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Pharyngeal Emergencies

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Pharyngeal emergencies, which can be subdivided into traumatic versus nontraumatic, are a common cause of Emergency Department visits. Patients often present to Emergency Department with a wide variety of pharyngeal symptoms, for which computed tomography imaging has become the first line imaging modality. Familiarity with these conditions enables a radiologist to make a prompt diagnosis, assess the extent of disease, and evaluate for potential complications.

In this chapter, we present a brief overview of nontraumatic pharyngeal emergencies based on anatomic subdivisions (nasopharynx, oropharynx, and hypopharynx), discuss their etiologies, clinical presentations, computed tomography imaging findings, and management options. We will also discuss differential diagnoses based on imaging findings.

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Introduction

Patients presenting with severe symptoms relating to the aerodigestive tract are frequently first encountered in the Emergency Department (ED).[1,2] Head and neck related complaints/symptoms are reported to be one of the most common causes of ED visits with pharyngeal emergencies accounting for the second most common reason for head and neck related ED visits.[3]

Pharyngeal emergencies can be broadly divided into traumatic and nontraumatic emergencies. Patients often present to the ED with a wide variety of pharyngeal symptoms for which computed tomography (CT) imaging has become the first line imaging modality. Familiarity with these conditions enables a radiologist to make a prompt diagnosis, assess the extent of disease, evaluate for potential complications, and guide appropriate management.

The purpose of this review is to provide a succinct overview of the most common nontraumatic pharyngeal emergencies based on anatomic subdivisions and discuss their etiologies, clinical presentations, CT imaging findings, and management options. We will also discuss differential diagnoses based on imaging findings.

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Oropharynx

Tonsillar/Peritonsillar Abscess

Most of the pharyngeal symptoms presenting to the ED are related to simple upper respiratory tract infections, such as pharyngitis and tonsillitis, and should be treated expectantly without imaging. However, if the patient presents with persisting symptoms, fevers and odynophagia, or more severe symptoms such as drooling or voice changes, a CT neck with contrast should be performed to evaluate for a more complicated infection. Once a simple tonsillitis has spread into the peritonsillar space, the area can feel fluctuant on physical exam, even though a true drainable fluid collection is not present.[4] Imaging can help distinguish between simple tonsillitis and peritonsillar phlegmon (cellulitis) both of which can be treated with antibiotics, from a true abscess which may need surgical intervention.

CT findings of acute tonsillitis include enlarged tonsils with variable attenuation and heterogenous striated enhancement with associated fat stranding and reactive cervical lymphadenopathy (Fig. 1). While most patients presenting to the ED with unilateral tonsillar enlargement and cervical lymphadenopathy will have an infectious etiology, the radiologist needs to also be aware that squamous cell carcinoma or lymphoma of the tonsil may also have a very similar presentation. However, instead of the striated enhancement of the enlarged tonsil, a more mass like enlargement with a more homogeneous enhancement is seen (Fig. 2).

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Figure 1 Acute tonsillitis. Twenty-eight-year-old male presented with throat pain and fever. CT neck shows enlargement and heterogeneous enhancement of the right palatine tonsil (*) compatible with tonsillitis. Central areas of more hypodensities likely reflects phlegmonous change without discrete drainable fluid collection.

Figure 2 Sixty-two-year-old man that presented to the ED for persisting tonsillitis symptoms despite a course of antibiotics. CT neck revealed a left palatine tonsillar mass infiltrating into the left base of tongue (*) with rounded, clustered left level II lymph nodes (arrow).

