Beyond Squamous Cell Carcinoma: Unusual Laryngeal Lesions and Their Imaging Features

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ABSTRACT

The larynx is a compact structure with complex anatomy essential for airway protection and phonation. Although common laryngeal pathologies are well recognized and readily diagnosed, such as epiglottitis in children, post-intubation subglottic stenosis, and squamous cell carcinoma in adults, several rare conditions with overlapping clinical features may mimic neoplasms, resulting in delayed diagnosis and management. These include uncommon infections, non-squamous carcinomas, vascular malformations, and vascular tumors, among others. Many of these lesions demonstrate characteristic imaging findings. Imaging, therefore, plays a pivotal role in differentiating these entities and guiding treatment. Awareness of these uncommon laryngeal lesions and their imaging characteristics is crucial for accurate diagnosis, appropriate treatment planning, and the prevention of unnecessary delays in management.

Keywords: Larynx, Laryngeal tumors, laryngeal infections, Chondrosarcoma.

Type of Article: Case Series **Specialty:** Radiology

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Background

The larynx is a small structure with complex anatomy and function responsible for airway maintenance and phonation. A wide spectrum of pathological processes can involve the larynx, ranging from inflammatory and infectious conditions to benign and malignant neoplasms, most presenting with hoarseness of voice, a common but nonspecific otolaryngologic symptom. While common benign laryngeal lesions such as vocal cord nodules and polyps, infections such as epiglottitis, neoplasms such as squamous cell carcinoma (SCC), and conditions such as post-intubation subglottic stenosis are well recognized, several uncommon lesions may present with overlapping clinical and imaging features. Uncommon entities such as laryngeal tuberculosis (TB), fungal infection, vascular malformations, and non-squamous cell origin tumors are infrequently encountered in routine clinical practice and may pose a diagnostic challenge due to their nonspecific presentation. The most suitable use of computed tomography (CT) and magnetic resonance imaging (MRI) is to show the extent of the lesion and identify the likely etiology of a laryngeal mass.

Contrast-enhanced CT (CECT) of the neck is integral to the evaluation and management of laryngeal lesions. CT is readily available and excels in anatomical resolution, particularly in detecting cortical cartilage and osseous involvement. MRI serves as a problem-solving tool in laryngeal imaging, offering superior soft tissue resolution and allowing more accurate assessment of the intrinsic characteristics of a lesion, its extent, and infiltration of adjacent soft tissue structures, when present [1].

This study presents a spectrum of uncommon laryngeal lesions that, although rare, may mimic neoplasms and result in delayed recognition and treatment. Knowledge of the imaging features of these entities can lead to their prompt identification, which is essential for accurate diagnosis, timely management, and improved patient outcomes [1].

Methodology

This case series included eight cases of patients with uncommon laryngeal lesions exhibiting classical and representative imaging findings. Cases were selectively chosen from patients evaluated between 2016 and 2024

to illustrate the imaging spectrum of these uncommon lesions. CT, MRI, and ultrasound (US) of the neck, where available, were reviewed. Clinical records and relevant histopathological data were retrospectively assessed.

Case Presentation

Infections

Case 1

A 75-year-old male presented with insidious-onset, painful, progressive dysphagia for 2 months. He had multiple pre-existing comorbidities, including diabetes mellitus (DM), hypertension, chronic kidney disease, and coronary artery disease, for which he was receiving treatment. Direct laryngoscopy demonstrated an irregular exophytic growth involving the right aryepiglottic (AE) fold, and biopsy samples were obtained. CECT of the neck showed an irregular hypodense collection involving the right AE fold with smooth peripheral enhancement, without solid enhancing components (Figure 1a-c). No significant cervical lymphadenopathy was identified. Imaged sections of the chest demonstrated the left lung upper lobe cavity and multiple miliary nodules in both lungs (Figure 1d). Based on the imaging findings, an infectious etiology such as TB was favored over malignancy. Xpert TB polymerase chain reaction testing of sputum was positive for TB. The histopathology specimen from the right pyriform sinus showed granulomatous inflammation consistent with TB, and acid-fast bacilli stains were positive. The patient was started on antitubercular therapy (ATT), using the 2HRZE/4HR regimen, consisting of an intensive phase of 2 months with isoniazid (H), rifampicin (R), pyrazinamide (Z), and ethambutol (E), followed by a continuation phase of 4 months with isoniazid (H) and rifampicin (R). Following completion of 6 months of therapy, he demonstrated significant symptomatic improvement on follow-up.

Case 2

A 56-year-old male with type II DM presented with dyspnea and noisy breathing for 3 months. Symptoms developed following COVID-19 respiratory illness requiring

