

Carcinoma of the thyroid gland showing thymic-like elements: hypofunctioning nodule accumulating ^{99m}Tc -MIBI and ^{18}F -FDG

To the Editor: Carcinoma showing thymus-like elements (CASTLE) is a rare tumor of thymic origin occurring in the thyroid gland or in adjacent soft tissues of the neck. Here we present a 55 years old man without symptoms. Physical examination revealed a 2.5cm hard nodule on the lower part of the right thyroid lobe, which was movable during swallowing. No cervical lymph node was palpable and the neck was not tender to palpation. Thyroid function and calcitonin tests were within normal limits. Thyroid US showed a lobulated, solid, noncalcified, hypoechoic mass, measuring 2.7×2.3cm in cross-sectional diameter and demonstrating moderate vascularity on color flow images (Fig. 1).

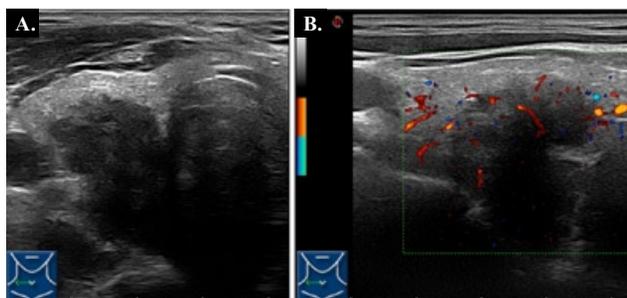


Figure 1. Thyroid ultrasonography showed a lobulated, solid, noncalcified, hypoechoic nodule (A) with moderate vascularity on color flow image (B).

On thyroid scans using technetium-99m-pertechnetate ($^{99m}\text{TcO}_4^-$) and ^{99m}Tc -methoxy-isobutyl-isonitrile (^{99m}Tc -MIBI), a hypofunctioning (cold) thyroid mass (Fig. 2A and 2B) was seen in the lower part of the right thyroid lobe. Fluorine-18-fluoro-2-deoxy-d-glucose-positron emission tomography/computed tomography (^{18}F -FDG-PET/CT) showed an irregular mass with soft-tissue density, extending from the lower part of right thyroid lobe into the tracheo-esophageal groove, infiltrating the right posterior tracheal wall. The distribution of ^{18}F -FDG exhibited a heterogeneously focal pattern with maximum standard uptake value (SUV_{max}) 5.3 (Fig. 3). At surgery a 2.5-cm, solid, lobulated tumor was seen closely attached to the trachea. A total thyroidectomy was performed followed by radiotherapy. Microscopic examination revealed confluent nests and lobules of epithelioid and spindle-shaped cells with pleomorphic vesicular nuclei, distinct nucleoli with small lymphocytes and plasma cell infiltration, and focal squamous differentiation. Solid islands of tumor cells were separated by thick fibrous septa. Immunohistochemical tests showed that the tumor was positive for CD5 and CD117 (Fig. 4).

This tumor was originally described by Miyauchi et al in 1985 [1]. Since then, fewer than 30 cases of this unusual tumor have been reported based on a MEDLINE search on January 5, 2011. It typically occurs in adults in the fifth decade, in the

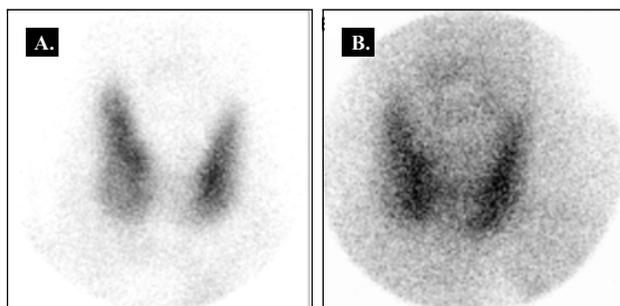


Figure 2. Thyroid scintigraphy showed a "cold" thyroid nodule at 30min post injection of 370MBq ^{99m}Tc -pertechnetate in the lower part of right lobe of the thyroid gland (A). This nodule showed a "positive result" at 30min after injection of 740MBq ^{99m}Tc -methoxy-isobutyl-isonitrile (B).

