these two groups. Therefore, SUV alone should not be used to differentiate between malignant and benign TIs [4,7]. Also dual time-point PET acquisition seems to be not useful in discriminating benign from malignant lesions among focal TIs [4].

Further studies and prospective protocols are necessary to clarify some points, such as the clinical difference between well-differentiated thyroid malignancies positive or negative at F-18-FDG PET/CT, the prognostic value of focal TIs detected by F-18-FDG PET/CT and the relationship between glucose metabolism and iodine metabolism in focal TIs.

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