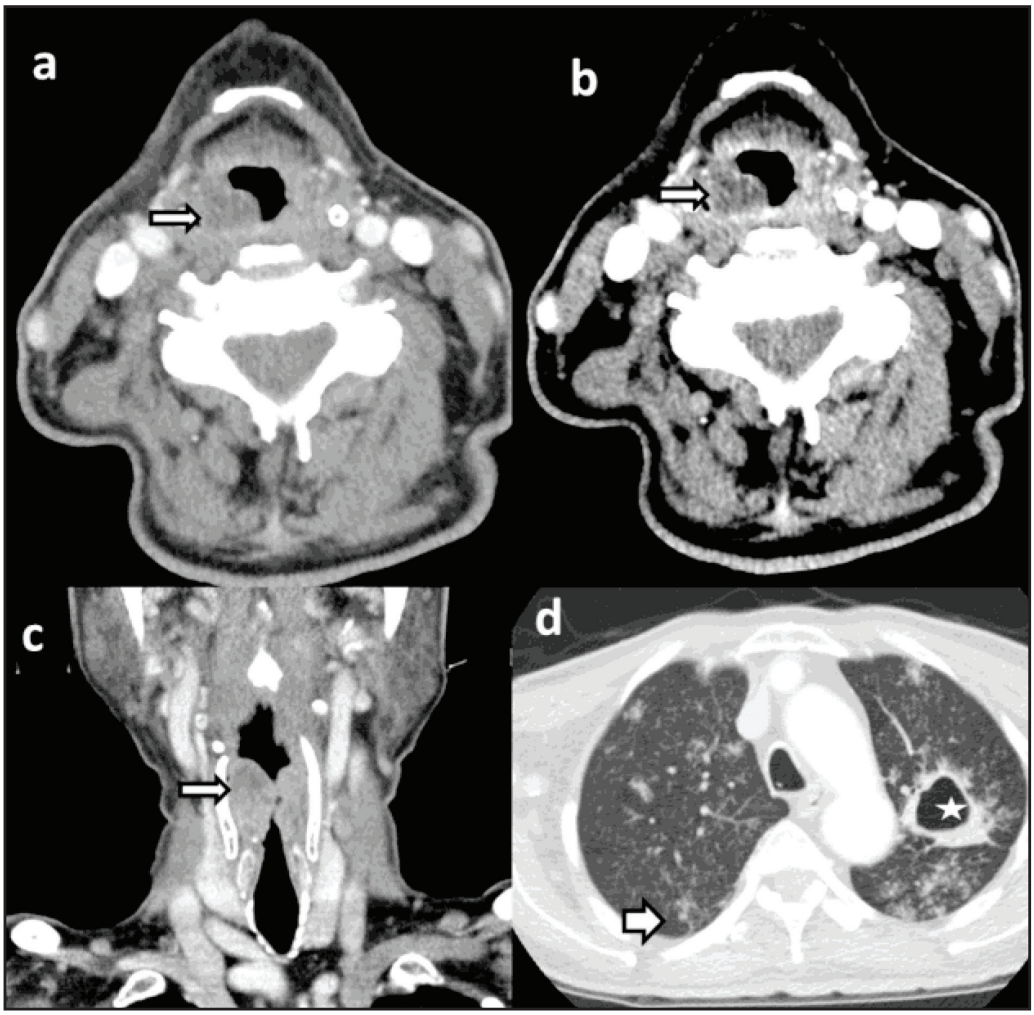

Figure 1. *75-year-old male with laryngeal tuberculosis, Axial (a, b) and coronal (c) CECT neck demonstrating an irregular hypodense collection in the right AE fold (long arrow), Axial (d) CECT thorax demonstrating left lung upper lobe cavity (star) and multiple miliary nodules (short arrow) in both lungs.*

ICU admission for 1 week, during which he received intravenous antivirals, corticosteroids, and high-flow oxygen therapy. CECT of the neck demonstrated distortion of the laryngeal and upper tracheal framework in the form of irregular circumferential soft tissue thickening involving the glottic and subglottic regions, causing severe luminal narrowing and post-stenotic dilation of the upper trachea (Figure 2). The patient subsequently underwent emergency tracheostomy for stridor. Microlaryngoscopy revealed unhealthy mucosa involving the glottic and subglottic larynx, which was biopsied. Histopathology showed acute invasive fungal infection with broad pauciseptate fungal hyphae suggestive of mucormycosis. He was given 7 days of IV Amphotericin 60 mg (conventional) as per the amphotericin protocol and started on Tab Posaconazole, which he tolerated well. The patient was unwilling to undergo surgical debridement. The patient underwent laryngoscopy, which showed complete resolution of the disease, and the mucosa appeared healthy. Follow-up CECT performed 1 month after completion of therapy demonstrated resolution of mucosal irregularity with persistent subglottic stenosis requiring balloon dilatation.

Congenital lesions

Case 3

A 33-year-old male with a known extracranial arteriovenous malformation (AVM) involving the head and neck since childhood underwent CECT of the neck as part of the pretherapeutic evaluation (Figure 3a). Incidentally, a small, well-defined, lobulated, non-enhancing lesion was identified in the pre-epiglottic space, abutting the body of the hyoid bone (Figure 3a, b). Focused US demonstrated an anechoic lesion with thin internal septations and no internal vascularity (Figure 3c). No phleboliths were identified. The anatomic location and imaging findings were consistent with a thyroglossal cyst. As the patient was asymptomatic for this lesion, conservative management was advised.