It is important to understand that the rim-enhancing fluid collections typical of mature abscesses elsewhere in the body are not always present in the neck because its confined spaces allow for an earlier presentation of the pus collection before it becomes encapsulated. Thus, the absence of rim-enhancement should not deter one from making the diagnosis of a drainable abscess. The far more common peritonsillar abscess (Fig. 3), is a fluid collection outside of the tonsil proper that deviates the tonsil away from the tonsillar bed, while the rare true tonsillar abscess is contained within the tonsil itself (Fig. 4). The distinction between a tonsillar and peritonsillar abscess is important for management considerations, given that tonsillar abscesses can be managed medically whereas peritonsillar abscesses usually require surgical drainage.[5]

While a contrast enhanced CT has a high sensitivity of nearly 100% when evaluating for a peritonsillar abscess, there is an approximately 25% false positive rate given the difficulty in differentiating phlegmonous changes from an abscess.[6] Recent studies have shown promising use of intraoral ultrasound to assess for tonsillar/peritonsillar abscess in patients with tonsillitis with suspected tonsillar/peritonsillar abscess.[7]

If untreated, they can lead to retropharyngeal effusion (Fig. 5) or septic thrombophlebitis of the ipsilateral internal jugular vein, discussed below.[8]

Oral Cavity

Ludwig Angina

Ludwig Angina is a rare but life-threatening condition characterized by rapidly progressive, severe cellulitis of the floor of the mouth, that is, submandibular, sublingual, or submental spaces.[9] If untreated, this fatal condition can lead to death secondary to airway compromise.[10] While the incidence of Ludwig's Angina has decreased, it can be seen in the elderly or immunocompromised patients in the setting of untreated odontogenic infections, microtrauma infiltrating deep into the oral cavity such as with "piercing," mandibular fractures or tonsillar/peritonsillar abscesses.

Patients typically present with tender nonfluctuant swelling of the floor of the mouth with a characteristic "hot potato" voice. CT imaging reveals diffuse edema and fat infiltration of the submandibular, sublingual, or submental space(s) causing elevation of the tongue (Fig. 6A-D).

Treatment includes aggressive antibiotics therapy and airway management.[10] Abscess formation is not common but when present, requires surgical drainage. If untreated, this fatal condition can spread to the neck and mediastinum.

Descending Necrotizing Mediastinitis

This aggressive infection is an acute life threatening mediastinitis associated with high mortality. It is usually caused by a descending oropharyngeal or cervical spine infection due to the continuity of fascial planes between the neck and mediastinum (aka "danger space") but can also be seen in patients after sternotomy surgery complications or in the

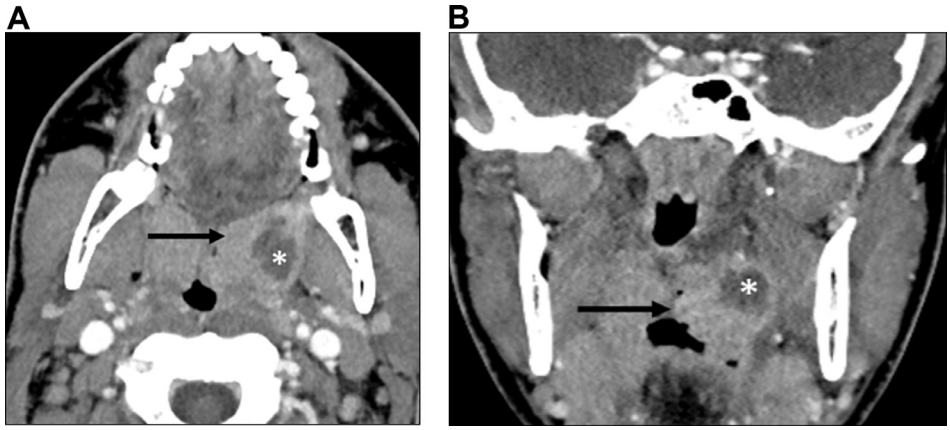

Figure 3 Peritonsillar abscess: 23-year-old female presenting with fever and sore throat. Contrast enhanced CT neck reveals enlarged bilateral palatine tonsils with striated enhancement consistent with acute tonsillitis. There is a peripherally enhancing hypodense fluid collection in the left parapharyngeal space (*) consistent with a peritonsillar abscess. The abscess is causing inferomedial displacement of the left palatine tonsil (black arrows).

