Recurrence of a Deep Neck Infection

A Clinical Indication of an Underlying Congenital Lesion

Annette O. Nusbaum, MD; Peter M. Som, MD; Michael A. Rothschild, MD; Joel M. A. Shugar, MD

Objective: To discuss the computed tomographic (CT) and clinical findings of those entities that may present as recurrent deep neck infections.

Patients and Methods: Twelve patients with recurrent deep neck infections and CT scans were retrospectively identified since 1990. Their CT scans and medical histories were reviewed. The diagnosis was pathologically confirmed in all cases.

Results: The CT scans revealed an abscess or a localized infected cyst in the deep soft tissues of the neck, with varying degrees of associated inflammatory change in the adjacent soft tissues. The diagnoses in these cases included 1 first branchial cleft cyst, 3 second branchial cleft cysts, 1 third branchial cleft cyst, 2 fourth branchial cleft cysts, 2 infected lymphangiomas, 2 thyroglossal duct cysts, and 1 cervical thymic cyst.

Conclusions: Most deep neck infections are the result of suppurative adenitis. The location of the primary focus is usually from the mucosa of the upper aerodigestive tract or from an odontogenic source. Less common causes are perforations due to a foreign body, thrombophlebitis of the internal jugular vein, or osteomyelitis of the spine. Recurrences in these situations are unusual. Less commonly, congenital lesions can present as deep neck infections, and recurrences are common. Our cases suggest that the recurrence of a deep neck infection should alert the physician to the possibility of an underlying congenital lesion and that CT is helpful in the early recognition of these lesions.


Most deep neck infections arise from foci in the mucosal surfaces of the upper aerodigestive tract or from a carious tooth. Less commonly, such infections are the result of a perforation by a foreign body or thrombophlebitis. Clinically, deep neck infections initially present in a similar manner, and discovery of the underlying causative factors, if possible, requires imaging. Often, it is only after a recurrence occurs that the less common congenital causes of deep neck infection are correctly diagnosed. Since 1990, we have encountered only a few of these entities, and they include first, second, third, and fourth branchial cleft cysts, low-lying thyroglossal duct cysts, cystic hygromas, and a cervical thymic cyst. We report our experience with these relatively uncommon lesions and briefly review their pertinent imaging findings.

From the Departments of Radiology (Drs Nusbaum and Som) and Otolaryngology (Drs Som, Rothschild, and Shugar), Mount Sinai School of Medicine, City University of New York, New York, NY.

**RESULTS**

The Table gives the diagnosis and characteristics of the 12 cases. The clinical distinction of each of the entities was difficult and was primarily suggested by the location of the disease in the neck. That is, the first branchial cyst was in the parotid region, while the fourth branchial cysts and the thymic cyst were in the lower part of the neck. The thyroglossal duct cysts were in the lower midline of the neck. However, clinical differentiation of the other lesions was not possible. Computed tomography allowed better differentiation of these lesions by identifying (1) involvement of the thyroid gland in the fourth branchial cysts; (2) involvement of the hypopharynx in the third branchial cyst; (3) the classic imaging location in the neck for the second branchial cysts; (4) the first branchial cyst to be within the parotid gland; (5) the midline location of the thyroglossal duct cysts; (6) the lateral location of the lymphangioma, deep to the sternocleidomastoid muscle; and (7) the isolated location of the thymic cyst in the lower part of the neck not involving the thyroid gland.

Clinically, all the lesions presented in a similar manner, which included a painful, tender swelling in the neck, with variable degrees of overlying cellulitis. All 12 patients responded to initial antibiotic
therapy. Definitive surgical treatment was eventually required for recurrences in all patients.

**COMMENT**

Neck infections commonly caused by suppurative adenitis, perforation, or thrombophlebitis usually respond completely to antibiotics and/or initial surgical drainage. Recurrences in these cases are rare, as the primary focus is readily identified and treated. However, congenital lesions, which are less common causes of deep neck infection, can present clinically in a similar manner. Our cases suggest that when the underlying cause is a congenital lesion, recurrences are more common. These recurrences are usually attributed to the initial lack of clinical awareness of the underlying pathology. Thus, although there is an initial response to antibiotic therapy, the underlying lesion remains and recurrence is inevitable. If surgery is performed and the congenital nature of the lesion is not preoperatively recognized, a limited operation, usually an incision and drainage, is commonly performed instead of the appropriate surgical procedure for that particular type of lesion. Again, recurrence is common.