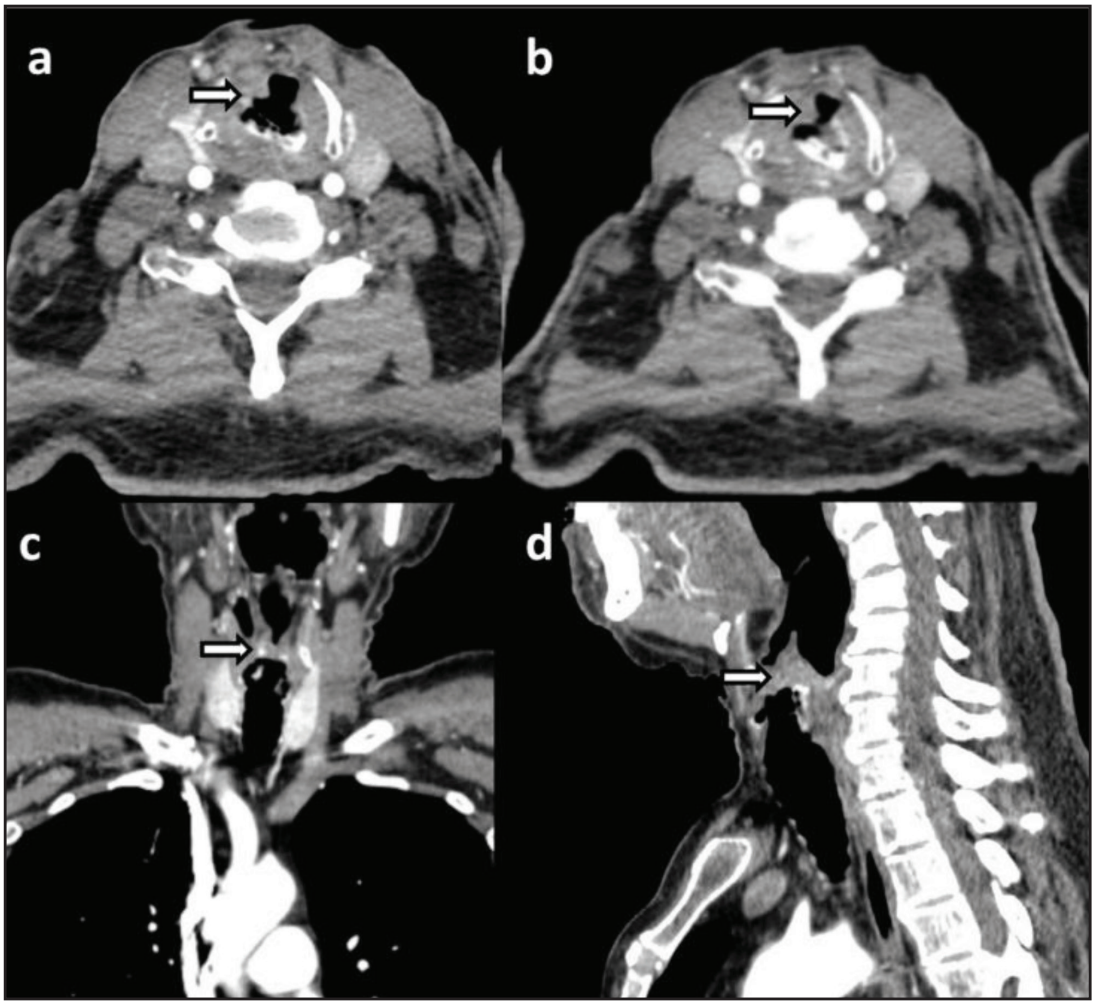

Figure 2. *56-year-old male with laryngeal mucormycosis, Axial (a, b), coronal (c), and sagittal (d) CECT of the neck demonstrating an irregular circumferential soft tissue thickening involving the glottic and subglottic regions (long arrows) causing severe luminal narrowing.*

Vascular malformation

Case 4

A 29-year-old male presented with fluctuating left neck swelling for 1 year, occasionally associated with dysphagia. Direct laryngoscopy demonstrated a mucosa-covered bulge with bluish discoloration involving the left false cord, ventricle, and paraglottic space. CECT of the neck demonstrated a small, ill-defined soft tissue lesion containing multiple phleboliths in the left AE fold (Figure 4a). Focused US demonstrated mobile low-level internal echoes and phleboliths within the lesion (Figure 4b). Limited MR imaging demonstrated homogeneous T2-weighted short tau inversion recovery (T2-STIR) hyperintense signal (Figure 4c, d). Imaging findings were consistent with a slow-flow vascular malformation. He was started on sirolimus, despite which there was an increase in the size of the swelling with pain. Vincristine was administered with a short course of prednisolone. He was given weekly doses of vincristine (three doses) and subsequently showed improvement in pain and a decrease in the size of the swelling.

Vascular tumors

Case 5

A 32-year-old male presented with progressive hoarseness of voice for 6 months associated with intermittent throat pain. CECT of the neck demonstrated a small, well-defined, intensely enhancing lesion centered in the anterior commissure projecting into the laryngeal lumen, with a suggestion of a feeding artery likely arising from a branch of the external carotid artery (Figure 5a, b). On ultrasonogram (USG) screening, the lesion appeared well defined and hypoechoic (Figure 5c). Differential diagnoses of hemangioma and paraganglioma were considered. MRI of the neck demonstrated a markedly T2 hyperintense lesion with early, avid homogeneous enhancement on dynamic imaging, favoring hemangioma (Figure 5d-f). Operative findings demonstrated a large, lobulated, reddish soft tissue lesion arising from the anterior two-thirds of the right false cord and the right AE fold. The patient was treated with sodium tetradecyl sulphate sclerotherapy injected at multiple points over the lesion. The lesion reduced in size on subsequent follow-up.