Figure 4 Tonsillar abscess. Forty-one-year-old male presented with fever and sore throat. Contrast enhanced CT reveals bilateral rim-enhancing hypodense fluid collections in the palatine tonsils bilaterally consistent with bilateral tonsillar abscesses.

setting esophageal perforations.[11] Immunocompromised patients, particularly diabetics, are especially at risk for this infection.

Patients present with fever, chills, and retrosternal pain. CT imaging reveals infiltration and stranding of mediastinal fat with the ominous presence of gas. There can be associated enhancing mediastinal fluid collections and mediastinal lymphadenopathy or, less commonly, pericardial or pleural effusions or pneumomediastinum depending on the etiology of mediastinitis.[12] More cranially, there can be thickening of the cervical fascia with enhancement and associated cervical lymphadenopathy.

Management is based on extent of disease, categorized as above or below the carina, as described by Endo et al.[13] Patients with disease above the carina may require only cervical drainage whereas patients with extension of disease below the carina require additional mediastinal drainage. The surgical approach for mediastinal drainage depends on the involvement of the anterior versus posterior mediastinum, thus is it imperative that the radiologist include this specific information in the report.[13,14]

Larynx

Epiglottitis

Epiglottitis is an acute inflammation of the epiglottis and the aryepiglottic folds historically caused by *H. Influenzae type B*. While the incidence of epiglottitis in children has greatly decreased because of immunizations, it can still be in seen in adults secondary to *Streptococcus* or *Staphylococcus* infections and in children who are nonvaccinated or have vaccination failure.[15,16] If untreated, acute epiglottitis can lead to airway obstruction and respiratory failure.[17]

Patients present with fever, dysphagia, inspiratory stridor, and voice changes. A single lateral plain radiograph is the imaging study of choice in pediatric patients because it is quick and requires the least amount of maneuvering of the patient. It is imperative that the patient is kept as calm as possible and that an Ear Nose Throat (ENT) consult is obtained early in the management process. The risk of respiratory compromise in these patients requires that a physician able to perform emergent intubation accompany

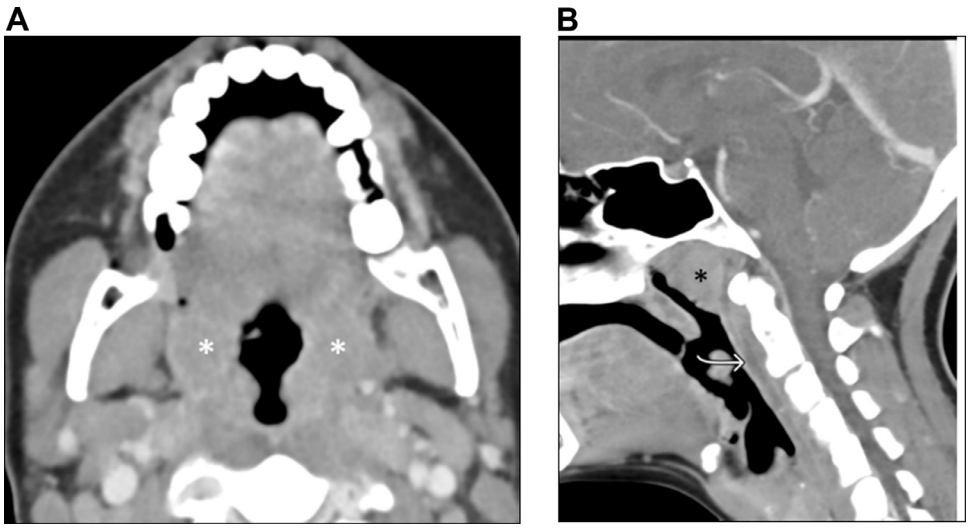

Figure 5 Acute pharyngitis with retropharyngeal effusion: 30-year-old female presented with neck pain and fever. CT neck revealed enlarged adenoids (black asterisk) and palatine tonsils (white asterisk) with heterogenous enhancement in this patient with pharyngitis. There is trace retropharyngeal fluid (arrow) without distention reflecting retropharyngeal effusion secondary to pharyngitis.

the patient outside of the ED. The characteristic abnormality on the lateral radiograph is the "thumb print sign" due to the thickening of the epiglottis and aryepiglottic folds. CT may be considered if diagnosis is unclear on the lateral radiograph, however, the CT should be obtained with extreme caution as placing the patient in the prone position can increase the risk of respiratory arrest.

