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## Case Report

# Diffuse thyroid metastases and bilateral internal jugular vein tumor thrombus from renal cell cancer

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### ABSTRACT

Renal cell cancer rarely metastasizes to the thyroid gland, and it has been reported to present as a solitary mass. We present a case of diffuse thyroid cancer metastases from renal cell cancer. Bilateral internal jugular vein tumor thrombi were also present. To the best of our knowledge, this is the first description of diffuse thyroid metastases from renal cell cancer in the English literature. Renal cell cancer metastases should be considered in the differential of thyroid imaging abnormalities arising in the setting of known renal cell carcinoma, particularly late in the course of disease. This is frequently associated with internal jugular vein thrombi, which should be evaluated with an abnormal thyroid. Thyroglobulin levels are usually normal in such patients.

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## Introduction

Renal cell carcinoma (RCC) accounts for 2%–3% of all malignant diseases in adults [1] and is responsible for 2.4% of all cancer deaths each year [1]. It is the seventh most common cancer in men and the ninth most common in women [1]. Clear-cell RCC is the most common subtype of RCC, occurring in about 7 of 10 people with RCC [2]. The metastatic pathways for RCC are not always foreseeable, but most common sites of metastases include lungs, brain, bone and/or bone marrow [1]. Metastatic involvement of the thyroid gland from RCC is extremely rare [3–7]. RCC metastases to the thyroid gland have been previously reported as a solitary mass only, without report of diffuse metastatic

involvement in the existing literature [3,4,6]. To the best of our knowledge, this is the first description diffuse thyroid cancer metastasis from renal cell cancer, in the English literature.

## Case report

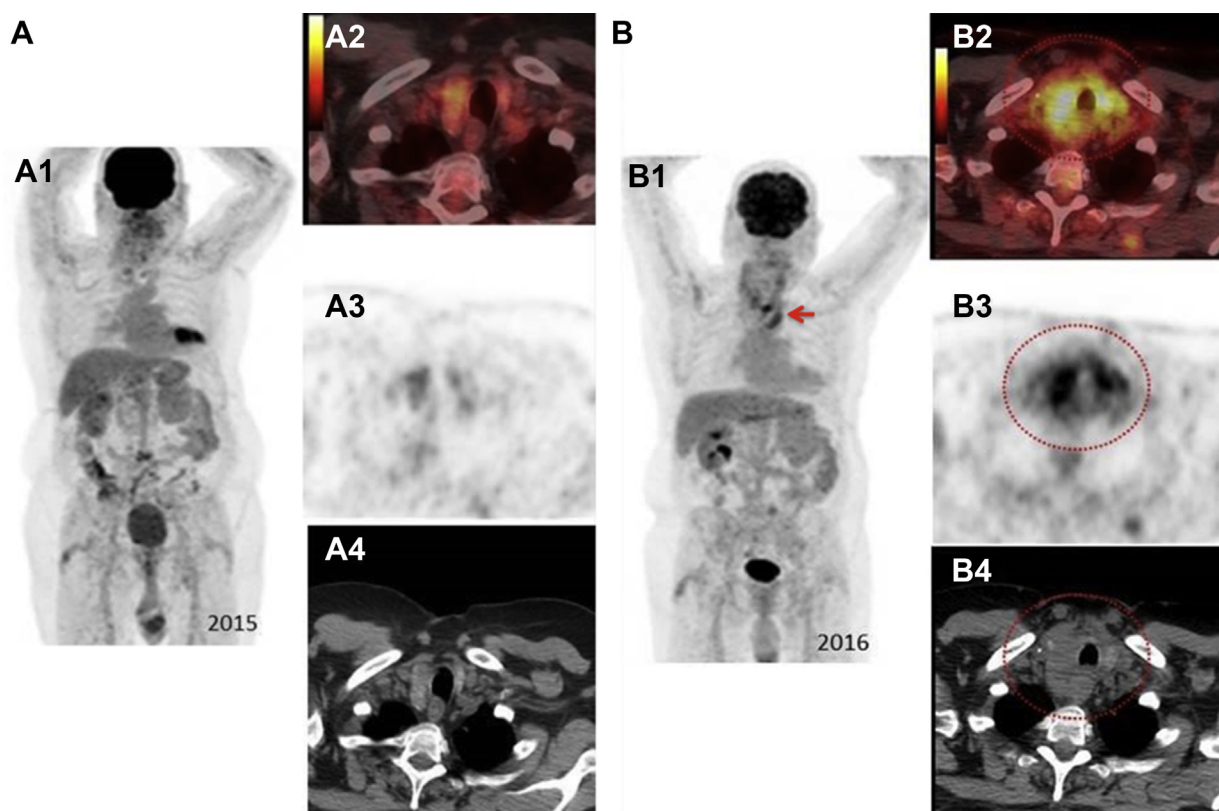
An 87-year-old man presented for annual surveillance positron emission tomography computed tomography (fluro deoxy-glucose [FDG]-PET/CT) for evaluation of metastatic renal cell cancer in remission. The patient had left nephrectomy 10 years ago and the last surveillance examination did not demonstrate any evidence of recurrent disease (Fig. 1A). At the FDG-positron