In each of our cases, the addition of CT to the initial workup provided early evidence of the true underlying disease. Although a definitive diagnosis requires surgical confirmation, the contribution of imaging to the early correct diagnosis in our patients with deep neck infections makes an argument that CT warrants a part in the initial evaluation of such patients. Because the imaging findings and embryology of congenital lesions have been well described in numerous other publications, it is not necessary to review them extensively in this article.2-23 Rather, we want to emphasize some pertinent points that relate to the problems of diagnosis in these cases.

The vast majority of thyroglossal duct cysts occur above the level of the normal thyroid bed; however, abnormal adherence of thyroid cells to the developing heart, which can lead to deposition of thyroid tissue and a cyst

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**PATIENTS AND METHODS**

We retrospectively reviewed our clinical and imaging records since 1990 to identify patients who had recurrent deep neck infections and who had undergone a computed tomographic (CT) examination. We identified 12 patients, and the images shown in Figures 1, 2, 3, 4, and 5 are representative of these cases. Seven of the 12 CT studies were performed on a high-speed scanner (model 9800 HiSpeed; General Electric, Milwaukee, Wis) as 3-mm contiguous scans or as spiral acquisitions reconstructed as 2-mm contiguous images. Intravenous contrast was administered in each case. The other 5 CT scans were performed on a variety of units, because the patients were referred to our medical center for treatment and their scans were obtained elsewhere. The diagnosis was confirmed pathologically in all cases.

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Figure 1. Thyroglossal duct cyst. Contrast-enhanced axial computed tomographic scan shows a small midline cyst (arrow) at the lower level of the thyroid gland. This study was obtained 48 hours after the initiation of antibiotic therapy for cellulitis of the lower neck area and after resolution of the secondary inflammatory changes. This cellulitis was the patient’s second episode of low neck inflammation.

Figure 2. Second branchial cleft cyst. Top, Contrast-enhanced axial computed tomographic scan shows a large cyst just below the level of the mandible on the left side. The cyst was initially clinically thought to represent either submandibular sialadenitis or adenitis. The cyst wall is thick and enhances. The cyst is anterior to the sternocleidomastoid muscle, lateral to the carotid sheath, and behind the submandibular gland, which is pushed down and forward by the cyst. Bottom, Contrast-enhanced axial computed tomographic scan shows a left-sided cyst just below the level of the angle, with a thick, enhancing rim. Enhancement of the fistulous tract (black arrow) is seen heading toward a swollen left palatine tonsil (white arrow). This case was initially treated as tonsillitis with adenitis.
in the lower neck area, mediastinum, pericardium, or heart, has been reported. Consequently, thyroglossal duct cysts may occur lower in the neck than usual. Although at the level of the larynx, these cysts are typically found just off the midline, adjacent to the outer thyroid cartilage and deep to the strap muscles, at and below the level of the thyroid gland, they may return to their typical midline location (Figure 1). In atypical locations, the diagnosis may not be made at initial presentation, and recurrent infections may occur until the diagnosis is established and appropriate surgery is performed.

A first branchial cleft cyst may occur superficial to or within the parotid gland. The differential diagnosis of a solitary parotid cyst includes mucoceles, sialoceles, lymphoepithelial cysts, and branchial cysts. If the cyst is infected, an abscessed intraparotid node must be added to the differential diagnosis. A fistulous tract directed toward the external auditory canal may not be identified in first branchial cysts, and the presumptive diagnosis must be based on the histologic features and cyst location.

A second branchial cleft cyst is usually located at the angle of the mandible, ventral to (and, if large enough, slightly deeper than) the anterior border of the sternocleidomastoid muscle, lateral to the carotid sheath structures, and dorsal to the submandibular gland (Figure 2, top). If a fistulous tract is present, it is directed toward the palatine tonsil (Figure 2, bottom).

A third branchial cleft cyst is usually located in the middle to lower part of the left side of the neck, near the level of the upper thyroid lobe. However, it may be higher in the neck at a level closer to that of the typical second branchial cyst. If a fistulous tract is present, as in our case, it is directed toward the upper lateral piriform sinus wall. We identified associated inflammation of the ipsilateral hypopharyngeal wall on the CT scan, as noted by enhancement and thickening of the mucosa (Figure 3).