Although uncommon, epiglottitis is now more common in adults than in children.[18] And like children, can have a quickly deteriorating airway status. Patients present with sore throat and dysphagia, fever and high white blood cell count. Stridor and respiratory distress are warning signs that airway intervention may be imminent. CT imaging in patients with epiglottitis reveals edema and thickening of the aryepiglottic fields with airway narrowing (Fig. 7). Very rarely will there be an associated deep neck space infection. The main differential for epiglottitis is laryngotracheobronchitis (croup), which reveals subglottic narrowing instead of the supraglottic edema seen in epiglottitis. In adults, mass lesions of the epiglottis, including squamous cell carcinoma or inflammatory disorders should be considered in the correct clinical setting.

Retropharynx

Retropharyngeal Abscess

Retropharyngeal (RP) abscess can be a potentially life-threatening infection of the retropharyngeal space. This entity is seen most commonly in children and is due to recurrent pharyngeal and ear infections that result in the suppuration of RP lymph nodes that ultimately rupture.[19] Though rare, RP abscesses in adults can be seen in the setting of cervical spine discitis/osteomyelitis, or less commonly, due to oropharyngeal infections or direct inoculation secondary to mucosal trauma such as foreign body ingestion or recent instrumentation.[19-22]

Patients with RP abscesses often have vague presentations, presenting with nonspecific signs, such as irritability, fever, neck swelling, or stridor. Retropharyngeal abscesses can be difficult to accurately diagnose on imaging and often the decision for surgical intervention will rely heavily on the clinical picture. The RP space is a potential space that can passively fill with fluid due to a wide variety of causes, including tonsillitis/pharyngitis, acute calcific tendinitis of the longus colli muscles, internal jugular vein thrombosis, or postradiation changes. Imaging features of RP edema/effusion include mild distention of the RP with maintenance of its normal configuration (Fig. 5), which has a "bow-tie" configuration.[8,23] The role of the radiologist, then, is to help determine when the fluid the RP space is not due to passive fluid but infected fluid that may need surgical intervention. The most specific finding is the loss of the normal "bow-tie" configuration of the RP space. Since the abscess exerts mass effect on the RP space, the thin mid-portion of the "bow-tie" expands and becomes convex anteriorly (Fig. 8) while the posterior prevertebral muscles become flattened.[23] As mentioned earlier, it is important to note RP abscesses may not exhibit the typical rim enhancement at presentation.

Another important imaging differential of retropharyngeal space fluid is a suppurative retropharyngeal node, which unlike the retropharyngeal abscess, is still contained within the capsule of the lymph node.[23] Suppurative lymph nodes do not need surgical intervention.

Management of a retropharyngeal abscess includes surgical drainage and aggressive IV antibiotics. Complications associated with retropharyngeal abscess include anterior extension with compression and compromise of the airway, posterior extension of the infection which can lead to discitis/osteomyelitis and caudal extension which can lead to mediastinitis. Lateral extension of the infection/inflammation can cause narrowing or thrombosis of the internal jugular vein or internal carotid artery, with possible internal carotid artery

