

Thyroid Abscess as a Complication of Bacterial Throat Infection

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ABSTRACT

Thyroid abscesses are rare complications of neck infections. We report the case of a teenager who developed increasing neck pain and swelling following treatment for a Streptococcus throat infection. Imaging demonstrated a complex fluid collection in the left thyroid lobe. Ultrasound guided aspiration was performed for diagnostic purposes, yielding purulent fluid that grew multiple bacterial species. Following initial antibiotic treatment, the patient underwent definitive surgical management. Underlying risk factors and imaging techniques will be reviewed.

CASE REPORT

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A previously healthy 17-year-old female developed increasing neck pain and swelling over the course of a month following treatment for a Streptococcus throat infection without airway compromise or fevers. Given her persistent left neck swelling with mild leukocytosis, an outside computerized tomography (CT) scan was performed demonstrating a complex 2 cm solid and cystic mass in the left lobe of the thyroid with peripheral enhancement, consistent with an abscess wall versus normal thyroid tissue (figures 1a and 1b). This was then further evaluated with an US, which demonstrated a complex fluid collection (figures 2a, 2b and 2c), prior to the patient being transferred to our institution for definitive care. US guided aspiration was performed for diagnostic purposes (figure 3), yielding approximately 2 cc of purulent yellow brown fluid that grew multiple bacterial species (Streptococcus anginosus, Eikenella corrodens, Peptostreptococcus). The entirety of the collection could not be drained secondary to loculation and septation. Following initial failed attempts at oral and parenteral antibiotic treatment, the patient was taken to the operating room for definitive surgical management. A 3 cm incision was made in the left neck, parallel to the superior cornu of the larynx and anterior to the sternocleidomastoid muscle, extending deep to platysma. Sharp and blunt dissection was then performed to

reach the fluid collection and approximately 30 cc of mucopurulent fluid was expelled. The area was irrigated and a small rubber-band drain placed before the skin incision was closed and sterile dressing applied. Oral antibiotics was continued for approximately two weeks following surgery and the patient recovered uneventfully. A follow up CT was performed demonstrating resolution of the thyroid abscess with persistent soft tissue in the left pyriform sinus; underlying fistula could not be excluded (figures 4a and 4b). At the time of publication, the patient had undergone no further workup.

DISCUSSION

The thyroid gland is relatively resistant to infection due to its encapsulation, iodine concentration, rich lymphatic drainage and dual blood supply [1], thus thyroid abscesses are rare complications of neck infection and suppurative thyroiditis. However, they are associated with significant risk of rapid progression and potential compromise of the airway. Prompt recognition and treatment are associated with improved patient outcomes.

Suppurative thyroiditis is the least common cause of thyroiditis (subacute and chronic thyroiditis being far more common). A thorough Medline search was performed,

uncovering only 578 cases that were reported in the English-language through 2010 [2-4]. Infection can occur from direct extension in the neck region or from inoculation due to direct trauma - either iatrogenically, in the case of fine needle aspiration, or from penetration through the esophagus or skin. However, the most likely source is via hematogenous spread from a remote infection. The most common organisms involved in suppurative thyroiditis include Staphylococcus and Streptococcus species; however, most infections are polymicrobial and the flora varies widely depending on the patient's immune status. There is evidence that the incidence of thyroid abscess may be increasing, particularly in the setting of Human Immunodeficiency Virus infection [4].

Interestingly, most patients suffering from suppurative thyroiditis remain euthyroid during the course of the disease. Yu et al reviewed the thyroid function tests in 95 cases of suppurative thyroiditis and 83.1 % were euthyroid, including euthyroid sick syndrome [3]. However, if patients develop biochemical markers of hypothyroidism or hyperthyroidism, fungal and mycobacterial origins should be considered respectively [2].

US should be considered as a first line imaging study to confirm the diagnosis of suppurative thyroiditis and/or abscess. US allows for excellent visualization of the thyroid gland and lacks ionizing radiation. On US, suppurative thyroiditis often demonstrates heterogeneous echotexture of the thyroid gland with a superimposed anechoic / hypoechoic mass, in the setting of abscess formation. The echotexture of an abscess can vary based on the amount of internal debris / hemorrhage. Abscesses tend to demonstrate peripheral hypervascularity without significant interval vascular flow.

However, some researchers have argued CT and /or MRI to be better techniques for diagnosing inflammatory masses of the thyroid [5] as they provide more information regarding the extent and spread of the infection [6].

CT findings of suppurative thyroiditis and/or abscess vary depending on the stage of infection. Heterogeneous enhancement of the thyroid can occur, but often times the findings are nonspecific with surrounding soft tissue stranding / inflammatory change. With the development of a focal abscess, there is a centrally hypodense, peripherally isodense (with respect to the thyroid) mass, representing the focal fluid collection.