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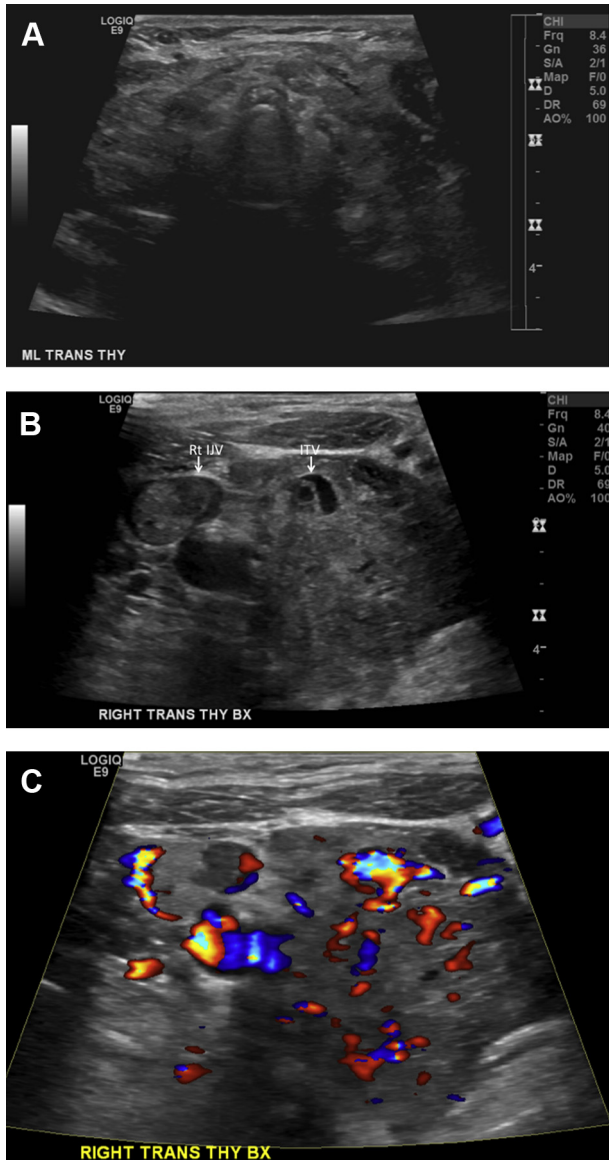
**Fig. 1 – Comparative positron emission tomography computed tomography images demonstrating initial findings (A) and that at subsequent (B) annual surveillance. Maximal intensity projection (MIP), fused axial image, attenuation-corrected PET image and computed tomography images are presented. (A) One year ago, the patient had a normal-sized thyroid with expected low-level fluoro deoxyglucose uptake. (B) At one-year surveillance follow-up, the patient developed marked thyroid enlargement with avid fluoro deoxyglucose uptake. MIP images also demonstrate linear increased uptake in brachiocephalic vein (arrow).**

emission tomography computed tomography, new hypermetabolic pulmonary nodules were identified suspicious for new metastatic disease. Interval development of diffusely increased activity in a newly enlarged thyroid gland was concerning for malignancy (Fig. 1). No focal lesions were present. Abnormal activity was noted in bilateral jugular veins and brachiocephalic vein. The patient was referred to ultrasound, where in the thyroid again demonstrated to be diffusely enlarged, markedly heterogeneous and hypervascular, without focal lesions (Fig. 2). At the time of the ultrasound, thrombi were noted in bilateral internal jugular veins. On color Doppler interrogation, internal vascular flow was noted within these thrombi, which demonstrated arterial waveforms on spectral Doppler interrogation (Fig. 3). In addition, thrombus material could be traced in the internal thyroid vein, in contiguity with the tumor thrombus in the jugular veins (Fig. 2). On the basis of clinical scenario, heterogeneous non-mass-like enlargement, the absence of calcifications, bilateral tumor thrombi, and a normal thyroglobulin level and metastatic renal cell cancer was suspected. Subsequently, a nontargeted thyroid fine-needle aspiration was performed, which demonstrated metastatic clear-cell renal cell cancer, with cells containing clear “bubbly” cytoplasm and round and distinct