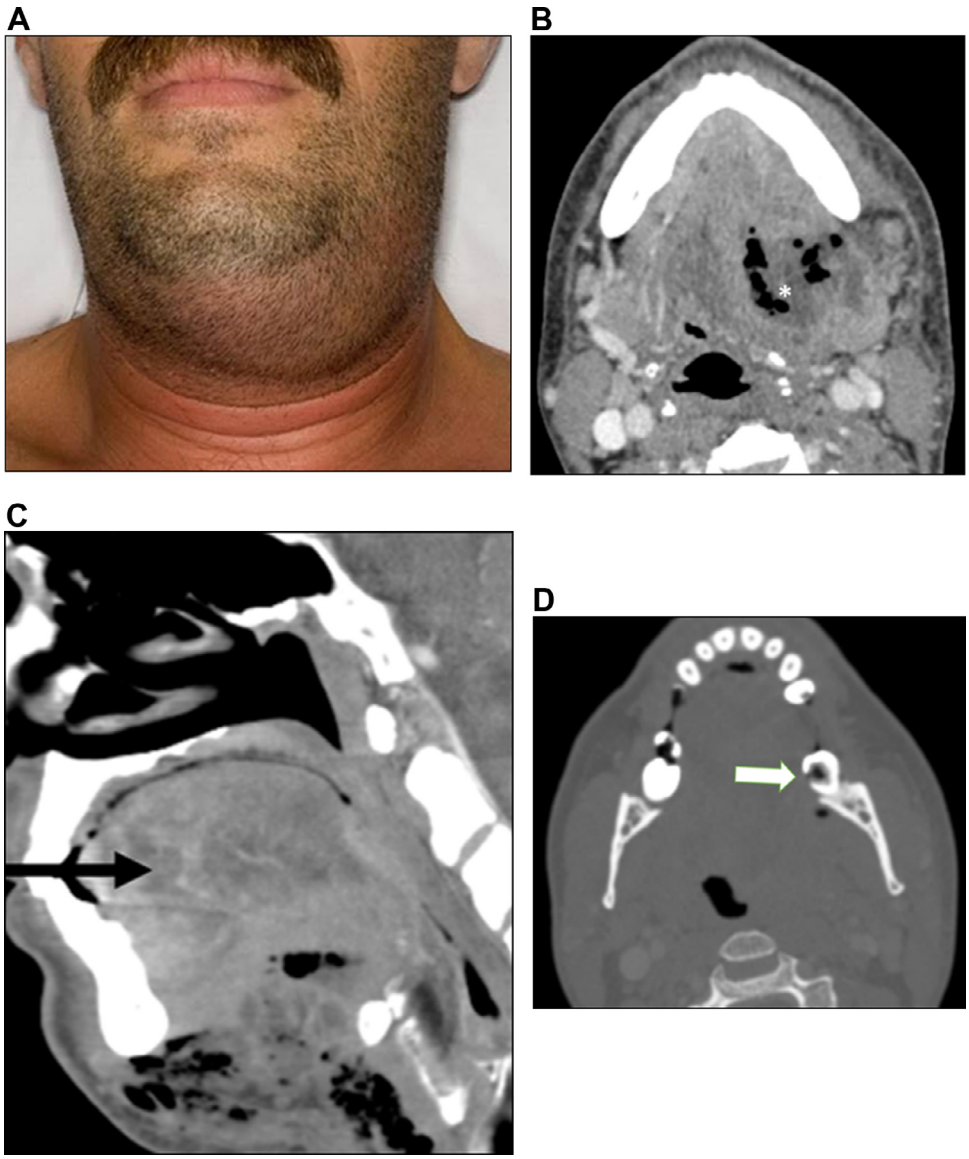

Figure 6 A-D: Ludwig's angina. Forty-year-old male presenting with worsening facial swelling and redness (A). Axial contrast enhanced CT neck (B) reveals extensive sublingual and submandibular space edema with air indicating abscess formation (*). Sagittal reconstruction (C) reveals elevation of tongue (black arrow). Bone window (D) evaluation of the teeth reveals poor dentition (white arrow), likely the cause of this patient's Ludwig's Angina *(Courtesy Jonathan Morris, MD). (Color version of figure is available online.)*

pseudoaneurysm formation. Grisel syndrome is rare complication causing torticollis due to inflammatory laxity of the ligaments of the atlantoaxial joint.[24]

Acute Calcific Tendonitis of the Longus Colli Muscles

Acute calcific tendonitis of the longus colli muscles is granulomatous inflammation of the longus colli tendons typically occurring in middle age patients with slight predilection for females.[25] Patients present with acute neck pain, fever, dysphagia, and reduced neck range of motion with lab work revealing leukocytosis and elevated inflammatory markers such as CRP.