MRI can demonstrate findings typical of a fluid collection (T1 hypointense and T2 hyperintense, relative to soft tissue). However, the imaging appearance can vary based on the cellularity and debris within the collection. Tuberculous thyroid infection has been described as increased signal relative to the normal thyroid tissue on all sequences [7].

Radionuclide scanning with Technetium-99m demonstrates lack of uptake in the area of abscess[8]. However, this does not differentiate an abscess from another etiology of cold nodule, including carcinoma. There may be utility for Gallium-67 scanning, which is more sensitive for infection, particularly if the site of infection is not readily

apparent as this allows whole body imaging and abscesses will demonstrate increased uptake [9].

Despite excellent parenteral antibiotic regimens, most patients have historically required an open surgical procedure, either excision or incision and drainage. However, a more conservative, less invasive approach may result in decreased morbidity. Needle aspiration with sonographic guidance has proved successful in a few reported cases [6, 10-11]. Iylin et al. reported two cases in which drainage of the thyroid abscess was performed twice (on the first and fifth day of admission) using a 21-gauge needle, followed by injection of antibiotics into the abscess cavity. Both individuals remained disease-free at 6 month and 5 year follow-up periods [6]. Other authors report successful aspiration of thyroid abscesses following a single aspiration [10, 11].

An additional consideration would be placement of percutaneous drainage catheters via either CT or US guidance. This would necessitate "simple" abscesses, ones without loculations, as the separate compartments could not be interrogated with a single drain. CT catheter placement has been performed in head and neck infection [12], although no case report of thyroid abscess could be found after literature search. US guided drainage placement has been recommended when the abscess is larger than 3 cm and / or when the abscess occurs in a glandular structure (thyroid, parathyroid) [11].

As with our patient, often the abscess is complex and catheter or needle drainage is not a definitive means of treatment, thus surgical drainage may still be necessary in certain circumstances. This also allows for resection of any associated anatomic abnormality, which may be required to decrease recurrence of abscess formation.

Multiple prior reviews of thyroid abscess have documented the coexistence of a predisposing congenital variant, most commonly a pyriform sinus fistula, resulting from the third or fourth branchial pouch [6]. These anomalies have multiple presentations, including thyroid abscesses, recurrent sinuses, neck cellulitis and compressive symptoms, including dysphagia and odynophagia [13]. Often children present with a history of repeated upper respiratory tract infections, sore throats, and pain and tenderness around the thyroid region. Pyriform sinus fistulas often become symptomatic during childhood and adolescent years, thus it is important to consider this anomaly in a young patient with such a presentation [14]. Once the pyriform sinus fistula has been discovered, the traditional approach has been to treat the suppurative thyroiditis, followed by a second surgical procedure to excise the underlying congenital anomaly [13]; otherwise, the recurrence of the disease is likely.

Wang et al concluded barium esophagography to be the superior study in determination of an underlying pyriform sinus fistula [14]. However, barium esophagography may not be the diagnostic test of choice during the acute phase of inflammation. It is thought that the sinus opening may be occluded by edema of the surrounding soft tissue, thus closing off the opening and causing a false negative result [14]. Consequently, it is recommended if the initial study does not

reveal an anomaly, subsequent studies should be performed at a later date. US, CT and MRI can also be considered to identify an underlying pyriform sinus fistula; however, the specificity and sensitivity of these tests is increased when performed using the trumpet maneuver. The patient is asked to perform a modified Valsalva maneuver by forcefully expiring against pursed lips, which causes distention of the pyriform sinus and thus allows for an increased visualization of the pyriform sinus fistula[14].

The second most important risk factor for development of suppurative thyroiditis is a decreased immune status, which also increases the risk of atypical pathogens as being the cause, including *P. jiroveci* (carinii), *Klebsiella pneumoniae*, *Candida*, and *Brucella melitensis* [15-18]. While the mortality from suppurative thyroiditis is low, ranging between 3.7 and 12.1% [2], the superimposition of immune suppression raises the mortality rate. Other predisposing factors include multinodular goiter, as well as autoimmune thyroiditis and thyroid cancer [19].

While suppurative thyroiditis and abscess are uncommon entities, the incidence is increasing with increased numbers of immunocompromised patients. It is important to consider these diagnoses, especially given the lack of associated derangement of thyroid function tests. Radiologic studies play an essential role in the diagnosis, determination of congenital anomalies, and may play a growing role in treatment.

TEACHING POINT

Thyroid abscesses are rare; however, the incidence may be increasing with the rise of immunosuppression. The imaging findings are nonspecific and multiple modalities may be required to reach a diagnosis. US should be considered early in the imaging process given its lack of ionizing radiation and its ability to guide percutaneous treatment.