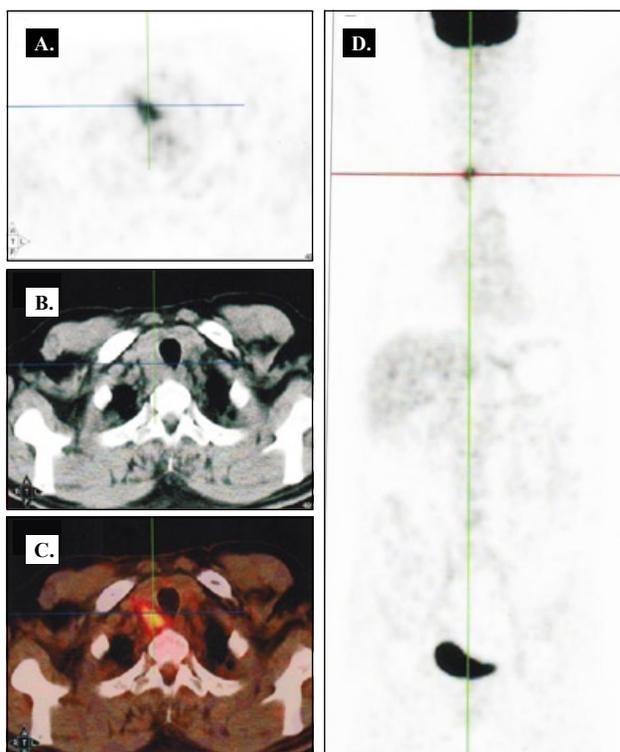


Figure 3. Fluorine-18-fluoro-2-deoxy-d-glucose-positron emission tomography/computed tomography (^{18}F -FDG-PET/CT), obtained 1h after intravenous administration of 370MBq ^{18}F -FDG, showed an irregular mass with soft-tissue density, extending from the lower part of right thyroid lobe into the tracheo-esophageal groove and infiltrating the right posterior tracheal wall. Maximum standard uptake value of 5.3 (A, transverse PET image; B, axial CT image; C, transverse fusion PET/CT image; D, MPI of whole body).

middle to lower part of the thyroid, and may invade adjacent soft tissue and metastasize to regional lymph nodes. Clinically, surgery alone is sufficient for patients without lymph node metastases. The role of radiotherapy when lymph node

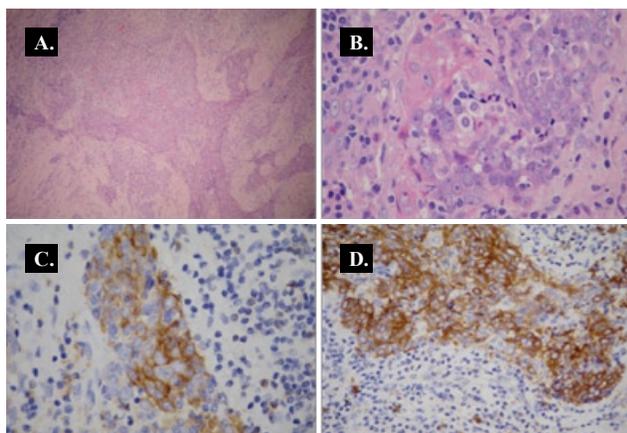


Figure 4. Pathology showed confluent nests and lobules of epithelioid and spindle-shaped cells separated by fibrous bands (A, 40X). Tumor cells display pleomorphic vesicular nuclei, distinct nucleoli with small lymphocytes and plasma cell infiltration, and focal squamous differentiation (B, 400X). Immunostaining for CD5 (C, 400X) and CD117 (D, 200X) showed membrane staining.

metastases has occurred can limit subsequent recurrence, but there is no evidence that chemotherapy is beneficial [2].

Histopathological examination and immunohistochemical tests can provide the final diagnosis of CASTLE according to favorable features including lobulated architecture, infiltration by lymphocytes, scarce neutrophils, a low mitotic count, perivascular-like spaces, and expansile growth, provided that lymphoepithelioma-like carcinoma of the skin, primary aero-digestive tract squamous cell carcinoma, and metastatic squamous cell carcinoma of unknown primary have been excluded. The sensitivity and specificity of the pathologic diagnosis of CASTLE by immunohistochemical staining with CD5, a marker of carcinoma of thymic origin, were 82% and 100%, respectively [3]. Recently, the overexpression of CD117 (a tyrosine kinase-KIT receptor) has been found in thymic carcinomas and has potential diagnostic utility in differentiating these tumors from adenoid cystic carcinomas of the salivary gland, chromophobe renal cell carcinomas, renal oncocytomas, and neuroendocrine tumours, which express KIT infrequently [4]. Early detection of this malignancy is critical to determine treatment strategy and improve prognosis.

On thyroid scan [5] hyperfunctioning nodules rarely harbor malignancy, in contrast to hypofunctioning nodules with or without higher serum TSH, even within the upper part of the reference range [6].

It has been reported that negative ^{99m}Tc -MIBI thyroid scans exclude differentiated and medullary thyroid cancer [7]. On the contrary, a positive ^{99m}Tc -MIBI scan is non-specific, meaning that the nodule may be benign or malignant and further studies and surgery are recommended.

The ^{18}F -FDG-PET/CT study having higher resolution and better anatomic localization of the lesion over conventional gamma camera (Fig. 4C) [8], showed high ^{18}F -FDG uptake ($\text{SUV}_{\text{max}} = 5.3$) suggesting malignancy of the nodule. It can be noted that low uptake of the tracer can not completely rule out malignancy. In our patient, ^{18}F -FDG-PET/CT study and fusion image (Fig. 3B) showed a lobulated solid tumor infiltrating right-posterior tracheal wall suggested malignancy and radical surgery.

In conclusion, we present a case of a rare CASTLE case in the thyroid gland characterized by a hypofunctioning nodule that accumulated ^{99m}Tc -MIBI and ^{18}F -FDG.

Acknowledgments

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