Acute nontraumatic neck pathology - what an emergency radiologist needs to know

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Learning objectives

The authors pretend to review the most frequent acute neck pathological entities, excluding neck trauma. They discuss the role of imaging in the acute management of these patients, with emphasis on CT and its utility in evaluating possible airway compromise as well as the location, nature, and extent of the infection in the neck; based on their data base of one year.

Background

Patients usually present to the emergency department with a variety infectious, inflammatory and neoplastic conditions of the neck. The use of cervical CT has become routine in the emergency setting, and knowledge of the imaging findings of common acute conditions of the neck is essential to ensure an accurate diagnosis of these potentially life-threatening conditions. Usual acute pathology includes, for instance, oral cavity infections, peritonsilar or deep neck spaces abscess and sialadenitis. Since these conditions may have similar symptoms and complications, the radiologist is essential in trying to make a prompt diagnosis and evaluate the extent of the disease and its possible negative outcomes.

CT is the now the gold standard in the emergency setting, since it’s fast and reasonably priced and may be the only examination that an acutely ill patient may tolerate. Besides it’s the imaging modality of choice to evaluate infection, namely to differentiate between cellulitis and actual abscess formation, and also in determining the etiology of the process (being for example more sensitive in detecting periodontal disease and small salivary stones).

Imaging findings OR Procedure details

**MCDT PROTOCOL:**

- Volumetric acquisition (from skull base to trachea bifurcation)
- I.V. contrast administration, except if contraindicated (usually 90 ml; 50 sec delay; 2cc/sec)
- Contiguous 2-3mm axial and coronal reconstructions
1 - TONSILLAR DISEASE

*Acute tonsillitis* diagnosis is based on clinical findings.

**CT indications:**

. Differentiate tonsillitis from its complications;

. Presence of atypical clinical manifestations;

. Suspicion of direct extension into the deep spaces of the neck, such as parapharyngeal and retropharyngeal spaces (Fig. 1 and 2);

. Inability of physical examination;

. Failure of resolution despite an adequate antibiotic therapy.

- Complication of untreated or incompletely treated acute tonsillitis: *Peritonsillar abscess* (Fig. 3, 4 and 5)

**CT findings:**

. Diffuse enlargement and enhancement of the tonsil, with an associated fluid collection exhibiting rim-like enhancement.

2 - RETROPHARYNGEAL AND PREVERTEBRAL ABSCESS

The retropharyngeal space is not well depicted at imaging since it is a virtual space unless a pathologic process is present.

- *Abscess* in the retropharyngeal space results from spread of infection to retropharyngeal lymph nodes or from foreign body ingestion trauma (Fig. 9) or iatrogenic injury.

**CT findings:**

. Fluid within the retropharyngeal space, with peripheral rim-like enhancement after contrast material administration (Fig. 1 and 2).
Complications:

. Airway compromise (Fig. 2);
. Mediastinitis (Fig. 10);
. Internal jugular vein thrombosis and carotid artery involvement;
. Pneumonia or empyema.

3 - LUDWIG or VINCENT’S ANGINA

It's a type of cellulitis of the floor of the mouth (FOM) that involves the submandibular space.

Etiology:

. 90% of cases: odontogenic infection of the second and third mandibular molar tooth, typically caused by Streptococcus organisms; 10% may result from penetrating trauma.

Prompt treatment with antibiotics and airway management is crucial.

- Bilateral spread to the FOM, sublingual and submandibular spaces and particularly into the mediastinum is potentially **life-threatening**.

CT indications:

. Evaluate airway patency;
. Determine the presence of a drainable abscess;
. Evaluate the extension into the deep spaces of the neck and towards the mediastinum (through the Danger space).

CT findings:

. Local skin thickening (Fig 6);
. Increased attenuation of subcutaneous fat and loss of fat planes within the submandibular space (Fig 6 and 7);
Muscle enlargement (Fig 6 and 7);
Soft tissue emphysema;
Eventually focal fluid collections within neck fascial spaces.

Complications:
- Mandibular osteomyelitis;
- Spread of infection into the deep fascial spaces of the neck;
- Lemierre syndrome (septic thrombophlebitis of the internal jugular vein).

4 - FOREIGN BODY ASPIRATION and INGESTION

More frequent in children between the ages of 1 and 3 years or in elderly people;

Usually become lodged in the right main stem bronchus (aspiration) or in the esophagus (ingestion) - Fig. 9;

If the patient's clinical status is stable enough to allow plain radiography, AP and lateral neck and chest radiographs are obtained; about 80% of the aspirated foreign bodies are radiolucent, resulting in normal radiographs.