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FIGURES

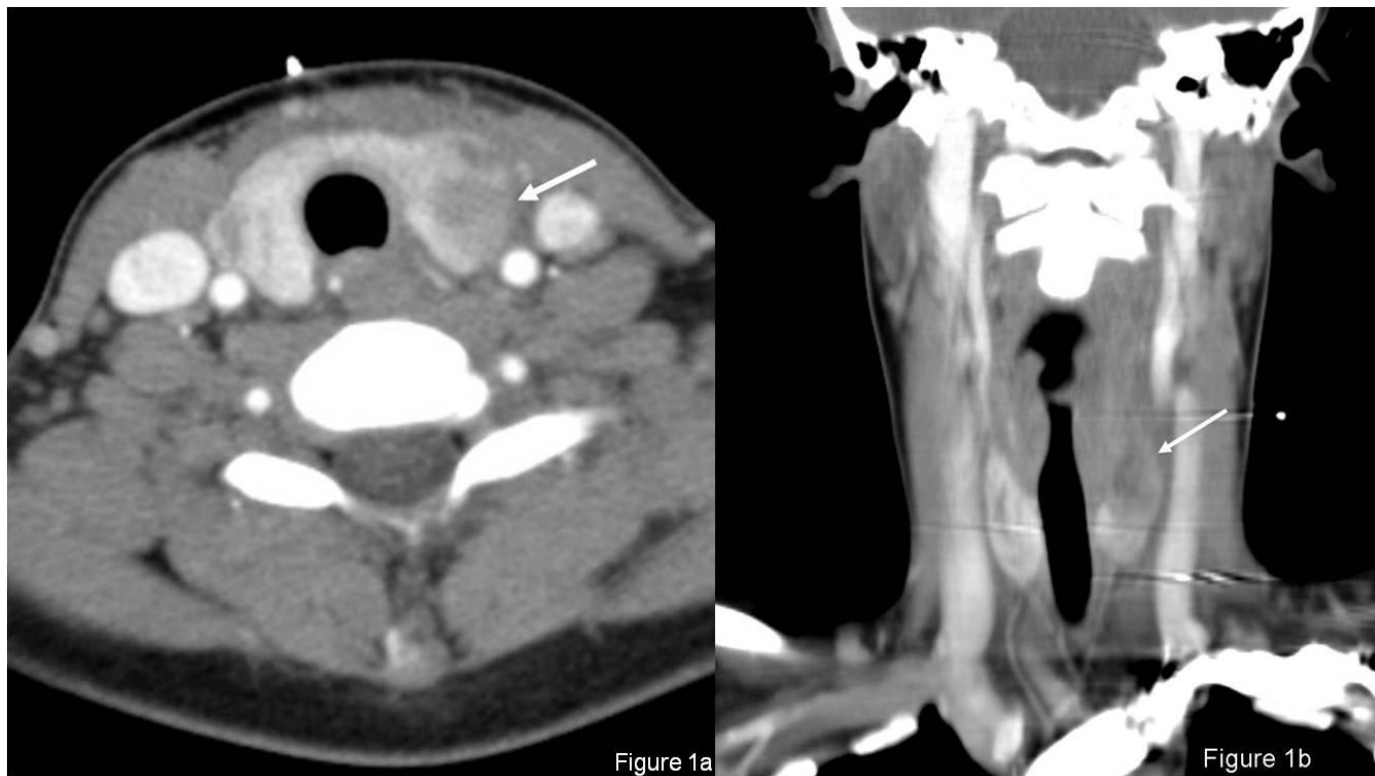


Figure 1: 17 year old female with left superior thyroid abscess. Intravenous contrast enhanced CT imaging of the neck using a Siemens Sensation 10 CT machine (kVp 120, auto mAs setting (range 66 - 349), 3 mm slice thickness) for evaluation of neck swelling. A marker was placed over the patient indicated region of swelling. Axial (a) and coronal (b) reconstructions demonstrate a focal mass in the superior left thyroid pole with central low density, consistent with fluid (arrow). The periphery demonstrates increased density, consistent with an abscess wall; however, it does not enhance as avidly as the adjacent thyroid tissue.



Figure 2: 17 year old female with left superior thyroid abscess. Ultrasound performed using a Siemens Acuson Sequoia ultrasound machine (14 MHz linear transducer). Transverse gray scale (a) and longitudinal gray scale (b) and Doppler images (c) demonstrate a centrally hypoechoic, peripherally isoechoic collection in the upper aspect of the left thyroid lobe. The collection demonstrates scattered peripheral vascularity without central flow.