CT imaging reveals amorphous calcification of prevertebral muscles (longus colli) at C1-C2 with edema of the prevertebral soft tissues and retropharyngeal effusion (Fig. 9) with rare minimal enhancement.[26] Rarely, calcifications may be as low as the upper thoracic prevertebral muscles. Increased distention and enhancement with lymphadenopathy of the prevertebral soft tissue should raise concern for a retropharyngeal abscess. Management is pharmacotherapy with nonsteroidal anti-inflammatory drugs.

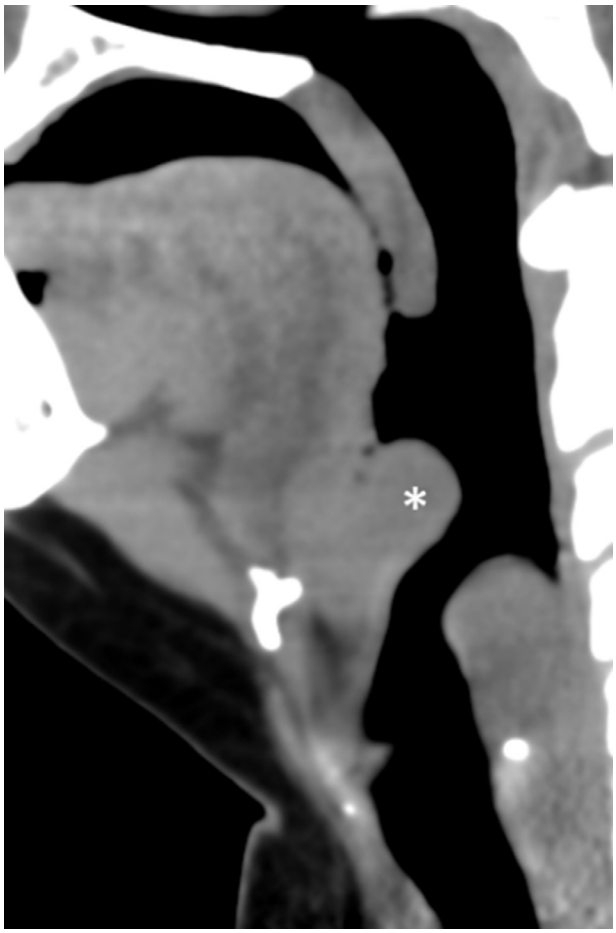

Figure 7 Epiglottitis. Thirty-eight-year-old female presenting with fever and sore throat. Sagittal reconstruction of CT neck reveals enlarged and edematous epiglottis (*) consistent with epiglottitis.

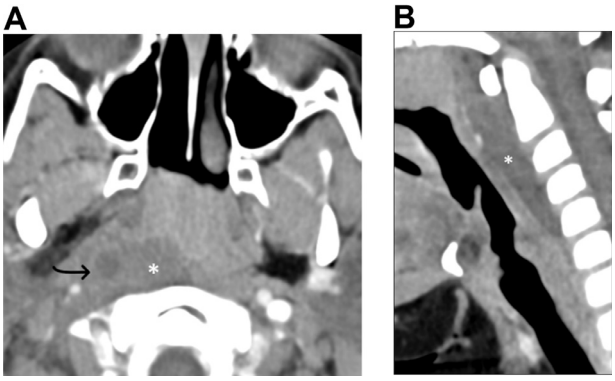

Figure 8 Retropharyngeal abscess: 7-year-old female presenting with worsening neck pain, difficulty swallowing and swelling. Contrast enhanced axial CT neck (A) with sagittal reconstruction (B) reveals an enhancing retropharyngeal hypodense fluid collection causing distention of the retropharyngeal space with convex anterior borders (*) consistent with a retropharyngeal abscess. Suppurative retropharyngeal lymph node is also seen (A arrow) that likely ruptured into the retropharyngeal space causing abscess formation.

