Late-Onset Metastatic Renal Cell Carcinoma to the Thyroid Gland: An Unusual Airway Emergency

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Financial support: None declared
Conflict of interest: None declared

Patient: Female, 88-year-old
Final Diagnosis: Metastatic renal cell carcinoma to thyroid gland
Symptoms: Hemoptysis • neck mass • shortness of breath • stridor
Medication: —
Clinical Procedure: Biopsy • bronchoscopy • excision of the mass • laryngoscopy • tracheostomy
Specialty: Otolaryngology

Objective: Rare disease
Background: Thyroid malignant lesions mostly present as an anterior neck mass with or without compressive symptoms. Infrequently, metastases from extra-thyroid neoplasms migrate to the thyroid gland. These lesions most commonly arise from renal cell carcinoma (RCC), which is the primary kidney malignancy in adults. This case parallels one of the longest latency periods described in the literature from a primary RCC with metastasis to the thyroid gland (TG).

Case Report: We report a case of an 88-year-old female patient with past medical history of RCC resected 25 years earlier, who presented to the Emergency Department with a large left anterior neck mass causing dyspnea and stridor due to intra-tracheal extension. The airway symptoms progressed rapidly, and she required emergent management to secure the airway in the operating room.

Conclusions: This case reports a rare instance in which RCC metastasis presented with intra-tracheal extension causing airway compromise and the need for emergent airway management. It is the first time that use of cold instruments has been documented to excise RCC’s intra-luminal tracheal lesion to secure the airway in an emergent case in a safe manner. With this surgical approach, the airway is secured by endotracheal intubation after excision of an intra-luminal tracheal lesion, with the benefit of avoiding awake tracheostomy in a patient with a distorted neck anatomy. Also, this case reinforces that metastatic RCC to the thyroid gland can occur 25 years after initial diagnosis. For this reason, we advocate lifelong monitoring in patients with the diagnosis of RCC.

Keywords: Carcinoma, Renal Cell • Dyspnea • Neoplasm Metastasis • Respiratory Sounds • Thyroid Gland • Tracheal Neoplasms

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/934814
Background

Thyroid gland (TG) neoplasms are generally found to be primary glandular lesions, most commonly papillary thyroid carcinoma. Rarely, metastatic lesions are found in the TG and most commonly arise from renal cell carcinoma (RCC), which is the primary kidney malignancy in adults [1]. It is well established that RCC is more common in men. However, RCC with metastasis to the TG is more common in women [2]. These tumors frequently metastasize to the lungs and bones, and sporadically invade the TG.

Patients with RCC metastasis to the TG can present with a palpable nodule, goiter, neck swelling, dysphagia, dyspnea, dysphonia, cough, stridor, and/or tracheal compression, and/or tracheal invasion, leading to respiratory compromise, as in this report. Fine-needle aspiration is both highly sensitive and specific and is the criterion standard for diagnosis of thyroid masses [3,4]. If clinically feasible, total or partial thyroidectomy with complete resection of the tumor is the preferred treatment. Close follow-up should be given because recurrence may occur, particularly if the tumor has spread to adjacent structures or if thyroid metastases exceed 3.5 cm [5]. On the other hand, nonsurgical candidates may be treated with systemic therapy [6].

Extensive lesions may present with respiratory compromise; therefore, it is imperative to secure the airway. In this study we aim to report our experience with a rare case of RCC metastasis to the TG with extension into the trachea causing dyspnea 25 years after the initial diagnosis. We report, for the first time, an alternative and safe surgical approach to secure the airway in this unusual emergent case.

Case Report

An 88-year-old female patient presented to the Emergency Department reporting a 1-week history of inspiratory stridor after a 2-week history of progressive shortness of breath. Also, she reported intermittent hemoptysis and a 6-week history of enlarging anterior neck mass causing dysphagia to solids. The patient reported having a previous thyroid fine-needle aspiration done 5 years earlier, with findings suspicious for follicular neoplasm. Successive thyroid ultrasounds showed mass enlargement, although no surgical intervention was performed because the patient was lost to follow-up.