Figure 3. Third branchial cleft cyst. Contrast-enhanced axial computed tomographic scan at the level of the lower hyoid body shows a cystic lesion with a thick, enhancing rim and inflammatory changes in the surrounding soft tissues (black arrow). There is low-attenuation edematous thickening of the ipsilateral aryepiglottic fold (white arrow) and the pyriform sinus wall, consistent with inflammation. The caudal margin of the inflammatory area abutted the upper left thyroid lobe. This scan was obtained during the patient’s second episode of left neck inflammation.

Figure 4. Fourth branchial cleft cyst. Top, Contrast-enhanced axial computed tomographic scan shows an extensive multiloculated abscess at the level of the thyroid gland. The abscess abuts the left thyroid lobe (arrow), and there is some decrease of the normal high attenuation of the anterior left thyroid lobe. This patient had 2 prior episodes of low neck inflammation before the diagnosis was made and surgery was performed. Bottom, Contrast-enhanced axial computed tomographic scan shows a small low-attenuation cystic area (white arrow) along the anterior portion of the left thyroid lobe (black arrow). There is lower attenuation in the anterior left thyroid lobe, consistent with thyroiditis. This patient had 1 prior episode of presumed thyroiditis before the diagnosis was made and surgery was performed.

Figure 5. Cervical thymic cyst. Contrast-enhanced axial computed tomographic scan shows a large cyst in the lower part of the neck, below the thyroid gland. Some enhancement of the cyst wall remains after the start of antibiotic therapy. The caudal margin of the cyst extended just to the level of the manubrium.
A fourth branchial cyst usually occurs in the lower neck area, distinguishing it from the more common second branchial cyst. However, clinically, there may be an overlap between the levels of a third and fourth branchial cyst. One of the distinguishing factors is the close association of the thyroid gland, almost always on the left side, to the fourth branchial cyst and the common clinical presentation of thyroditis when these cysts are infected.\(^1^3,15-17\) If a fistulous tract is present, it is directed toward the apex of the piriform sinus. Our 2 cases of fourth branchial cysts had very similar CT findings: there was an abscess or localized cyst in the lower part of the left side of the neck, with associated secondary inflammatory changes in the adjacent soft tissues, and there was a poorly marginated loss of the normal high attenuation in the left thyroid lobe (Figure 4).

The infected lymphangioma had a thickened, enhancing rim with a surrounding low-grade cellulitis. The diagnosis was suggested by its more lateral neck location, deep to the sternocleidomastoid muscle. Although most deep neck infections occur before the age of 2 years, nearly 10% of the cases present in older patients. Most occur in the posterior triangle of the neck, from the piriform fossa causing acute suppurative thyroditis, neck abscess, or both; CT appearance and the use of air as a contrast agent.\(^1^3\) At surgery, multiple adjacent cysts were found in the lower neck area of the patient in this case, establishing the diagnosis.

Approximately two thirds of the cases of cervical thyroglossal cysts occur in the first decade of life, and the remaining cases are distributed over the second and third decades. They can present anywhere in the neck, from the angle of the mandible to the sternum, usually parallel to the sternocleidomastoid muscle. Most occur in the lower neck area as a slowly enlarging mass, and sudden enlargement usually indicates that there has been a hemorrhage into the cyst. The cysts may be isolated from the normal thyromucous tract or attached to it by a fibrous band. Unlike mediastinal thyroglossal cysts, cervical thyroglossal cysts and myasthenia gravis are not associated. Although a thyroglossal cyst has been reported to cause acute supplicative thyroditis, this is an uncommon event.\(^2^3\) The location in the lower area of the neck and the lack of contact with the thyroid gland in our case suggested the imaging diagnosis (Figure 5).\(^1^9,2^3\)

In the majority of cases of deep neck infections, antibiotic therapy, with possible surgical incision and drainage, is usually sufficient for cure. This treatment is usually definitive, and recurrence is rare. Thus, a recurrence of a deep neck infection should alert the physician to some unrecognized underlying anomaly, such as a congenital lesion. In this regard, CT evaluation can be extremely helpful, as demonstrated in our cases.

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Reprints: Peter M. Som, MD, Department of Radiology, Mount Sinai Hospital, One Gustave L. Levy Place, Box 1234, New York, NY 10029.

### REFERENCES