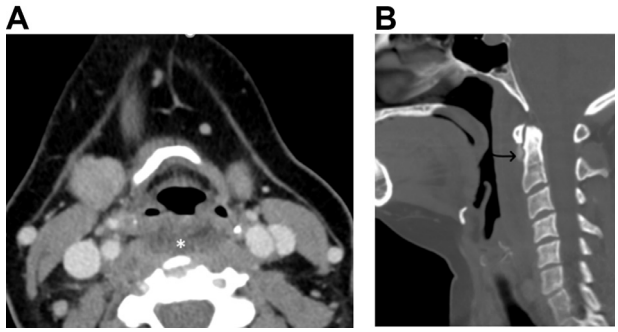

Figure 9 Acute calcific tendonitis of the longus colli. Thirty-seven-year-old female presenting with neck pain. Axial contrast enhanced CT neck (A) reveals retropharyngeal fluid and prevertebral soft tissue edema (*), the fluid in retropharyngeal space does not cause anterior convexity hence is unlikely to be an abscess. Sagittal bone window reconstruction (B) revealing amorphous calcification of the longus colli muscle (arrow) at C1-C2 level.

Miscellaneous

Lemierre's Syndrome

Lemierre's syndrome is typically seen in teenagers and young adults between the age of 15 and 24 years. It is characterized by thrombophlebitis of the internal jugular vein in the setting of oropharyngeal infections such as pharyngitis, tonsillitis, or a retropharyngeal abscess.[27,28]

Patients typically present with fever, sore throat, trismus, retromandibular/neck pain, or neck mass. CT imaging findings are partial or complete thrombosis of the internal jugular vein with diffuse surrounding inflammatory changes and passive fluid (Fig. 10) within the retropharyngeal space.[29] Hematogenous spread of infection can cause septic embolism to the lungs characterized by cavitary lung nodules.

Management includes aggressive intravenous antibiotic therapy with the role of systemic anticoagulation therapy still being controversial.

Angioedema

Angioedema is subcutaneous and submucosal edema caused by postcapillary venule inflammation secondary to release of vasoactive substances.[30] Angioedema can be hereditary or acquired, secondary to medications such as ACE inhibitors, aspirin, NSAIDS, or contrast agents and can happen even years after initiation of these medications.

Patients typically present with swelling, dyspnea, dysphonia, and hypoxia. CT shows circumferential mucosal and submucosal edema of the epiglottis, aryepiglottic folds, prevertebral, and submental soft tissue with varying degrees of airway narrowing (Fig. 11). No enhancing fluid collections or cervical lymphadenopathy is seen. Angioedema can involve multiple regions of the head and neck and can also involve the GI tract.