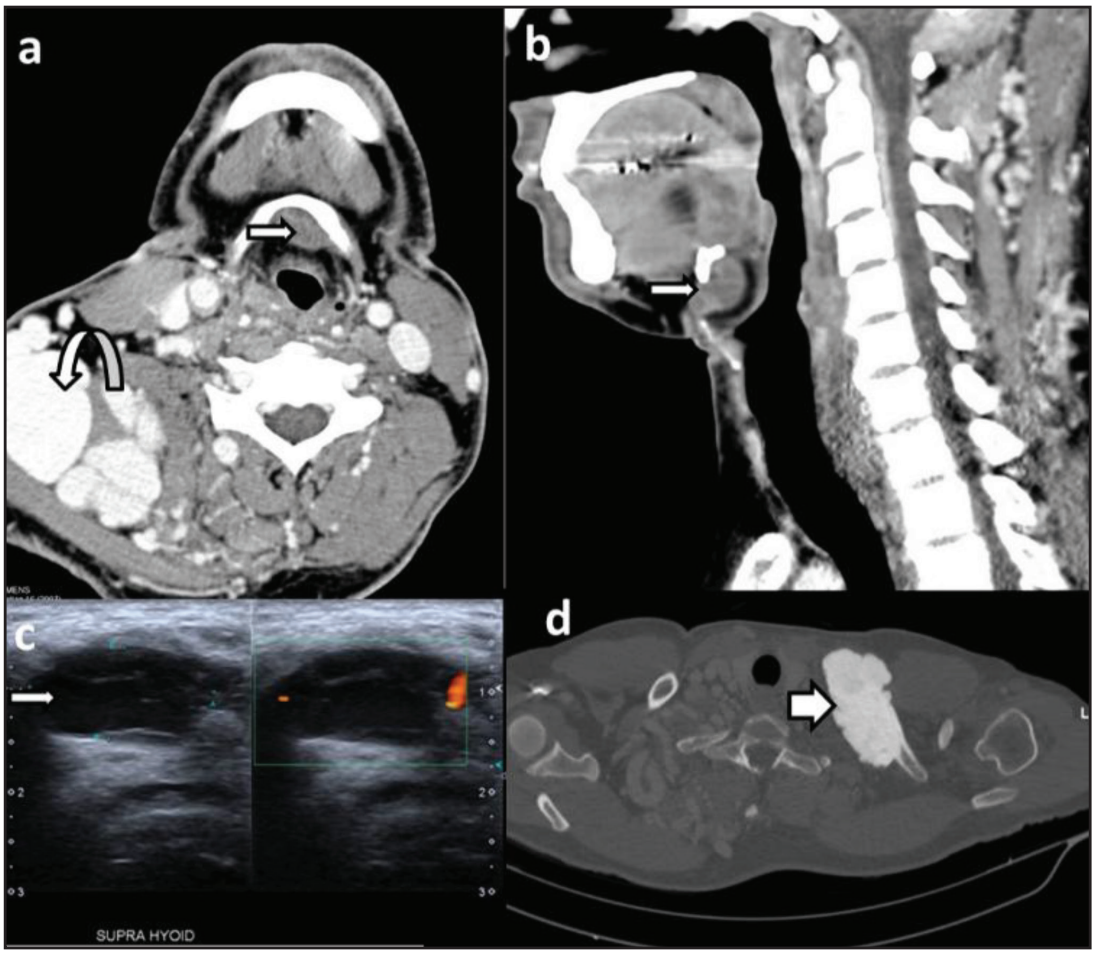

Figure 3. *33-year-old male with pre-epiglottic thyroglossal duct cyst. CECT of the neck, axial (a) and sagittal (b), demonstrating a lobulated, non-enhancing lesion (long arrows) in the pre-epiglottic space, which is anechoic with thin internal septations and no internal vascularity on USG (c). The patient had a known large AVM in the right neck (curved arrow) and incidental melorheostosis of the left clavicle (d).*

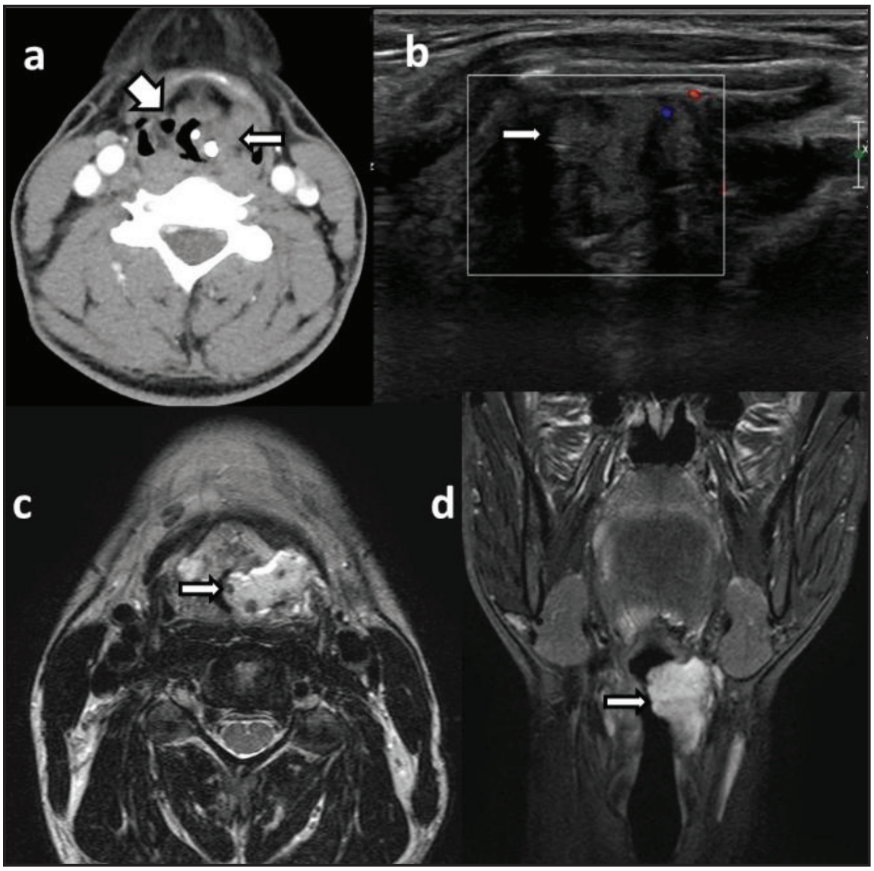

Figure 4. *42-year-old female with slow-flow vascular malformation. (a) CECT of the neck demonstrating a lobulated soft tissue lesion containing multiple phleboliths involving the left AE fold (long arrow) and an incidental right external laryngocele (short arrow). (b) The lesion is hypoechoic on USG with low-level echoes and no internal vascularity. (c) On MRI, the lesion is hyperintense on T2WI and T2-STIR.*

