Intravascular Metastasis at the Internal Jugular Vein From Follicular Thyroid Carcinoma

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Follicular thyroid carcinoma (FTC) is the second most common thyroid malignancy and accounts for approximately 10% of all thyroid malignancies.[1] Lymph node metastases are uncommon, and distant pulmonary or bony metastases are more common in patients with FTC than papillary thyroid carcinoma (PTC). Metastasis to the internal jugular vein (IJV) from a thyroid malignancy is not common, and most are direct invasions from the outside wall of the IJV. However, our case was a hematogenous intravascular metastasis that was easily diagnosed by sonographically guided fine-needle aspiration biopsy (FNAB).

Abbreviations
CT, computed tomography; FDG, fluorodeoxyglucose; FNAB, fine-needle aspiration biopsy; FTC, follicular thyroid carcinoma; IJV, internal jugular vein; PET, positron emission tomography; PTC, papillary thyroid carcinoma; Tg, thyroglobulin

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Case Report

A 52-year-old man was referred for sonographic examination to evaluate a hypermetabolic lesion that suggested metastasis in his left neck. He had undergone total thyroidectomy and cervical lymph node sampling because of 4-cm widely invasive FTC at an outside hospital. No cervical lymph node metastasis was observed. The patient then received radioactive iodine ablation therapy with 200 mCi. During the follow-up period, his serum thyroglobulin (Tg) level was maintained within normal ranges, but 4 years 9 months after the surgery, it was elevated at 861 ng/mL. Outside [^{18}F]fluorodeoxyglucose (FDG)-positron emission tomography (PET)/computed tomography (CT) showed a hot-uptake lesion in his left pubic bone area, and he was referred to our hospital. At that time, there was no other hypermetabolic lesion in his neck area (Figure 1). He underwent partial resection for a left pubic bone mass 1 month later, but the mass was not

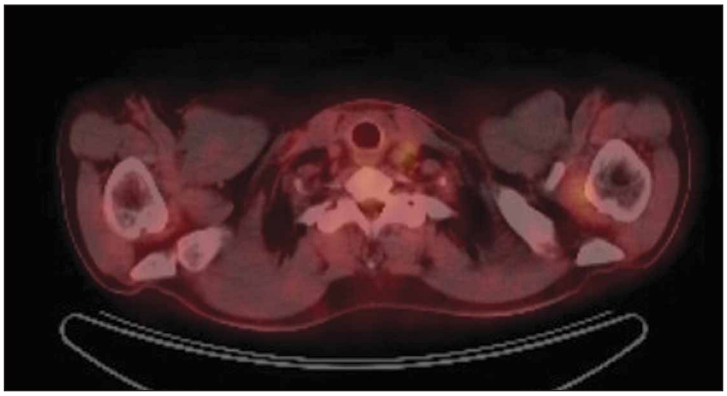
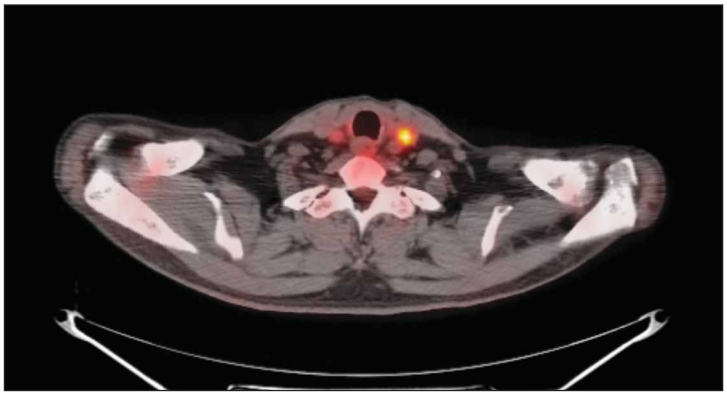


Figure 1. Outside axial [^{18}F]FDG-PET/CT shows no hypermetabolic lesion in the left carotid space.

complete excised. Then he underwent radiation therapy with 4500 cGy to his pubic area. His serum Tg level was markedly decreased at 36.7 ng/mL but was still high. Subsequent [^{18}F]FDG-PET/CT was performed to evaluate a residual lesion at the excision site 3 months after the resection, and it showed a newly developed hypermetabolic lesion in the left paratracheal region (Figure 2).

A neck sonographic examination was performed to evaluate the hypermetabolic lesion, and it showed a round, mainly hyperechoic mass within his left IJV (Figure 3A). His left IJV was partially occluded by the mass, and there was no other suspicious extravascular lesion at the level of the mass. On a color Doppler image, there was a color signal within the mass (Figure 3B).

