## 56. Infections

Of the inflammatory conditions affecting the head and neck, the most commonly observed on MRI is sinusitis. The respective sagittal and axial T1 and T2WI of Figure 56.1 A, B demonstrate a band of low to moderate and high SI, respectively, surrounding the periphery of the maxillary sinuses, bilaterally. These findings correlate with mucosal thickening, which alone does not indicate the presence of a sinus infection. In this instance, however, the (B) bilateral dependent areas of high SI fluid with resulting air-fluid levels, together with associated mucosal thickening, clinch the diagnosis of sinusitis. Sagittal images, as in Figure 56.1 A, are important to confirm that the fluid is dependent (and specifically are excellent for demonstrating an air-fluid level), aiding in differentiation from a retention cyst. The different MR SI characteristics of sinusoidal fluid are described in Chapter 20. Contrast administration distinguishes the enhancing, inflamed mucoperiosteum in acute sinusitis from the non-enhancing contents of a retention cyst, mucocele, or retained secretions.

Mucoceles—most commonly occurring in the frontal sinuses (with the next most common site being the ethmoid sinuses)—are benign, slow-growing, cystic, expansile masses that develop secondary to obstruction of a sinus ostium. The SI of this lesion (like the fluid of sinusitis) varies directly with its protein content such that especially proteinaceous lesions mimic the high SI appearance of hemorrhage (more frequently seen in coagulopathy or the setting of trauma) on T1WI. Desiccation over time results in a lower SI on both T1 and T2WI. There may be minimal peripheral enhancement.

The SI evolution of sinusoidal blood products is similar to that described for intraparenchymal blood in Chapter 8, although a delay in course may be observed due to overall poor oxygenation. Sinusitis associated with Wegener's granulomatosis is identifiable by osseous destruction out of proportion to mucosal involvement (the latter resulting in a soft tissue mass/nodularity).

In an immunocompromised patient or one in which a sinus infection has not responded to antibiotic therapy, a superimposed fungal infection must be considered. The signal intensity of secretions within the involved sinus is variable, although fungal elements may lead to low SI on T2. A fungal infection can also extend via veins intracranially, into the orbit or into the cavernous sinus (invasive fungal sinusitis). Enhancement or loss of the normal signal void within a dural venous sinus is an ominous finding. Orbital extension may be initially visualized as edematous SI changes within the eyelid. Progression of orbital cellulitis results in chemosis (edema of the conjunctiva), formation of subperiosteal phlegmon, then abscess, and finally infiltration of the peri- and retro-orbital fat. Idiopathic

orbital inflammatory disease (pseudotumor) is a similarly-appearing inflammatory condition, marked by a poorly marginated enhancing soft tissue mass within any area of the orbit, and is a diagnosis of exclusion.

Other infections within the head and neck take a multitude of forms. Although seldom obtained for acute otitis media or mastoiditis, fluid within the middle ear or mastoid air cells is well visualized by MR. Likewise cholesteatomas—associated with chronic middle ear infections—are most commonly evaluated by CT, although MR allows differentiation of the non-enhancing lesion (which also demonstrates restricted diffusion) from any surrounding enhancing, inflammatory granulation tissue. Fat within a cholesterol granuloma (together with methemoglobin), meanwhile, lends it a high SI on T1WI, distinguishing it from the two previous entities. Within the external auditory canal, malignant (necrotizing) otitis externa appears as high SI on T2WI, potentially eroding the undersurface of the temporal bone and extending intracranially. Subsequent parenchymal or dural involvement is best visualized on post-contrast scans. On the other hand, osteomyelitis—which more commonly occurs in the mandible secondary to infected teeth—is more sensitively detected as low SI on pre-contrast T1WI (with high signal intensity on post-contrast fat suppressed scans).


Fig. 56.1

Infections may spread to the parapharyngeal space via the petrous bone or tonsils. A peritonsillar abscess is demonstrated on the FS T2 and CE FS T1WI of Figure 56.1 C, D.

On the former, enlarged, inflamed lymph nodes and tonsillar tissue appear distinct from muscle as high SI. Encasement of the internal carotid artery—appearing as a dark flow void—constitutes a surgical emergency, while compromise and leftward shift of the nasopharyngeal airway are also present. This abscess also characteristically demonstrates (D) a non-enhancing, necrotic center surrounded by a large region of peripheral enhancement (Fig. 56.1 D). As opposed to post-contrast scans, pre-contrast T1WI are best obtained without FS to allow for identification of normal fat planes and their destruction. Abscesses within the salivary glands appear similar, mimicking malignancy in this area, while symmetric, bilateral gland enlargement suggests inflammation related to autoimmunity. Ductal calculi—a common cause of sialadenitis—may be seen as signal voids (due to dense calcification), but are more reliably imaged by CT or sialography. MR sialography (based on the principle of stationary fluid within the ductal structures having intrinsically high T2 SI) can be useful for evaluation of acute and chronic sialadenitis, allowing non-invasive assessment of the ductal system and gland parenchyma. Finally, causes of inflammatory thyroiditis are not reliably distinguished on MR, although periglandular extension of hyperintensity on T2WI distinguishes an infection from autoimmune entities like Grave's disease. The latter (with diffuse thyroid enlargement) may appear concomitant with extraocular myositis, which demonstrates diffuse muscular enlargement (inferior > medial > superior > lateral > obliques, with sparing of the muscle tendons). The enlargement of the extraocular muscles can, although rarely, cause optic nerve compression.