Case 6

A 26-year-old female presented with snoring for 8 months without significant comorbidities. Nasopharyngolaryngoscopy identified a well-defined submucosal lesion centered in the right pyriform sinus. Contrast-enhanced MRI of the neck demonstrated a well-circumscribed, lobulated lesion centered within the right paraglottic space extending to the laryngeal surface of the epiglottis and narrowing the airway. It was mildly hyperintense on T1-weighted images (T1WI), heterogeneous and hyperintense on T2/STIR, with multiple hypointense flow voids on T2-weighted imaging (T2WI), showing intense post-contrast enhancement (Figure 6). In view of the characteristic 'salt-and-pepper' appearance of the tumor on MRI, the imaging diagnoses of paraganglioma was suggested. Urinary metanephrine and normetanephrine levels were also elevated, favoring paraganglioma. Owing to tumor vascularity, the patient underwent preoperative tumor embolization followed by complete surgical excision. Histopathology confirmed paraganglioma. At 1-year follow-up, the patient remained asymptomatic, and there was no evidence of tumor recurrence on follow-up imaging.

Other tumors

Case 7

A 73-year-old male presented with a long-standing history of dysphonia and voice fatigability. Microlaryngoscopy demonstrated a mucosa-covered lesion centered within the left paraglottic space, with ossified cartilage obscuring visualization of the true vocal cords and completely obstructing the laryngeal inlet. CECT of the neck demonstrated a large, lobulated, exophytic, solid enhancing mass involving the posterior lamina of the cricoid cartilage, extending into the arytenoids and left AE fold (Figure 7). Multiple intrinsic ring-and-arc and punctate calcifications were present. The mass caused severe glottic and subglottic stenosis. Imaging findings were suggestive of chondrosarcoma. The patient underwent emergency tracheostomy and biopsy. Histopathology confirmed chondrosarcoma. Surgical excision was advised; however, the patient was lost to follow-up after discharge. This was a limitation.

Nonneoplastic infiltrative conditions

Case 8

A 42-year-old female presented with progressive shortness of breath and cough for 2 years. There were no

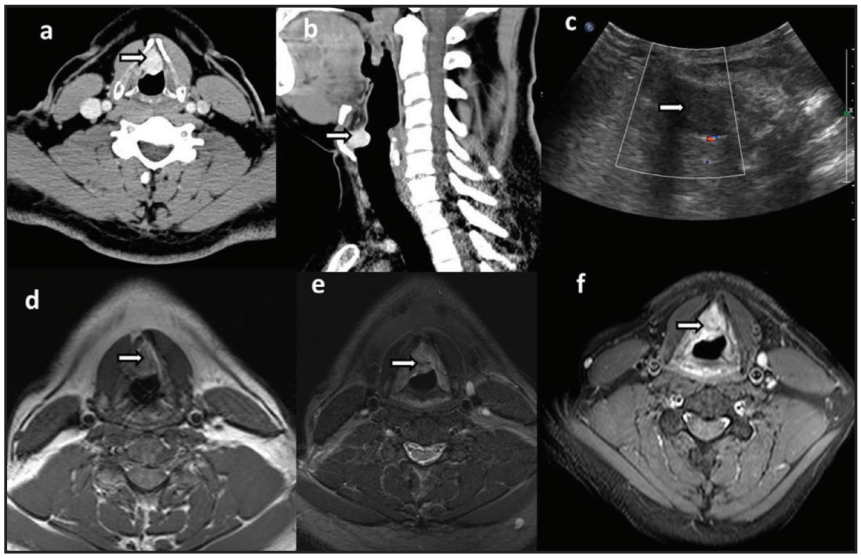

Figure 5. *32-year-old male with laryngeal hemangioma, Axial (a) and Sagittal (b) CECT neck demonstrating a well-defined, intensely enhancing lesion in the anterior commissure (long arrows) projecting into the laryngeal lumen. (c) The lesion is hypoechoic on USG. On MRI, the lesion (long arrows) shows mild hyperintensity on T1WI (d), (e) hyperintense signal on T2-STIR, and intense homogeneous post-contrast enhancement (f).*

