Paranasal Sinuses

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Anatomy

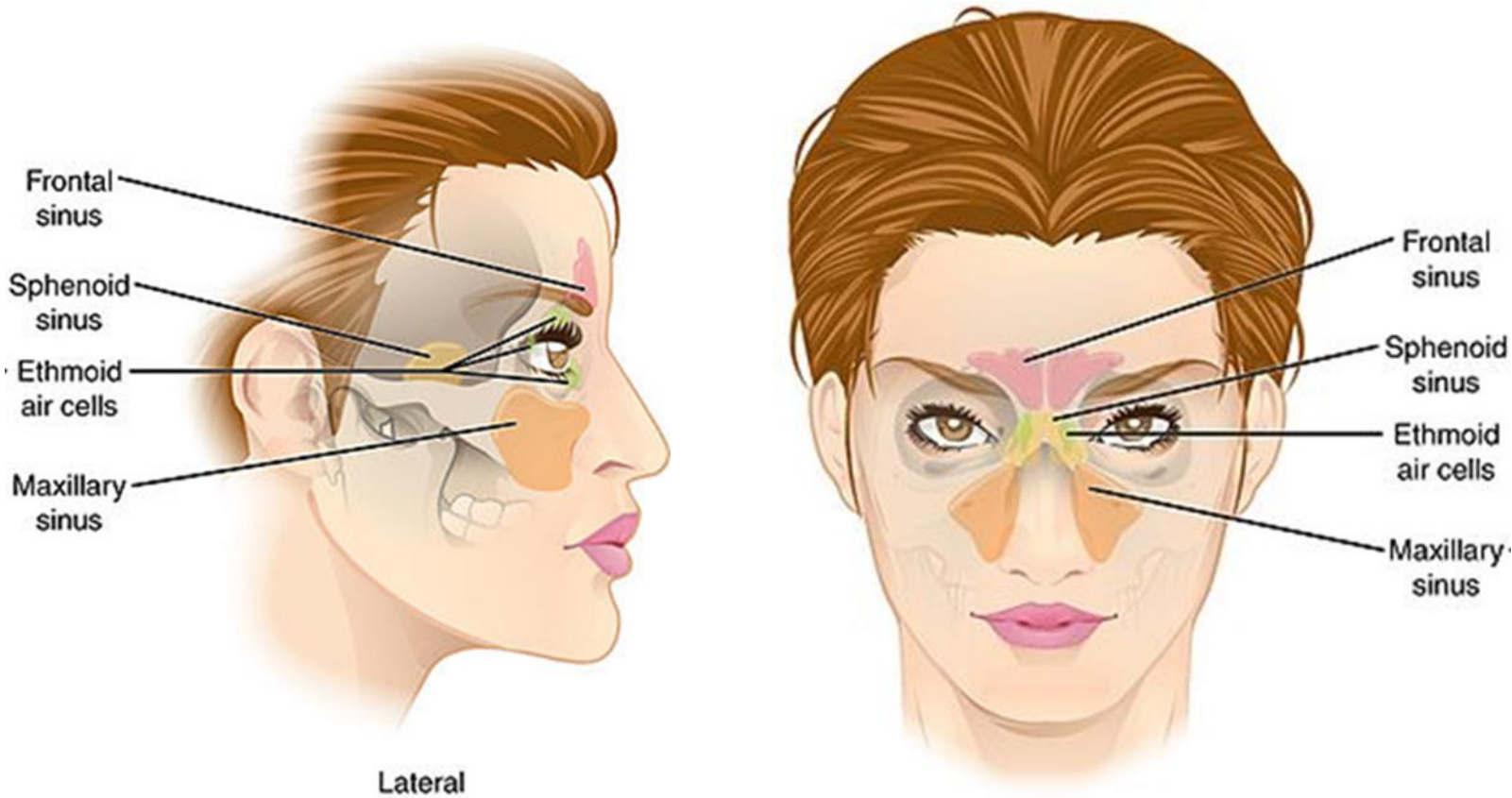
The paranasal sinuses are air-filled cavities that open into the nasal cavity, mostly into the middle meatus of the nose.