Figure 2. Follow-up axial [^{18}F]FDG-PET/CT performed 4 months after Figure 1 shows a hypermetabolic lesion, which suggests metastasis in the patient's left neck region.

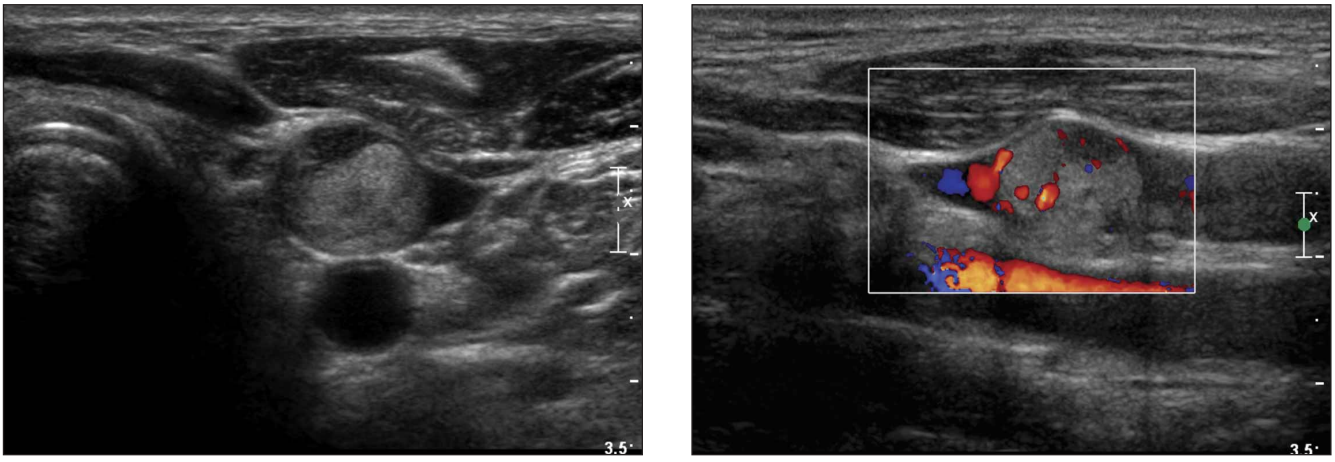


Sonographically guided FNAB of the intravascular mass was performed, and the aspirated specimen showed numerous clusters of microfollicle-forming atypical cells, which suggested metastatic FTC (Figure 4A). A wide excision of the left IJV containing the intravascular mass was performed, and the mass was finally confirmed to be hematogenously metastatic FTC (Figure 4B). On follow-up neck sonography, there was no evidence of recurrence at the operation site, and his serum Tg level was 6.8 ng/mL 8 months later because of the residual bony lesion.

Discussion

Follicular thyroid carcinoma is generally considered a more aggressive tumor than papillary thyroid cancer,[1] and PTC and FTC carry 10-year overall survival rates of 93% and 85%, respectively.[2] Lymph node metastases are uncommon in patients with FTC, occurring in approximately 10%, whereas approximately 50% of patients with PTC have at least microscopic lymph node metastases. In addition, distant pulmonary or bone metastases are more common in patients with FTC (30%) compared to those with PTC (15%).[1] Clinical presentations of FTC are diverse and range from skull masses to bulbar palsy.[3] Follicular cancer occurs more often in women, and the female to male ratio is 3:1. The mean age at presentation is 50 years, and it is more common in areas of iodine deficiency.[4]

Histopathologically, the recent World Health Organization classification of tumors divided follicular carcinomas into 2 major categories, according to their degree of invasiveness, as follows: minimally and widely invasive follicular carcinoma.[5] Minimally invasive follicular carcinomas have limited capsular and vascular invasion, whereas widely invasive follicular carcinomas have widespread infiltration of adjacent thyroid tissues and blood vessels.[5] Van Heerden et al[6] reported that only distant metastasis at diagnosis had independent prognostic significance ($P < .0001$) in the prediction of cause-specific mortality. According to their report, there had been no cancer-related mortality and no distant metastasis in 20 patients who had surgically treated minimally invasive FTC during a mean 10-year follow-up period, and the vascular