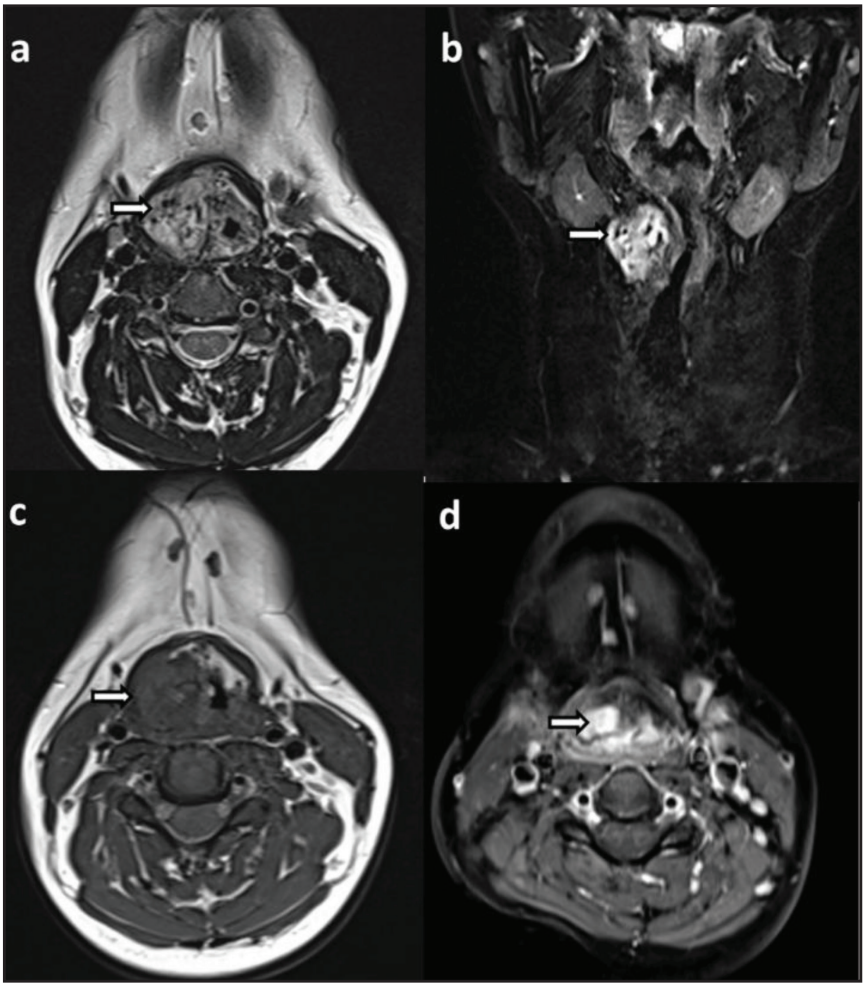

Figure 6. *26-year-old female with laryngeal paraganglioma. Contrast-enhanced MRI of the neck, axial T2WI (a), coronal T2-STIR (b), demonstrating a well-circumscribed, lobulated T2/STIR hyperintense lesion (long arrows) with multiple T2 hypointense flow voids centered within the right paraglottic space. The lesion is isointense on T1WI (c) and extends to the laryngeal surface of the epiglottis, narrowing the airway. It shows intense post-contrast enhancement (d).*

other symptoms suggestive of systemic involvement. Laryngoscopy demonstrated a granular mass occupying ~30% of the subglottic lumen, with normal vocal cords. CECT of the neck demonstrated an ill-defined enhancing mass in the subglottis extending inferiorly as diffuse thickening of the anterior and lateral tracheal walls (Figure 8a, b). Focal calcification in the thickened anterior tracheal wall is seen at the C6 vertebral body level (Figure 8c). Imaging features were not typical of a single disease entity; therefore, differential diagnoses included relapsing polychondritis, tracheobronchopathia osteochondroplastica, granulomatosis with polyangiitis (GPA), and tracheobronchial amyloidosis. The patient underwent microlaryngoscopy with biopsy and carbon dioxide laser ablation. Intraoperatively, a polypoidal friable growth arising from the subglottis and involving the anterior and lateral walls of the trachea was identified. Histopathology confirmed amyloidosis. Her liver function tests, renal function tests (RFT), US abdomen, electrocardiogram, and echocardiography were normal. In

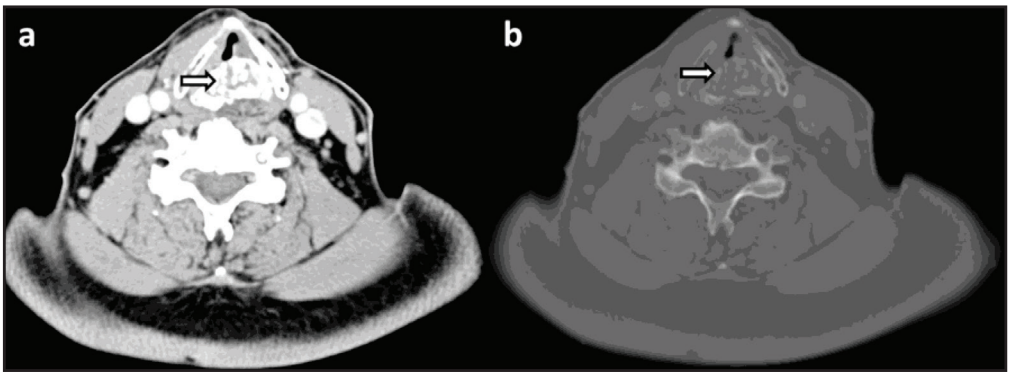

Figure 7. *73-year-old male with laryngeal chondrosarcoma, Axial CECT of the neck soft tissue (a) and bone window (b) images at the level of glottis demonstrating a lobulated expansile mass involving the arytenoid cartilages with ring-and-arc calcifications, causing luminal narrowing (long arrows)*