The patient’s past medical history included chronic conditions such as hypertension, diabetes mellitus, coronary artery disease, myocardial infarction 1 month prior to our evaluation, and diabetic peripheral neuropathy leading to pain and decreased sensation in bilateral lower extremities. Her past surgical history included sterilization and right total nephrectomy 25 years earlier due to a kidney-confined RCC.

Upon evaluation, the patient was found to be in acute respiratory distress. An ill-defined, indurated, anterolateral left neck mass with irregular borders was noted to be causing displacement of the trachea to the right. A flexible laryngoscopy was performed and a normal laryngeal anatomy and function with mild bulging of the left lateral pharyngeal wall without obstruction of the glottis was observed. A flexible bronchoscopy showed a tracheal mass 4 cm below the true vocal cords, obstructing approximately 80% of the airway due to a ball-valve effect. CT scan without contrast showed a large homogeneous, infiltrative, and poorly defined left anterior neck mass arising from the left thyroid lobe measuring 4.1×5.0×5.1 cm, with direct invasion of the trachea with an intra-luminal component measuring 1 cm in diameter (Figure 1). The mass extended inferiorly into the left superior mediastinum (Figure 2). Furthermore, multiple pulmonary nodules associated with metastatic disease to the lungs were found (Figure 3).

The patient was taken emergently to the operating room, where a direct laryngoscopy and rigid bronchoscopy were performed under general anesthesia. A successful excision of the intra-luminal tracheal lesion using cold instruments performed. The lesion was pedunculated and originated from the left anterolateral wall. Minimal bleeding was noticed after excision. Immediately, a trans-oral endotracheal intubation was safely achieved. Once the airway was secured, an open biopsy and tracheotomy were performed. The transtracheal biopsy of the thyroid and anterior neck mass revealed nearly complete replacement of the thyroid by clear cell carcinoma. Tumor cells were arranged in nests, and disclosed clear cytoplasm, distinct cytoplasmic membranes, and a fine capillary network around tumor nests. Focal pleomorphic hyperchromatic cells were seen, some with prominent nucleoli (Figure 4). The tumor immunohistochemistry profile confirmed a metastatic clear cell RCC, as tumor cells disclosed strong immunoreaction to RCC, CD10, EMA, and vimentin (Figure 5). Immunostains for TTF-1, CK5/6, p40, and p63 were negative.

Subsequently, abdominal renal protocol CT scan with i.v. contrast showed no evidence of new renal primary or metastatic lesions. The patient was discharged on the 5th day after admission, without complications. She was referred to the Hematology/Oncology service for evaluation. Chemotherapy was determined to be the best choice of treatment at this stage of advanced disease. After a chemotherapy regimen was initiated, the patient was lost to follow-up.

Discussion

Most thyroid masses are benign, but when malignant, primary TG neoplasms are the most common. Nevertheless, metastatic masses to the TG do occur (2.1%) and should always
remain as part of the differential diagnosis of an anterior neck lesion [7]. In the USA, metastases to the TG most commonly arise from primary tumors in the kidneys, lungs, colorectal, and/or head and neck cancers [3].

Renal cell carcinoma (RCC) most commonly metastasizes to the lung, bone, lymph nodes, liver, adrenal glands, and brain. Metastasis to the TG is uncommon [8], but RCC is the most common type of metastatic malignant lesion found in the thyroid. RCC has an indolent metastatic process and is known to recur decades after the primary tumor has been excised [9,10]. In this case, metastatic lesions were found in the TG and lungs 25 years after right nephrectomy, without evidence of abdominal recurrence.

RCC metastasis to the head and neck region appears to occur through different mechanisms. One of the postulated mechanisms of RCC spread is via the vascular system [11]. However, other spreading patterns have been proposed, such as retrograde lymphatic course to the thoracic duct, right-to-left heart shunts, metastasis via Botan’s vertebral venous plexus to the chest, and retrograde travel to the head and neck [12]. Li et al [13] state that metastatic cancer cells may enter a proliferative state and subsequently form a new tumor on a different organ or may become dormant. Potential mechanisms to change from dormant to proliferative states have been proposed and include: angiogenesis, immune response, cellular factors, and signaling pathways. Although cancer metastasis has been widely studied, the exact mechanisms by which RCC spreads to the TG are still unknown, particularly 25 years after initial presentation.

