Imaging Features of Tumor-like Conditions in Sinonasal Region

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Learning objectives

Our purpose is to provide an educational exhibit illustrating the computed tomography (CT) and magnetic resonance imaging (MRI) features of various tumor-like conditions in sinonasal region and use cases from our centre as illustrative examples.

Background

Tumor-like conditions are nonneoplastic processes that may be confused with benign or even malignant tumor, clinically and radiologically. They are curative with simple surgical technique and rarely recur. Precise preoperative diagnosis is important to avoid unnecessary extensive surgery and predict proper prognosis. This article reviews the clinical features and imaging findings of tumor-like conditions.

Cross sectional imaging is essential for evaluating sinonasal masses. Computed tomography (CT) is superior for bony changes while magnetic resonance imaging (MRI) has superior soft tissue characterization and delineation.

Findings and procedure details

Organized hematoma (OH)

- OH is an encapsulated blood clot undergoing neovascularization and fibrosis with recurrent intracapsular bleeding. The etiologies of initial bleeding are various such as facial trauma, coagulopathy, recurrent epistaxis or previous surgery.

- Common location: most of which arise in maxillary sinus, follow by nasal cavity

- Clinical presentations: Patients age ranged 12-76 years with slightly male predominance. Recurrent epistaxis and nasal obstruction are most frequent presenting symptoms.
- Imaging findings: OH often causes sinus expansion with smooth bony erosion at medial wall of the maxillary sinuses. OH may cause bony destruction and extend into ethmoid sinus.

Unenhanced CT: OH is isoattenuated or heterogeneous high attenuated to the soft tissue of inferior turbinate. Intralesional calcification can be presented in 8.3% which is better demonstrated than MR imaging.

MR Imaging: According to its compositions which contain various stages of hemorrhage, fibrosis, and various amount of vascular proliferation, OH has various signal intensities on both T1- and T2-weighted images. Hypointense peripheral rim on T2-weignt images is the characteristic feature, representing fibrous pseudocapsule.

Contrast-enhanced imaging: OH has patchy and frond-like enhancement.

Sinonasal angiomatous polyp (SAP)

- Sinonasal angiomatous polyp, also known as angiectatic polyp, is a fibrosed and vascularized polyp which is an uncommon subtype of inflammatory sinonasal polyp. It may be associated with minor trauma or previous chronic inflammation but the exact etiology is still unclear.

- Common location: Maxillary sinus and/or nasal cavity

- Clinical presentation: Patients age ranged from 11-80 years with slightly male predominance. Common symptoms are unilateral nasal obstruction and epistaxis.

- Imaging features: angiomatous polyp appears as a mass filling the nasal cavity and/or maxillary sinus.

Unenhanced CT: The mass contains mixed high to low attenuation because it composes area of hemorrhage, organized thrombi, necrosis and inflammation. Bony changes are always presented which may be bony expansion, demineralization/ resorption, frank erosion or even bony sclerosis/ hyperostosis. Medial maxillary wall is the most common site for bony erosion, followed by posterolateral wall and superior wall, respectively. Punctate calcification might be detected on CT, representing calcium salt deposition in organized thrombi or necrotic area.
MR Imaging: The lesion shows hypointensity on T1WI and heterogeneous hyperintensity on T2WI. Peripheral hypointense rim of T2WI is always presented, indicating hemosiderin deposition due to old microhemorrhage.

Contrast-enhanced imaging: Peripheral enhancement with possible perceptible intralesional enhancement of delayed phase of contrast-enhanced CT. MR imaging is better for demonstrating enhancement pattern which shows progressive enhancement on DCE images.

Cavernous Hemangioma

- Hemangiomas are the most common vascular malformation in the head and neck. However, sinonasal haemangiomas are rare. There are two major types, capillary and cavernous, depending on the dominant vessels at microscopy. Most sinonasal haemangiomas are of the capillary type which are more common in children. Cavernous type is relatively rare but more common in adults.