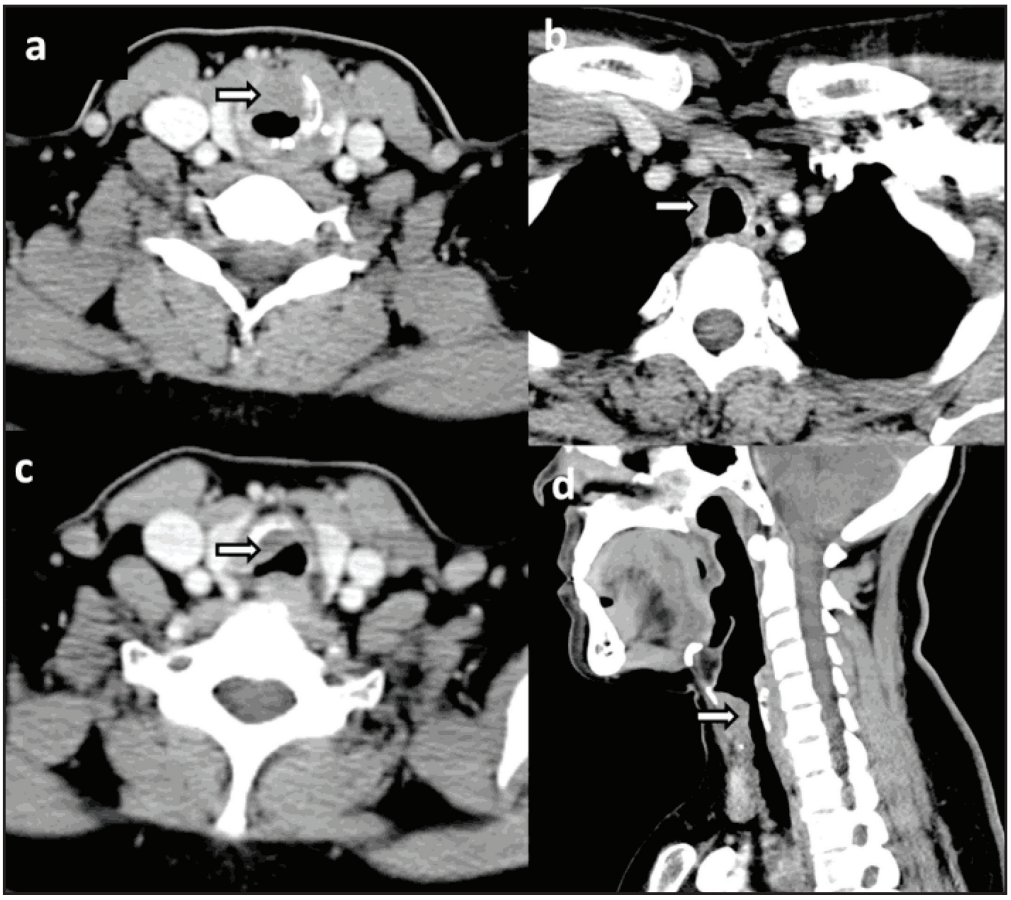

Figure 8. *42-year-old lady with laryngeal amyloidosis. CECT of the neck demonstrates mass-like thickening in the subglottis (a), diffuse thickening of the anterior and lateral tracheal walls (b), focal calcification in the thickened anterior wall (c), and severe luminal narrowing (d).*

addition, bone marrow examination did not demonstrate amyloid deposition. The disease was confined to the larynx and trachea, with no evidence of systemic amyloidosis. Carbon dioxide laser ablation of the laryngeal lesion was performed, and the patient was treated with dexamethasone.

Discussion

This case series presents a spectrum of uncommon lesions involving the larynx and related anatomic subsites. A summary of all eight cases, including patient demographics, clinical presentation, final diagnosis, method of diagnostic confirmation, treatment, and follow-up outcome, is provided in Table 1.

CECT of the neck plays a central role in the evaluation and management of laryngeal lesions, offering excellent anatomical detail and superior assessment of cortical cartilage and osseous involvement. MRI serves as a complementary problem-solving modality, providing superior soft tissue contrast for more accurate evaluation of lesion characteristics, extent, and adjacent soft tissue infiltration.

Common benign laryngeal lesions include vocal cord polyps, nodules, and cysts, which are usually diagnosed on laryngoscopy and rarely require imaging.

SCC is the most common primary malignant tumor of the larynx and is classified by subsite involvement. CT typically demonstrates an enhancing soft tissue mass disrupting the normal anatomic integrity, with potential for cartilage involvement and possible extralaryngeal extension and cervical lymphadenopathy in advanced stages. On MRI, SCC is typically isointense on T1WI, hyperintense on T2/STIR, with variable enhancement [2].

A fluid-density or necrotic collection without enhancing soft tissue components favors an infectious etiology. Although pyogenic conditions usually present acutely, laryngeal TB follows a more indolent course. On CT, laryngeal TB typically appears as symmetric or asymmetric circumferential mucosal thickening, commonly affecting the supraglottic larynx, particularly the AE folds, followed by the free edge of the epiglottis and the false and true vocal cords. Absence of enhancing solid component, preservation of the laryngeal cartilages, and maintained pre-epiglottic and paralaryngeal fat planes are an important imaging feature distinguishing laryngeal TB from malignancy [3].

Laryngeal mucormycosis is an extremely rare but highly morbid condition, with only a few cases reported in the literature. Unlike laryngeal malignancy, but similar to rhino-oto-cerebral mucormycosis, trans-spatial spread and non-enhancing, devitalized mucosa on MRI should raise suspicion of this condition in immunocompromised patients. Laryngeal mucormycosis rarely involves lymph nodes. MRI may help in the confirmation of diagnosis by demonstrating devitalized mucosa that is hypointense on T2 and lacks enhancement (unlike SCC, which is a solid, enhancing, T2 hyperintense mass). In our case of laryngeal mucormycosis, the clinical history of recent COVID-19 infection and corticosteroid exposure was important for clinical and radiological correlation. Early diagnosis and prompt initiation of amphotericin therapy are critical in reducing morbidity and mortality [4].

Thyroglossal duct cysts are anterior midline cystic lesions occurring anywhere along the course of the thyroglossal duct from the foramen caecum to the thyroid gland. Those with intralaryngeal extension are typically seen in the pre-epiglottic space, with a characteristic close relationship to the hyoid bone due to the posterior and superior course of the duct as it passes behind the hyoid bone [5].

Laryngeal venous malformations are uncommon and may pose a risk of airway compromise and life-threatening hemorrhage. The presence of phleboliths on imaging is diagnostic. On MRI, these lesions are typically markedly T2 hyperintense without diffusion restriction. Management depends on lesion type and extent and includes sclerotherapy, surgery, and laser therapy [6].

In adults, the supraglottis is the most common location for laryngeal hemangiomas [7]. These lesions typically appear as well-defined soft tissue lesions with high T2 and intermediate T1 signal intensity, exhibiting intense progressive post-contrast enhancement. These do not show diffusion restriction, unlike SCC. MRI is particularly valuable for confirming their vascular nature, accurately defining lesion extent, and assessing extra-laryngeal extension. Biopsy is generally avoided because of the risk of severe hemorrhage [8].

