Imaging of Acute Head and Neck Infections

Aldo Gonzalez-Beicos, MD, Diego Nunez, MD, MPH*

KEYWORDS

• Acute infection • Paranasal • Floor of the mouth
• Suprahyoid and infrahyoid neck

Facial and cervical infectious processes represent a common clinical problem in patients of all ages, in particular children and young adults. In the head and neck, symptoms and signs of infection are usually clinically evident and allow for a presumptive diagnosis. Imaging studies, in particular CT and, to a lesser extent MR imaging, are frequently requested in the emergency setting to confirm the diagnosis and, more importantly, to locate the infection and exclude the possibility of abscess formation. The contribution of diagnostic imaging becomes more relevant in patients with clinical suspicion of the deep neck infection where access to an adequate clinical exploration may be limited. This article reviews the role of imaging in the evaluation of patients with infectious diseases of the head and neck, recognizing knowing the anatomic cervical partitions and spaces for an optimal diagnosis. It also discusses the most common infections involving the head and neck, with attention to its complications.

SOURCES OF INFECTION AND IMAGING OPTIONS

Infections of the neck typically originate from a single source. Tonsillar infection is the most common cause in children and young adults whereas odontogenic infection is the most common cause in older population groups.[1,2] Other potential sources of neck infection include the salivary glands, nasal sinuses, middle ear and mastoids, cervical lymph nodes, and trauma.[3]

The exact incidence of neck infections is not currently known but the frequency is likely rising, given the increasing number of immunocompromised patients at risk for atypical infections and its complications. These patients often lack the typical signs and symptoms of infection; this can mask the severity of a rapidly progressive infectious condition. The possibility of underestimating the severity of a neck infection makes diagnostic imaging a first step in an emergency department in choosing the best therapeutic approach.

In an emergency setting, the use of radiography is usually limited to the initial screening of suspected retropharyngeal infection and other acute upper airway infections in children, such as epiglottitis and croup. Ultrasound is occasionally used in the evaluation of more superficial infections to exclude the possibility of the fluid collection. Unquestionably, CT and MR imaging have higher sensitivity for the recognition of deep infections, particularly for the identification of abscess formation as well as its precise location and extension of disease.

The immediate availability, the high quality of anatomic detail, and the ability to create multidimensional reformatted images make CT with intravenous contrast the optimal modality for imaging neck infections in an emergency department.

The characteristic findings of infection include the loss of definition between contiguous anatomic spaces of the neck. The muscles can be thickened with hazy contours secondary to edema, which can also extend to the superficial soft tissues, resulting in stranding of the subcutaneous fat planes. With the use of intravenous contrast, diffuse enhancement of the inflamed tissue is seen. The existence of an abscess can be recognized by the higher attenuation in the periphery and a central zone of lesser density. Areas of low attenuation, however, can be seen

The authors have nothing to disclose.
Department of Radiology, Hospital of Saint Raphael, Yale School of Medicine, 1450 Chapel Street, New Haven, CT 06511, USA
* Corresponding author.
E-mail address: dnunez@srhs.org

Radiol Clin N Am 50 (2012) 73–83
doi:10.1016/j.rcl.2011.08.004
0033-8389/12/$ – see front matter

within inflamed tissue, not necessarily representing liquefaction. When the infectious process progresses without prompt diagnosis and treatment, it is more likely to evolve into formation of an inflammatory cavity or abscess, which typically establishes within 1 or 2 weeks of the onset of the infection. The usual appearance of a cervical abscess on contrast-enhanced CT is that of a lesion with peripheral enhancement and central coalescent areas of lower density.[4–7] In the neck, this appearance can be confused occasionally with necrotic lymph nodes when they are affected by metastatic disease, particularly from squamous cell carcinoma. MR imaging provides exquisite anatomic detail and can be used as a secondary method to aid in the evaluation of the infectious processes, particularly when further characterization or differentiation is needed between abscess and adenopathy. Also, in infections arising behind the upper airway, MR imaging can be useful in excluding the possibility of diskitis or vertebral osteomyelitis.

ANATOMY

Despite the typically easy visual inspection and palpation of the mouth and superficial structures of the face, the presence of infection can significantly affect the mobility of the mandible, thus limiting adequate clinical assessment. That is why the evaluation can largely depend on imaging findings. Knowledge of the fascial reflections and spaces in the neck is essential to understanding the etiology, imaging findings, and routes of infectious spread. The superficial fascia completely surrounds the head and neck separating the deep layers of the neck from the skin. It contains fat, superficial lymph nodes, nerves and hair follicles as well as the platysma muscle and the external jugular vein. The deep cervical fascia forms the boundaries of the cervical spaces and creates the normal symmetry of the neck. It is composed of three layers: superficial, middle, and deep. The reflections of these layers form the masticator, parotid, vascular, and parapharyngeal spaces laterally as well as the mucosal, retropharyngeal, and perivertebral spaces deeper around the midline. These fibrous boundaries also determine the communicative pathways for infection spread in the neck. In addition, based on the centered midline position of the hyoid bone, the neck is topographically subdivided into two broad compartments with different anatomic and physiologic features: the suprahyoid and infrahyoid segments. The specific infectious entities are reviewed, based on three distinct areas: the anterior suprahyoid neck, including the nasal and oral cavities; the lateral and deep suprahyoid spaces; and the infrahyoid neck.

Anterior Facial and Suprahyoid Neck Infections

Paranasal sinuses

Infections of the paranasal sinuses are usually diagnosed on clinical grounds and imaging is often reserved for the exclusion of the orbital and intracranial complications of rhinosinusitis. The majority of sinus infections are uncomplicated and caused by viruses, whereas bacterial causes become more likely when the common symptoms of viral infection do not subside or worsen after several days. Sinus and ear pain, fever, and purulent secretions usually develop. Sinus infection may spread by direct extension or through the valveless communicating veins of the face, particularly to the orbit. The inflammatory process in the orbit produces edema and cellulitis, progressing to subperiosteal and intraorbital abscess (**Fig. 1**). In severe cases, the infectious process may be

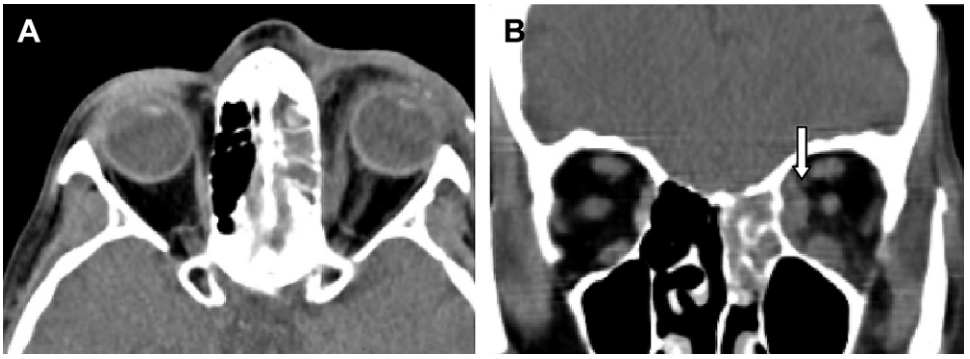

Fig. 1. Ethmoid sinusitis with subperiosteal orbital abscess. (*A*) Axial and (*B*) coronal CT images show left ethmoid sinus opacification and increased intraorbital soft tissues along the surface of the lamina papyracea, resulting in thickening and bulging of the medial rectus muscle (*arrow*).