- Common location: Lateral nasal wall or medial wall of the maxillary sinus.

- Clinical symptoms: Chronic epistaxis, nasal obstruction, cheek swelling and proptosis

- Imaging features: A growing soft tissue mass expanding air-containing spaces, most cases arise from or grow into maxillary sinus.

Unenhanced CT: Inhomogeneous soft tissue density circumscribed mass. The presence of phleboliths is characteristic for cavernous hemangioma, representing calcified thrombus in the dilated vascular spaces. Benign appearing bone changes including bone remodeling and expansion are typical. Bone destruction might be seen but less frequently occurred.

MR Imaging: Predominantly hyperintense on T2W. Otherwise heterogeneous in all other sequences.

Contrast-enhanced imaging: Heterogeneous enhancement due to intrallesional hemorrhage and necrosis.

Mucocele
- A collection of mucoid secretions surrounded by mucous secreting respiratory epithelium.

- Common location: Frontal sinus is the most common site, followed by ethmoid sinus. Approximately ten percent of mucoceles occur in the maxillary sinus. Sphenoid sinus is rarely involved.

- Clinical symptoms: Vary, depending on the location of mucocele. Ophthalmologic symptoms are most common.

- Imaging features:

  **Unenhanced CT**: A homogenous attenuating lesion completely opacified the paranasal sinus with associated sinus expansion and bone remodeling. The attenuation of mucocele is variable, could be hypo-, iso- or hyperattenuation, depending on mucoid, water and proteinaceous content. Severe bony wall thinning or even focal osseous defect may be occurred.

  **MR Imaging**: Variable signal on both T1- and T2-weighted images.

  **Contrast-enhanced imaging**: Peripheral enhancement may be seen. No central enhancement is appreciated.

**Sinochoanal polyp**

- Polyp is non-neoplastic hyperplasia of the inflamed mucosa.

- Common location: It commonly arises in the maxillary sinus and may be protrude into the nasal cavity, called antrochoanal polyp.

- Clinical symptoms: Nasal passage obstruction is the most common symptom.

- Imaging features: A well-defined lesion, causing smooth bone remodeling and ostial enlargement.

  **Unenhanced CT**: Mucoid density lesion
**MR Imaging:** Typically intermediate to low signal on T1- and homogeneously bright signal on T2-weighted images.

**Contrast-enhanced imaging:** Peripheral enhancement

**Sinonasal polyposis**

- Multiple polyps occur in approximately 25% of patients with allergic rhinitis and 15% in asthmatic patients.

- Common location: Nasal cavity, majority of polyps arise from uncinate-turbinate-infundibulum space and bulla-hiatus seminlaris-infundibulum

- Imaging features: Opacified sinuses and nasal cavity, causing ostial widening, nasal cavity or sinus expansion. Bony distortion or even aggressive appearing bony destruction might be demonstrated. Sinonasal polyposis typically enhanced peripherally. However, sometimes solid enhancement could be demonstrated and may be difficult to distinguish from tumor.

**Mycetoma**

- Also known as fungal ball, a non-invasive fungal colonization. The fungus ball represents a dense conglomeration of fungal hyphae usually in a single sinus. There is no fungal invasion of the sinus mucosa, blood vessels, or bone, although chronic nongranulomatous inflammation may be observed in the mucosa. It is usually caused by Aspergillus fumigates.

- Common location: Maxillary sinus

- Clinical symptoms: Asymptomatic or minor symptoms such as pressure sensation of the involving paranasal sinus, nasal discharge or cacosmia.

- Imaging features: A soft tissue mass with associated inflamed mucosa in a single sinus.