Laryngeal paragangliomas are rare tumors, accounting for ~1.5% of head and neck paragangliomas. They usually arise within the supraglottic submucosa. CT typically demonstrates a well-defined hypervascular mass with avid enhancement and occasional pressure erosion of the laryngeal cartilages. MRI demonstrates low-to-intermediate T1 signal, high T2 signal intensity with flow voids producing the classic “salt-and-pepper” appearance, and intense postcontrast enhancement. Angiography demonstrates marked tumor blush, and preoperative embolization is commonly performed to reduce intraoperative bleeding risk [9].

Laryngeal chondrosarcoma is an uncommon neoplasm, accounting for <1% of all sarcomas, and most frequently originates from the cricoid cartilage, with less common involvement of the arytenoid, thyroid cartilage, or epiglottis [10]. Imaging plays a crucial role in suggesting the diagnosis of a chondroid tumor. These lesions typically appear as variably dense expansile masses containing characteristic popcorn, punctate, or ring-and-arc patterns of chondroid calcifications and may extend into adjacent soft tissues or osseous structures. Radiologic assessment is essential for diagnosis, determining tumor extent, regional spread, and surveillance for recurrence [11].

Table 1. *Summary of clinical details.*

CASE NO.	AGE	SEX	CLINICAL PRESENTATION	IMAGING MODALITY	LOCATION OF THE LESION	FINAL DIAGNOSIS	METHOD OF DIAGNOSIS CONFIRMATION	TREATMENT	FOLLOW-UP OUTCOME
1	75	M	Dysphagia	CECT neck	Right AE fold	TB	Histopathology	ATT	Symptoms improved
2	56	M	Dyspnoea	CECT neck	Glottic and subglottic larynx	Mucormycosis	Histopathology	Antifungals	Resolution on imaging
3	33	M	Unrelated complaints	CECT neck	Pre-epiglottic space	Thyroglossal cyst	Focused USG	Conversative management	Kept on follow-up
4	29	M	Neck swelling	CECT neck	Left false cord, ventricle, and para-glottic space	Slow-flow vascular malformation	Focused USG and limited MR imaging	Sirolimus and Vincristine	Decrease in pain and size of swelling
5	32	M	Hoarseness of voice	CECT neck	Anterior commissure	Hemangioma	MR imaging	Sclerotherapy	Kept on follow-up
6	26	F	Snoring	CEMR face/neck	Paraglottic Space	Paraganglioma	Elevated Urinary metanephrine, normetanephrine levels, and histopathology	Preoperative tumor embolization	No symptoms
7	73	M	Dysphonia	CECT neck	Left paraglottic Space	Chondrosarcoma	Histopathology	Surgical excision advised, did not consent to treatment	Lost to follow up
8	42	F	Dyspnoea	CECT neck	Subglottis	Amyloidosis	Histopathology	Carbon dioxide laser ablation	Kept on follow-up

Approximately 20% cases of amyloidosis, a rare heterogeneous disorder characterised by abnormal protein deposition, involve the head and neck region, with the larynx being the most common site, accounting for 0.2%-1.2% of benign laryngeal lesions. Clinical manifestations depend on lesion size and location [12]. The posterior tracheal membrane is typically involved in tracheal amyloidosis and other granulomatous inflammatory conditions, such as GPA, but is usually spared in relapsing polychondritis. CT can detect punctate calcifications seen in approximately 0.5%-1.5 % of amyloidosis. Amyloid deposits characteristically demonstrate intermediate T1 and low T2 signal intensity, often resembling the signal intensity of skeletal muscle. Diffuse thickening of the vocal cords in laryngeal amyloidosis may mimic glottic carcinoma; however, the smooth mucosal surface on direct laryngoscopy, attributable to the submucosal nature of the lesion, and characteristic low signal intensity on T2WI, help distinguish amyloidosis from malignancy [13].

Conclusion

Although SCCs are more commonly encountered in radiological practice, a broad spectrum of other uncommon laryngeal pathologies also needs to be considered when imaging findings are not typical of malignancy. These include atypical infectious conditions such as TB and mucormycosis, vascular anomalies and vascular tumors, non-squamous cell origin neoplasms, as well as infiltrative disorders such as amyloidosis. Recognition of the distinguishing imaging characteristics of these lesions can aid in a more accurate clinico-radiological diagnosis. Accurate diagnosis can prevent unnecessary aggressive interventions, facilitate timely initiation of appropriate medical or surgical therapy, and reduce morbidity associated with delayed treatment. A thorough understanding of the imaging spectrum of uncommon laryngeal lesions, combined with clinical correlation, is therefore crucial for radiologists and clinicians evaluating laryngeal pathology. Serial imaging assists in correlating radiologic findings with clinical symptoms, assessing disease extent, and determine the appropriate timing for surgical intervention.

What is new?

Several case reports describing uncommon laryngeal lesions that may mimic malignancy have been published. However, our study provides a comprehensive compilation of uncommon laryngeal lesions, with an emphasis on their imaging characteristics and implications for management. The cases are systematically categorised by aetiology, facilitating a clearer understanding of diagnoses and key imaging features.

List of Abbreviations

ATT	Antitubercular therapy
CECT	contrast-enhanced CT
CT	Computed tomography
MRI	Magnetic resonance imaging
PCR	Polymerase chain reaction
TB	Tuberculosis
T2-STIR	T2-weighted short tau inversion recovery
USG	Ultrasonogram

Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None.

Consent for publication

Informed consent for publication was obtained from all patients at the time of imaging.

Ethical approval

Ethical approval is not required at our institution for the publication of an anonymous retrospective case series.

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