Figure 3 (left): 17 year old female with left superior thyroid abscess. Ultrasound guided drainage using a Siemens Acuson Sequoia ultrasound machine (14 MHz linear transducer). Single transverse gray scale image demonstrates needle (arrow) within the decompressed fluid collection.



Figure 4: 17 year old female with left superior thyroid abscess. Follow up CT scan 6 months after successful open surgical drainage of a left thyroid abscess. Intravenous contrast enhanced CT was performed using a Toshiba Aquilion CT scanner (kVp 120, auto mAs setting (range 131 - 440), 3 mm slice thickness). Axial (a) and coronal (b) reconstructions demonstrate resolution of the superior left thyroid lesion, with soft tissue in the inferior left pyriform sinus (arrows), concerning for underlying fistulous tract.

Etiology	Infectious process most commonly due to staphylococcus aureus, streptococcus pyogenes, staphylococcus eperdimidis, and streptococcus pneumoniae in descending order
Incidence	Rare – less than 600 reported cases
Gender Ratio	No gender predisposition
Age Predilection	Affects any age, but often found in children and adults ranging from 20-40 years of age.
Risk Factors	Congenital anomalies of the thyroid; most notably pyriform sinus fistula and less likely, thyroglossal duct remnant. Immunosuppression is also a risk factor.
Treatment	Surgical drainage with appropriate antibiotic therapy, along with surgical correction of any anatomical anomaly. Thyroid replacement therapy may be needed in cases with severe, diffuse inflammation and necrosis of the gland. Ultrasound guided drainage can be performed and may be sufficient with aggressive antibiotic therapy depending on the pathogen
Prognosis	Excellent following appropriate surgical and antibiotic therapy
Findings on Imaging	US- Unilobular swelling and hypoechoic fluid collection, in the setting of abscess formation Radionuclide thyroid scan- focally absent or decreased uptake Lateral soft tissue radiographs of the neck- may show evidence of tissue edema and tracheal air column may be deviated or compressed CT – Centrally hypodense, peripherally isodense (to thyroid) mass in the thyroid lobe MRI – Central T2 hyperintense and T1 hypointense, relative to the thyroid tissue; however, appearance can vary based on debris and cellularity

Table 1. Summary table: Overview of thyroid abscess

Differential Diagnosis	Ultrasound	Radionuclide thyroid scan	CT	MRI
Suppurative Thyroiditis with Abscess	Unilobular swelling and anechoic fluid collection, in the setting of abscess formation	Decreased ^{99m} Tc uptake with focal ⁶⁷ Ga uptake	Centrally hypodense, peripherally isodense (to thyroid) mass in the thyroid lobe	Central T2 hyperintense and T1 hypointense, relative to the thyroid tissue; however, appearance can vary based on debris and cellularity
Suppurative Thyroiditis	Diffuse swelling and heterogeneity of the thyroid	Heterogeneous ^{99m} Tc uptake	Heterogeneous enhancement	Heterogeneous appearance and enhancement
Adenoma	Hypoechoic soft tissue mass with internal vascular flow	Increased ^{99m} Tc uptake	Focal lesion, which may be hypodense or hyperdense to normal thyroid	Focal lesion, which may be hypointense or hyperintense to normal thyroid
Goiter	Enlargement of the thyroid, echotexture can vary depending on composition of discrete nodules	^{99m} Tc uptake varies based on composition of goiter	Varies depending on composition of discrete nodules	Varies depending on composition of discrete nodules
Subacute Granulomatous Thyroiditis	Diffuse heterogeneity of the thyroid	Diffusely decreased ^{99m} Tc uptake	Decreased attenuation on unenhanced scans	Increased T1 and T2 signal throughout thyroid
Intracystic Hemorrhage	Complex cyst with internal septation or echoes	Focal decreased ^{99m} Tc uptake	Increased attenuation secondary to hemorrhage	Variable signal depending on stage of hemorrhage
Malignancy	Appearance varies based on cell type, can present with solid mass, microcalcifications	Usually presents with decreased ^{99m} Tc uptake	Appearance is variable, can be used to look for metastatic lymph nodes	Appearance is variable, can be used to look for metastatic lymph nodes
Hashimoto's Thyroiditis	Diffuse heterogeneity of the thyroid, hypervascular in acute phase and hypovascular later in disease course	Usually enlarged gland with increased ^{99m} Tc uptake, but can be variable	Usually enlarged and heterogeneous	Usually enlarged and heterogeneous

Table 2. Differential diagnosis findings of thyroid abscess.

ABBREVIATIONS

CT = Computed Tomography
 FNA = Fine Needle Aspiration
 MRI = Magnetic Resonance Imaging
 US = Ultrasound

KEYWORDS

thyroid abscess; suppurative thyroiditis; bacterial throat infection

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