**Unenhanced CT:** A high attenuating mass in the sinus. Punctate calcifications may be demonstrated. Bony changes including sclerosis, expansion, thinning or focal erosion from pressure necrosis. Associated inflamed mucosa appears as hypoattenuating lining on CT.
MR Imaging: mycetoma has hypointense signal on both T1- and T2-weighted images. Signal void may be seen on T2-weighted images owing to calcification or paramagnetic metals content such as iron, magnesium and manganese. The inflamed mucosa has hyperintense signal on T2-weight images.

Contrast-enhanced imaging: Fungal ball itself does not enhanced. However, the inflamed mucosa shows contrast enhancement.

Images for this section:

Fig. 1: Figure 1. Organized hematoma (OH): A 20-year-old female presented with epistaxis and right nasal blockage. Unenhanced coronal CT, soft tissue window (A) shows a heterogenous high density lesion within the right maxillary sinus and nasal cavity. Unenhanced coronal and axial CT, bone window (B and C) demonstrate bone remodeling with mild expansion of the right maxillary sinus. There is no visualized normal bone at the region of inferior turbinate, middle turbinate and osteomeatal complex. Coronal T1- and T2-weighted images (D and E) show marked heterogenous signal intensity of the lesion, containing mixed hypo-, iso-, and hypersignal areas on both T1- and T2-weighted images. Dark peripheral rim on T2-weight image represents fibrous pseudocapsule. Coronal T1-weighted image with Gd administration(F) presents heterogenous patchy enhancement.
**Fig. 2:** Figure 2. Cavernous hemangioma; A 79 year-old female presented with epistaxis. Unenhanced axial CT, soft tissue window (A) shows an inhomogeneous soft tissue density lesion at left maxillary sinus. Unenhanced CT, axial and coronal views (B and C) show bone remodeling with mild expansion of the left maxillary sinus. Focal osseous defect at lateral left maxillary sinus wall is presented. Axial T1- and T2-weighted images; the lesion shows intermediate to hyposignal on T1- and predominantly hypersignal on T2-weighted image. Axial T1-weight with Gd administration show heterogeneous enhancement.
**Fig. 3:** Figure 3. Maxillary sinus mucocele; A 40 year-old male, presented with facial pain and nasal obstruction. Coronal CT, bone window (A) shows complete opacification with expansion of the left maxillary sinus. Severe bone thinning with possible osseous defect at the lateral maxillary wall are detected. The lesion shows hypersignal content on both coronal T1- and T2-weighted images (B and C). Coronal T1-weighted image with Gd administration (D) shows no contrast enhancement.
Fig. 4: Figure 4. Antrochoanal polyp: A 57-year-old male, presented with nasal obstruction. Unenhanced coronal CT, soft tissue and bone window (A and B) reveal a well-defined mucoid density lesion at left maxillary sinus extending through the widen maxillary ostium into left sided nasal cavity. Contrast enhanced CT (C) demonstrate thin peripheral enhancement.

Fig. 5: Figure 5. Sinonasal polyposis. A 71-year-old male with history of chronic rhinosinusitis. Unenhanced axial CT soft tissue and bone windows (A and B) show total opacification of the nasal cavity, ethmoid and sphenoid sinuses with mild expansion of the sphenoeethmoidal recesses. Contrast-enhanced axial CT (C) shows peripheral enhancement.
**Fig. 6:** Figure 6. Mycetoma; A 50-year-old male suffering from chronic sinusitis refractory to medical therapy. Unenhanced coronal and axial CT, soft tissue window demonstrate soft tissue density lesion containing multiple punctate calcifications at medial right maxillary sinus and nasal cavity. Total opacification of the right maxillary sinus could be trapped secretion and/or swollen mucosa. Unenhanced coronal CT shows sclerosis and hyperostosis of the right maxillary sinus wall, suggestive of chronic inflammation. Focal erosion at medial wall of the right maxillary sinus is also demonstrated.
Conclusion

Tumor-like conditions in sinonasal region may simulate true neoplasm. Knowledge of their imaging characteristics can facilitate a correct diagnosis.

Personal information

References