nucleoli (Fig. 4). Immunohistochemical stain demonstrated CD10 and RCC positivity and negative for TTF-1 and SOX-10.

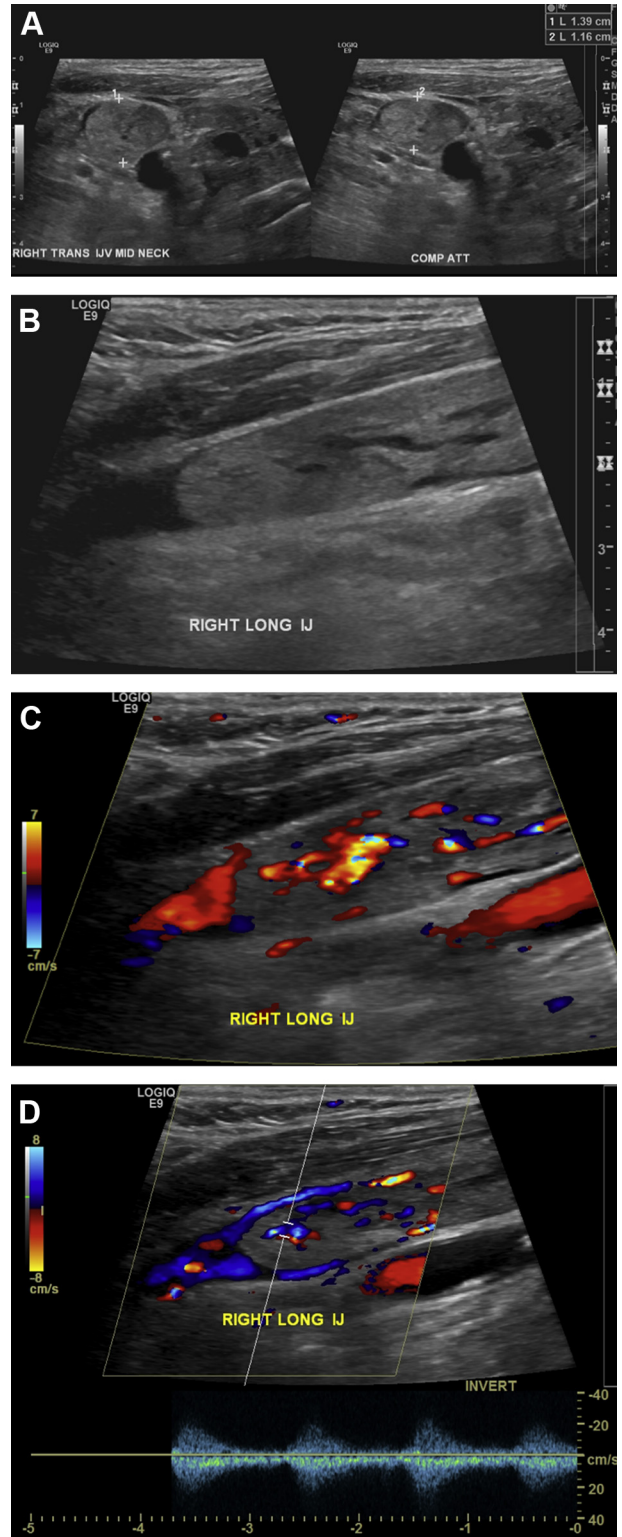
## Discussion

Metastatic involvement of the thyroid gland has been rarely reported. In a recently published series, less than 0.2% of all biopsied thyroid nodules result in detection of metastatic disease [5]. On an autopsy series, this number has been reported to be around 1.25%-24%, depending on the widespread nature of disease [8]. Although renal cell cancer very rarely metastasizes to the thyroid gland, it is the most common malignancy leading to thyroid metastases [5,7]. It has been reported to constitute one-third to half of all the causes for thyroid metastases [5,7]. This has most commonly been reported to occur late in the disease, with a mean interval of 7.5 years after initial diagnosis [4]. According to Duggal et al. [4], almost 150 cases of clinically recognized metastatic RCC to the thyroid have been reported in the English language literature. Clear-cell variant of RCC has been reported to most commonly metastasize to the thyroid as well [3–6].