CT indications:
- Symptomatic with normal radiograph;
- Suspicion of complications:
- Esophageal perforation (Fig 8 and 10);
- Tracheo-esophageal or aorto-esophageal fistulization;
- Mediastinitis (Fig 10, 11 and 12).

- Descending Necrotizing Mediastinitis
High mortality rate (up to 40%) due to delayed diagnosis, a result of nonspecific clinical findings; results from infection spread from the oral cavity or oropharynx to the mediastinum by way of the deep neck spaces.

**CT findings:**

- Increased attenuation of mediastinal fat;
- Bubbles of gas within the mediastinum;
- Mediastinal fluid collections;
- Pericardial or pleural effusions.

5 - ACUTE SIALADENITIS

Manifestation: salivary colic (painful swelling that is exacerbated by eating).

Usually due to duct obstruction by calculi:

- Present in the submandibular duct up to 90% of cases (in the parotid duct in 10%-20% of cases); secondary sialadenitis often occurs as a result of ductal obstruction from squamous cell carcinoma in the FOM.

**CT findings (Fig. 13):**

- Enlargement and enhancement of the submandibular gland;
- Calculi in salivary gland duct;
- Ductal dilatation secondary to an obstructive calculus (or stenosis);
- Typically unilateral;
- Associated cellulitis and myositis.

Images for this section:
Fig. 1: Axial contrast-enhanced CT neck image in a 7 year-old girl with fever, neck pain, sore throat, and cough shows a large peripherally enhancing fluid collection in the retropharyngeal and prevertebral spaces (red arrow), associated with an increased attenuation of the left parapharyngeal fat (yellow arrow).
Fig. 2: Axial contrast-enhanced CT neck image in a 7 year-old girl with fever and previous story of acute tonsillitis shows a huge abscess involving retropharyngeal (red arrow) as
well as left parapharyngeal / carotid and perivertebral spaces (yellow and black arrows). Note for the mass effect in the airway, which compromise its caliber.
**Fig. 3:** Axial contrast-enhanced CT neck image of a young child with fever and trismus shows: tonsils enlargement and a peripherally enhancing fluid collection / abscess on the right peritonsillar region (arrow), without involvement of the retropharyngeal space.

**Fig. 4:** Sagittal contrast-enhanced CT neck reformatting image shows enlargement and enhancement of the palatine tonsil with an associated large fluid collection, exhibiting a rim-like enhancement (arrow) and originating a mass effect on the oropharynx airway.
Fig. 5: Coronal contrast-enhanced CT neck reformatting image shows enlargement and enhancement of the palatine tonsils, with an associated large peritonsillar abscess on the right (arrow), with a mass effect on the oropharynx airway but without clear extension to the deep spaces of the neck.

Fig. 6: Axial contrast-CT neck image of a young child shows increased attenuation with local skin thickening and muscle enlargement involving the sublingual and the submandibular spaces.
**Fig. 7:** Axial contrast-CT neck image of a young child with a poor oral hygiene shows a local skin thickening associated to an enlargement and increased attenuation of subcutaneous fat as well as the platisma and the oral floor muscles, with relatively loss of definition of fat planes within the sublingual and submandibular spaces.
Fig. 8: Axial non-enhanced CT image shows a linear and dense foreign body in the proximal esophagus lumen as well as a small amount of adjacent extra-luminal air that stands for perforation.
Fig. 9: Sagittal reconstruction CT image demonstrates an ingested linear dense foreign body in the pharynx-esophageal transition.
Fig. 10: Axial non-contrast CT image reveals increased mediastinum fat attenuation with gas bubbles in mediastinitis.
**Fig. 11:** Coronal reconstruction CT image reveals associated increased mediastinum fat attenuation and extra-luminal air (yellow arrow) besides the foreign body (red arrow).
Fig. 12: Coronal reconstruction CT in lung window image proves extraluminal air within the mediastinum- pneumomediastinum (black arrow) in this case of mediastinitis.
**Fig. 13:** Acute submandibular sialadenitis. Axial contrast-enhanced CT image shows enlargement and slightly asymmetric enhancement of the right submandibular gland as well as a minor dilatation of the main submandibular duct, which contains a sialolith. Adjacent increased fat attenuation is also present - cellulitis.
Conclusion

A group of neck pathologies can present with acute symptoms and benefit from urgent imaging evaluation.

CT plays an increasing role in the initial work up of acute neck pathology and is considered the first line imaging modality in this type of emergency setting.

The possibility of airway compromise, and the presence as well as the nature (phlegmonous versus abscess formation) and the extent of the infection throughout neck compartments are features that should be carefully evaluated. Its recognition helps guiding management, namely using either a surgical or a conservative treatment.

Personal Information

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