Locally advanced thyroid lesions with tracheal extension are commonly suspected to be anaplastic thyroid carcinoma, which carries an extremely poor prognosis. Due to insufficient published data, RCC metastasis to the TG has uncertain clinical significance when compared to RCC metastasis to other organs [14].
Metastatic lesions to the TG may be treated surgically (i.e., lobectomy or total thyroidectomy) if confined to the TG parenchyma, or with systemic therapy if extra-thyroid extension is found [15].

Generally, RCC is diagnosed at advanced stages due to its slow-growing nature, and the ample space inside the abdomen, facilitating growth without noticeable symptomatology. It is also known for its indolent metastatic progression. Metastases to the TG have been reported concomitantly with the renal diagnosis, preceding the tumor diagnosis, as well as many years later. Villumsen et al [7] reported concurrent TG metastasis in 30-40% of patients with RCC. Indolent metastases show clinical symptomatology 3-5 years after initial diagnosis, but may take more than 20 years. Our patient presented with metastases to the thyroid and lungs 25 years after diagnosis of the primary RCC. No intra-abdominal lesions were observed, negating the possibility of a second primary lesion.

It is important to emphasize the ability of cancer cells to remain dormant for many years.

The patient described in this report presented with tumor migration to the lungs, and a locally advanced metastasis to the TG with direct invasion into the tracheal lumen, causing inspiratory stridor and airway compromise. Tracheal invasion usually occurs from direct extension of neoplastic lesions of neighboring tissues, including the thyroid, larynx, lymph nodes, and esophagus.

Byard [16] presented a case report of a 62-year-old male patient who had acute respiratory distress due to RCC metastasis occluding the tracheal lumen at the carina, and consequently died. Testini et al [17] presented the first case of RCC metastasis to the TG, causing compressive symptoms and airway compromise that was successfully treated via total thyroidectomy and tracheostomy. Additionally, Watanabe et al [18]...
described the case of a 74-year-old man who presented with direct invasion of the tracheal lumen by RCC, treated by palliative implantation of an expandable metallic stent to maintain airway patency.

Patients with large anterior neck masses present anatomical distortion, rendering a difficult technical intervention to secure the airway, leading to a potentially dangerous surgery. Therefore, it may be difficult to find the airway during awake tracheostomy. Additionally, initial endotracheal intubation can dislodge the tracheal mass and cause a fatal distal airway occlusion.

In this report, we show, for the first time, the efficacy of operative rigid bronchoscopy and use of cold instruments for removal of the intra-tracheal lesion to ensure airway patency, followed by endotracheal intubation to secure the airway. After the airway secured by endotracheal intubation, a control open tracheostomy can be performed for adequate airway management and tracheal lesion site stenting. With this approach, an awake emergent tracheostomy is avoided in a patient with distorted neck anatomy. Moreover, this approach has been shown to be a safe and effective way to excise intra-luminal tracheal masses causing acute airway obstruction in patients with extensive thyroid lesions.

Hemorrhage inside the airway is a major concern when performing intra-tracheal lesion excision. Notably, RCCs are known to be solid and highly vascular tumors [19]. Aziz et al [20] reported no significant difference in vascular density between primary and metastatic RCC lesions. Furthermore, an association between RCC tumor vascularity and post-biopsy hemorrhage has not been established. Therefore, tumor vascularity should not be considered when choosing an anatomic preference of primary versus metastatic lesion biopsy. Even though the bleeding risk is always present, maintaining airway patency and successful ventilation is the primary goal when performing intra-luminal tracheal surgery. Surgical methods that prevent hemorrhage should be used, especially inside the airway. Although cold instrument intervention is not the definitive method to minimize bleeding, this case shows that it is a safe alternative in a distal, intra-tracheal airway obstruction by RCC tumors.
Conclusions

Although metastasis to the TG is infrequent, patients with a history of RCC should be followed for possible indolent tumor spread to distant organs. This pathology is slow growing, but patients may present with acute life-threatening symptoms when vital organs are involved. In this report we present a case of metastatic RCC to the TG 25 years after initial diagnosis. For this reason, lifelong monitoring for RCC recurrence is necessary. Furthermore, we report use of a safe approach to secure the airway if the tracheal lumen is involved by the tumor.

Declaration of Figures’ Authenticity

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