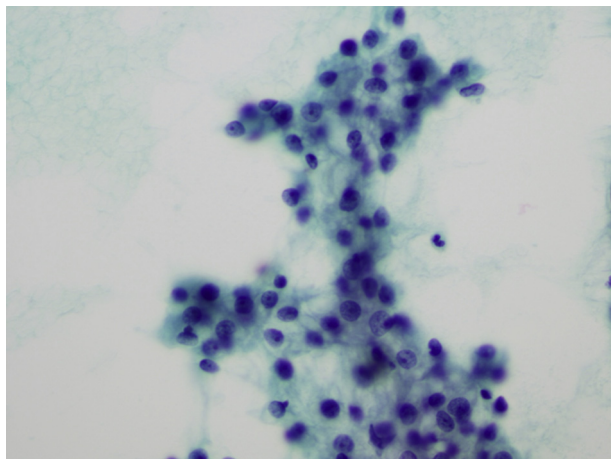
**Fig. 2 – (A)** Transverse ultrasound image of the thyroid demonstrates an enlarged gland with a markedly heterogeneous appearance. No discrete thyroid nodules are identified. **(B)** Focused evaluation of right thyroid lobe redemonstrates these findings. Also seen is soft tissue distending the inferior thyroidal vein (ITV) and right internal jugular vein (Rt IJV). **(C)** Color Doppler interrogation shows markedly increased vascularity throughout the right lobe of the thyroid.

All these observations are concordant with our case as the patient was initially diagnosed with clear-cell RCC approximately 10 years ago and had a long disease-free interval before recurrence. Disease recurrence was seen with development of pulmonary and thyroid metastases. The patient also had normal thyroglobulin levels with only mild elevated thyroid stimulating hormone. However, our case is unique



**Fig. 3 – (A)** Transverse and **(B)** longitudinal ultrasound images of the right neck demonstrate soft tissue within the right internal jugular vein. **(C)** On Color Doppler interrogation, internal flow is demonstrated within the thrombus. **(D)** Spectral interrogation reveals arterial waveforms, within the thrombus, highly suspicious for tumor thrombus.





**Fig. 4 – Cytology specimen from nontargeted fine-needle aspiration from the thyroid demonstrates cells with clear, bubbly cytoplasm, and round nuclei with distinct nucleoli. Immunohistochemical stains were positive for CD10 and RCC markers and negative for TTF-1 and SOX-10 markers (thyroid cancer markers).**

compared to previously reported cases of thyroid metastases from RCC, where solid masses were described without the report of diffuse metastatic involvement of the thyroid gland. In fact, Kobayashi et al [9] have proposed that presence of diffuse thyroid involvement argues against the presence of metastasis. Also the presence of tumor thrombus in bilateral internal jugular veins, and extension into the brachiocephalic veins in our case is unique and of significant interest.

Metastases should be suspected in cases of thyroid mass in a patient with known history of RCC. Although this will most commonly present as a solid mass, diffuse metastatic involvement can also be seen. RCC metastases should particularly be suspected if there is vascular invasion. Although vascular invasion is a well-documented microscopic feature of poorly differentiated thyroid cancer, less than 10 cases presenting gross intraluminal invasion of the internal jugular vein have been reported. Gardner et al. [10] have reported an approximate incidence of 1.5% of extrathyroidal vascular invasion with thyroid cancer. On the other hand, renal vein invasion with RCC is extremely common. Given this high propensity of vascular invasion with RCC, if vascular invasion is present with a thyroid mass in a patient with known

RCC, then this should raise the suspicion for metastatic disease over a primary thyroid malignancy.

## Conclusions

In conclusion, if patients have a known history of renal cell cancer with thyroid mass or non-mass-like imaging abnormalities, metastases should be considered in the differential of this mass. Thyroid function tests will be normal-to-mild deranged in metastatic involvement. Considering the propensity for vascular invasion, with thyroid abnormalities, the jugular system should be checked for tumor thrombus.

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