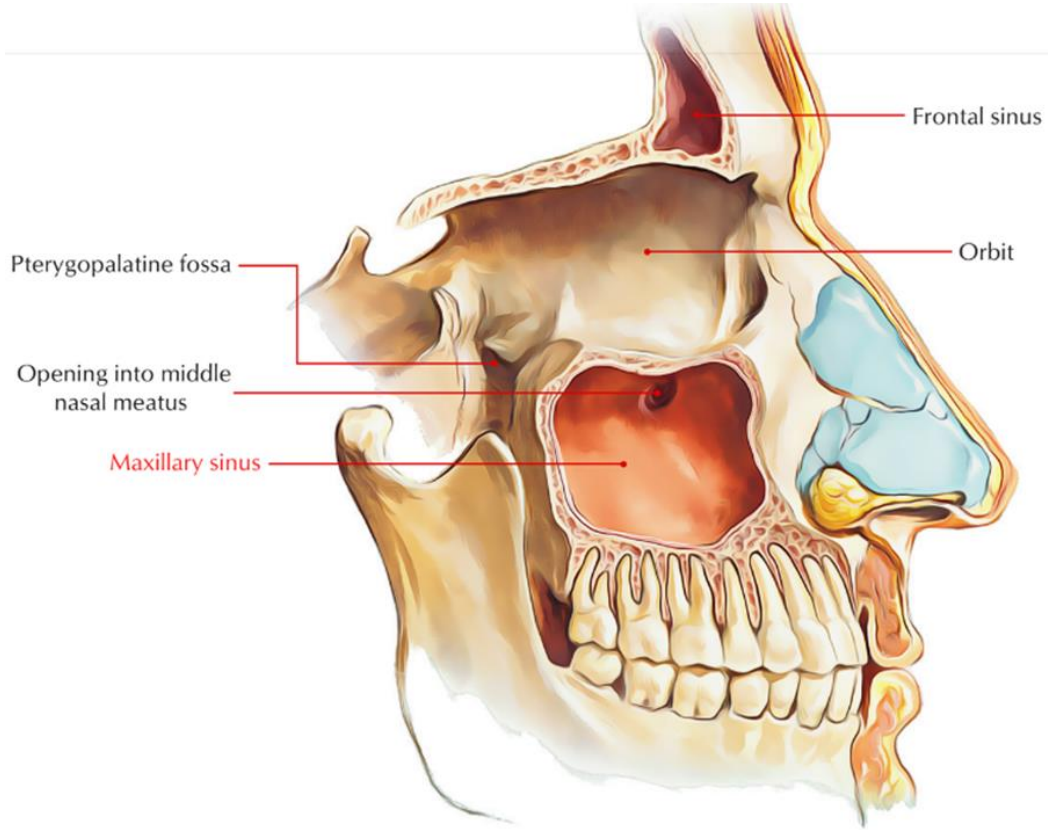
The maxillary sinuses occupy the cheeks.

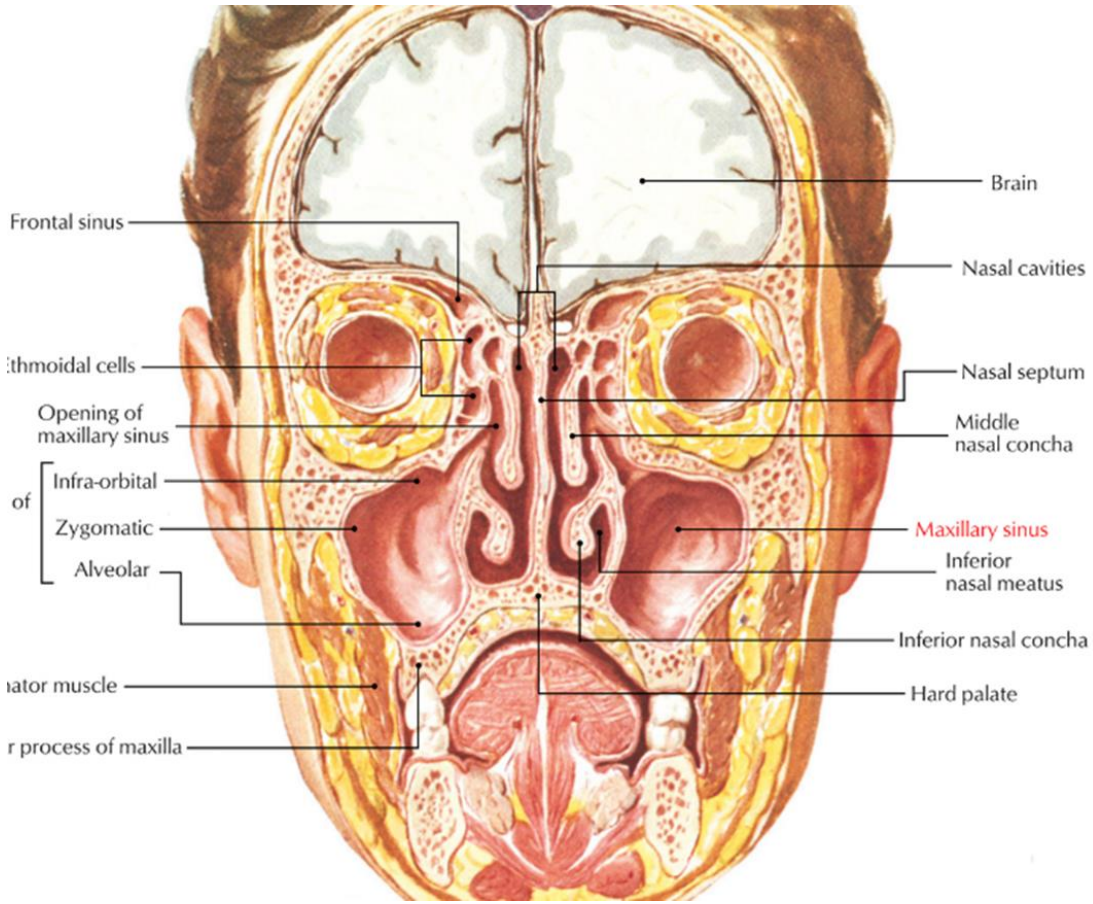
The ethmoid labyrinth consists of a number of air cells lying between the orbit and the lateral wall of the nose.

