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Pictorial Review

A whiff of trouble: Tumours of the nasal cavity and their mimics

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A range of disease entities can affect the nasal cavity, often presenting with variable and non-specific symptoms. There is considerable overlap between the clinical and radiological features of neoplastic and non-neoplastic entities. The nasal cavity is often included in routine imaging of the brain, middle ear, skull base, and paranasal sinuses and should be included as a critical review area. The definitive diagnosis is in most cases confirmed by histopathological analysis. However, this review highlights the role of imaging in identifying nasal cavity disease, eliciting features of aggressive or indolent behaviour, and helping to narrow the differential diagnosis, thus facilitating a systematic approach when reviewing the nasal cavity.

Introduction

The nasal cavity (NC) can be affected by various disease entities. While primary diseases of the NC are relatively rare, secondary involvement from diseases of neighbouring structures is commoner due to the complex regional anatomy. Both indolent and aggressive diseases of the NC often present with non-specific symptoms, such as nasal congestion, discharge, headache, and epistaxis. Therefore, diagnostic uncertainty in assessment may cause delay in recognizing clinically important disorders. Abnormalities of the NC can be identified on imaging performed in symptomatic patients as well as occur as an incidental finding while reviewing routine imaging of brain, middle ear, skull base, and paranasal sinuses. The reporting radiologist should have an awareness of imaging findings of common and clinically important diseases affecting the NC and should include it as an important review area.

The purpose of this review is to familiarize the reader with an array of nasal lesions that may be identified on routine cross-sectional studies. The authors will describe common and more esoteric diseases, providing a template that will aid in the differentiation of these lesions when encountered in daily practice.

Anatomy

The NC (Fig 1) is the gateway to the respiratory system and is bounded by the following anatomical structures: floor: hard palate; roof: cribriform plate of the frontal bone and ethmoid air cells; and lateral walls: three turbinates separated by spaces (meati). The cavity is separated in the midline by the nasal septum, which is cartilaginous anteriorly and bony posteriorly. The NC communicates with the paranasal sinuses via draining ostia, located on the lateral

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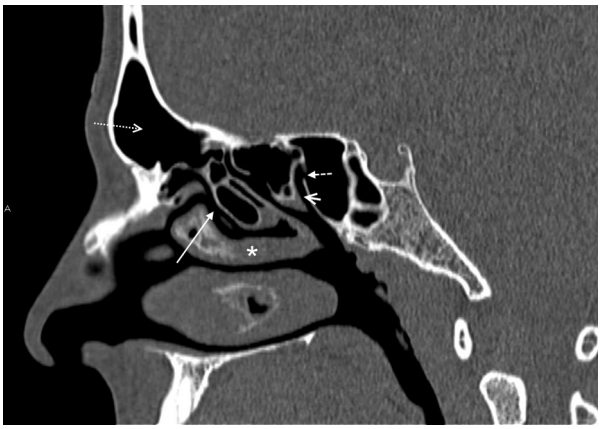

Figure 1 Sagittal CT image of the lateral wall of the NC demonstrating the sinus draining ostia: ethmoid infundibulum (solid arrow); sphenoethmoid recess (arrowhead); sphenoid ostium (dashed arrow); middle turbinate (*); frontal sinus (dotted arrow).

walls of the NC. The ostiomeatal complex, located adjacent to the middle turbinate, is the common site of drainage for maxillary and frontal sinuses and the anterior and middle ethmoid air cells. The sphenoethmoid recess, located under the superior turbinate, is the site of drainage for the sphenoid sinus and posterior ethmoid air cells.[1]

Imaging

Computed tomography (CT) and magnetic resonance (MR) are the primary modalities used for imaging the NC. Thin-section CT with multiplanar reconstructions is excellent for demonstrating bony anatomy (Fig 1), whereas the superior contrast resolution of MRI is useful in delineating the intricate soft-tissue composition and evaluating perineural, intra-orbital, and intracranial spread. T2-weighted (W) sequences are helpful in distinguishing tumours versus retained secretions.[2] T2W imaging in axial and coronal planes together with contrast-enhanced fat-suppressed T1W images are the most commonly used sequences in our centres. Newer MRI sequences have a role in aiding distinction between benign and malignant nasal lesions. In diffusion-weighted imaging (DWI), the main apparent diffusion coefficient (ADC) value of benign tumours was shown to be significantly higher than that of malignant solid lesions.[3] In dynamic contrast-enhanced (DCE) sequences, the characteristic time–activity curve in malignant lesions was reported to show rapid early enhancement and minimal wash out.[4] Combined positron-emission tomography and computed tomography (PET-CT) can also help to differentiate benign and malignant lesions, with the latter exhibiting significantly higher 2-[18F]-fluoro-2-deoxy-D-glucose (FDG) uptake that the former. The main role of PET-CT is, however, the monitoring of the treatment response in known malignancy by detection of recurrent or residual disease, as well as identification of nodal metastases.[5]

Neoplastic lesions

Primary benign and malignant sinonasal tumours (Table 1) comprise approximately 3% of all head and neck (H&N) tumours,[2] and the presenting symptoms are variable and highly dependent on the location and character of the tumour. Secondary tumours extend from neighbouring spaces, e.g., anterior cranial fossa, sella turcica, or nasopharynx. Extension into the NC can occur either through natural foramina or via destruction of the NC boundaries.[2]

The differentiation between NC tumours versus their non-neoplastic mimics on imaging is challenging, due to overlapping features. Table 2 summarizes imaging features that raise suspicions of a neoplastic lesion, hence requiring biopsy for further evaluation.

Primary neoplasms

Benign

Schneiderian papilloma

Schneiderian papilloma (Fig 2) accounts for approximately 0.5–5% of nasal neoplasms[7,8] and typically presents in middle-aged males.[2] It commonly arises in the lateral aspect of the NC, close to the middle turbinate.[9] Three variants are described: inverting (most common), fungiform, and cylindrical cell.[10] It has propensity for local recurrence after resection and for malignant transformation, with 2–15% having co-existing squamous cell carcinoma (SCC) at presentation.[11,12]

At CT, they are isoattenuating to normal mucosa, lack calcification, and characteristically cause bony remodelling. At MRI, they are iso- to hyperintense to muscle on T1W and hyperintense on T2W, with homogeneous enhancement regardless of co-existing SCC.[10]

Glomangiopericytoma

Glomangiopericytoma (Fig 3) is a benign subtype of haemangiopericytoma (a rare fibrovascular tumour of epithelial proliferation), arising in the NC or paranasal sinuses. It has a peak incidence in the seventh decade and a slight female predominance.[13] The typical clinical presentation is of unilateral nasal obstruction and epistaxis. Trauma, long-term steroid use, and hypertension are risk factors.[14]

Imaging appearances are non-specific. CT and MRI are mainly used to determine the location and extent of the

Table 1
Primary neoplasms of the nasal cavity.

Benign	Malignant	
	Epithelial	Non-epithelial
Schneiderian (“inverting”) papilloma		Melanoma
Granuloma gravidarum (lobular capillary haemangioma)	Squamous cell carcinoma (SCC)	Lymphoma
Glomangiopericytoma (sinonasal haemangiopericytoma)	Adenoid cystic carcinoma	Olfactory neuroblastoma
Nerve sheath tumours	Adenocarcinoma	Sarcoma
Osteoma		Fibrous histiocytoma