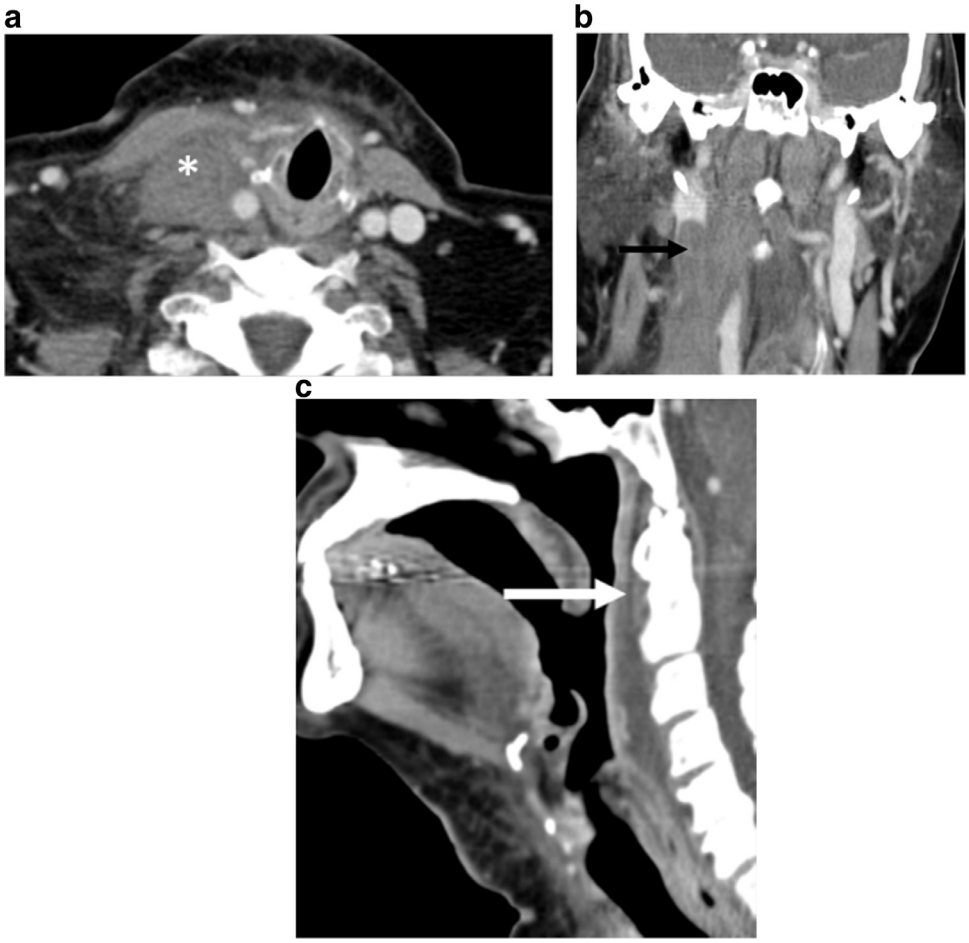

Figure 10 Lemierre's syndrome. Seventy-two-year-old male presented with neck swelling and difficulty breathing with physical exam consistent with pharyngitis. CT neck revealed fat stranding of the right parapharyngeal space (*) with thrombosis of the right internal jugular vein consistent (black arrow). There is trace retropharyngeal fluid (white arrow).

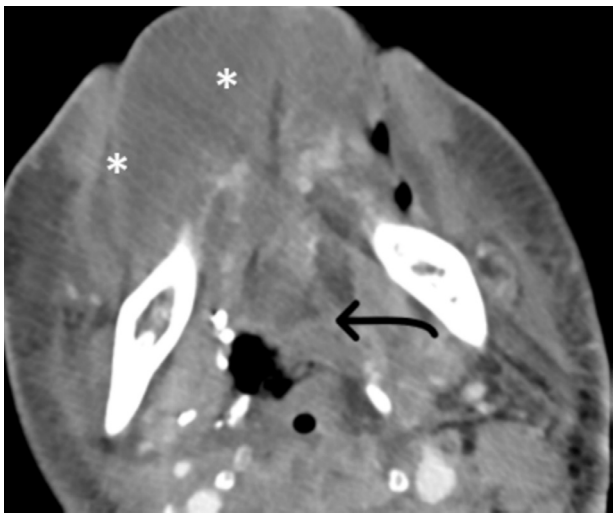

Figure 11 Angioedema. Seventy-year-old male with laryngeal cancer presented with facial swelling. There is marked superficial soft tissue swelling (*) as well as marked swelling of the tongue and the oropharynx (arrow).

Angioedema can cause airway compromise leading to acute respiratory failure and death. Airway management is crucial, followed by pharmacotherapy with IV dexamethasone and antihistamine.

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