A B

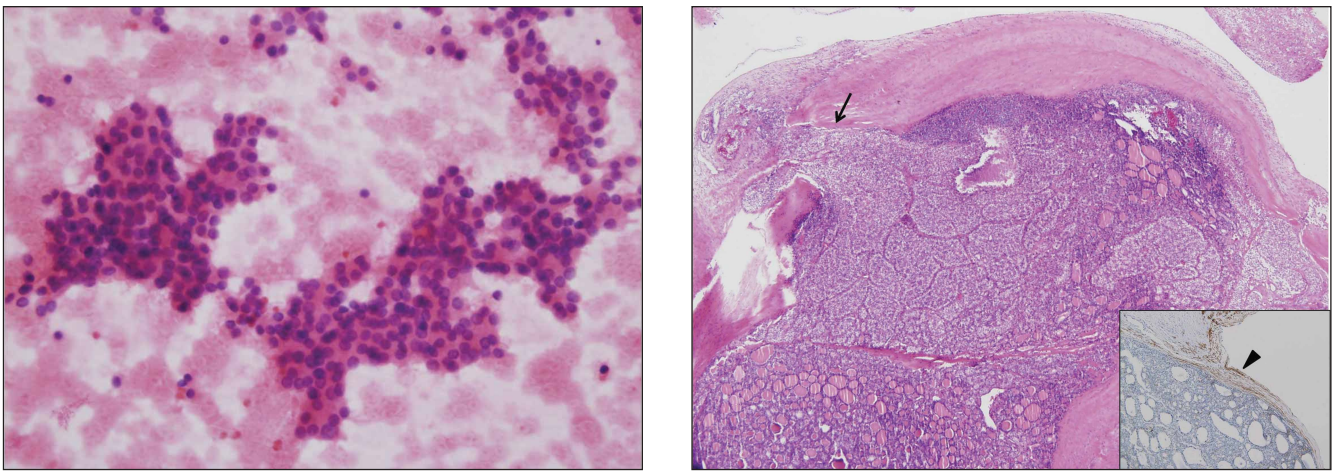
Figure 3. A, Neck sonography reveals a round, mainly hyperechoic mass suggesting metastasis from thyroid cancer within the patient's left IJV. **B**, Color Doppler imaging shows a color signal at the center and periphery of the mass.

invasion increased the disease-specific mortality at 10 years to 28%.[6] The probability of aggressive behavior increases with the extent of vascular invasion because of the greater probability of recurrence and metastases caused by angioinvasion; therefore, the risk of metastatic disease in patients with widespread vascular invasion is substantial.[5,7] The tumor type of our patient was a widely invasive follicular carcinoma, which suggested that he was at risk of metastasis. Additionally, Lo et al[7] had reported that older patients (men ≥40 and women ≥50 years) had a greater risk (10.4 times) than younger patients. The International Union Against Cancer/American Joint Committee on Cancer pTNM staging system also considers the age at presentation (45 years, any sex) and adopted size criteria as relevant to cancer-specific survival.[8] Our patient was a man, and his age at presentation was 47 years, which presented an additional risk factor.

Distant metastasis in differentiated thyroid cancer can be divided into 2 categories: distant metastasis as the initial diagnosis and distant

Figure 4. A, Cytologic specimen shows many clusters of microfollicle-forming atypical cells, suggestive of a follicular neoplasm (hematoxylin-eosin, original magnification ×400). **B**, Histologically, the tumor cells proliferate, forming well-developed follicles or solid nests. They invade to the venous walls aggressively (arrow), which is shown by the positivity of smooth muscle actin immunostaining (inset, arrowhead; original magnifications ×40 and ×100, respectively).

A B



metastasis after initial treatment of thyroid cancer. The most frequent site of metastatic disease is either the lungs or bones,[2,9] and there have been few reports regarding skeletal or skin metastases diagnosed by FNAB.[10,11] According to these reports, FNAB is a useful diagnostic tool for metastatic FTC, but it is difficult to diagnose follicular neoplasms by FNAB.[3,10–12]

This case was unique because it was a hematogenously metastasizing intravascular mass from FTC and not from a direct invasion, and it was a delayed metastasis. There was a report of thyroid insular carcinoma with jugular vein invasion, but it was different from our case because of its timing and cell type.[13] The reported case was an initial metastatic lesion, and it was a locally aggressive mass, but this case involved delayed metastasis. On sonography, this metastatic lesion showed echogenicity and characteristics similar to those of benign-looking thyroid nodules, which provided a clue for diagnosis.

In summary, FTC can metastasize into the vascular lumen and not by direct invasion. An initial large tumor size, a widely invasive type, and age older than 40 years in men, could be risk factors for metastasis.

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