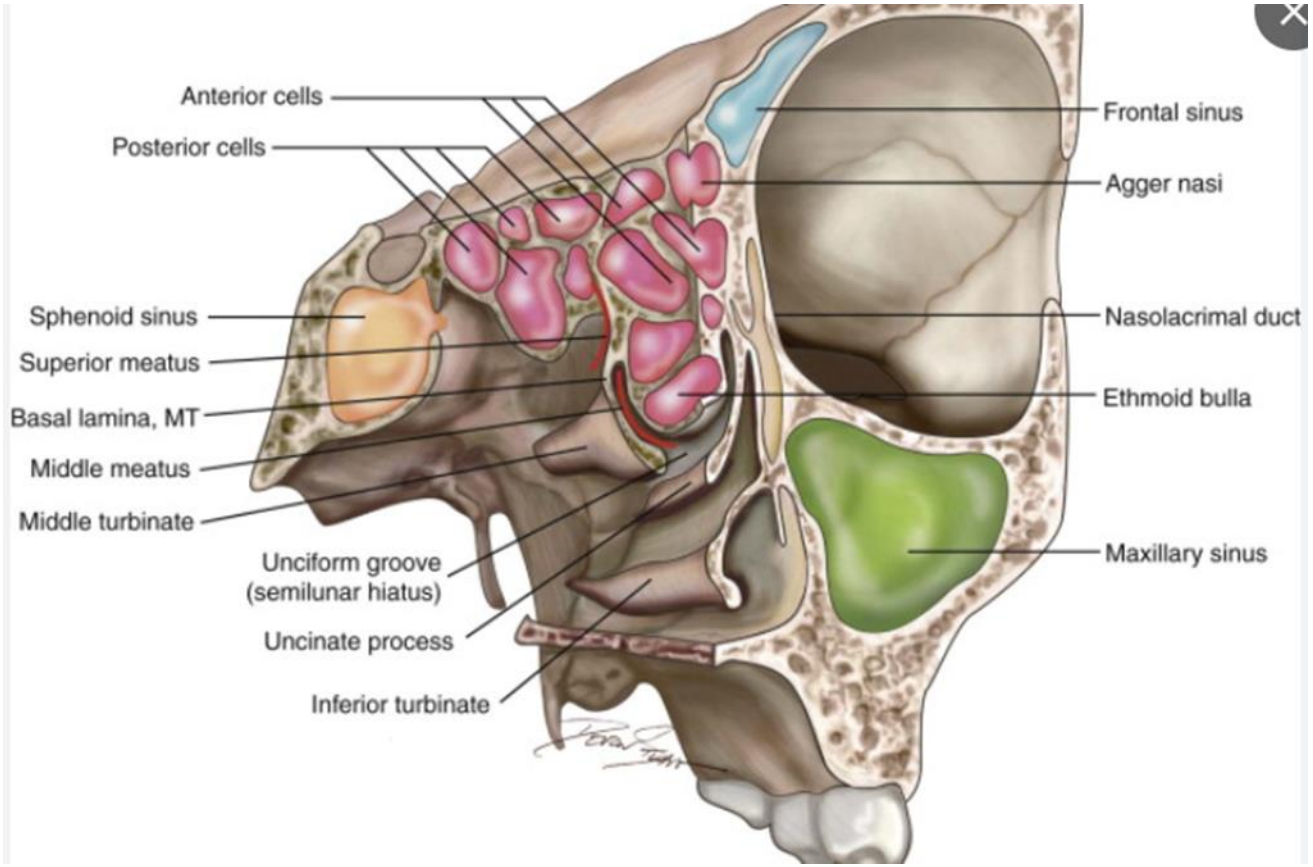
The frontal sinus is an ethmoid air cell that has migrated into the frontal bone, and it is connected to the middle meatus of the nose via the frontonasal duct.

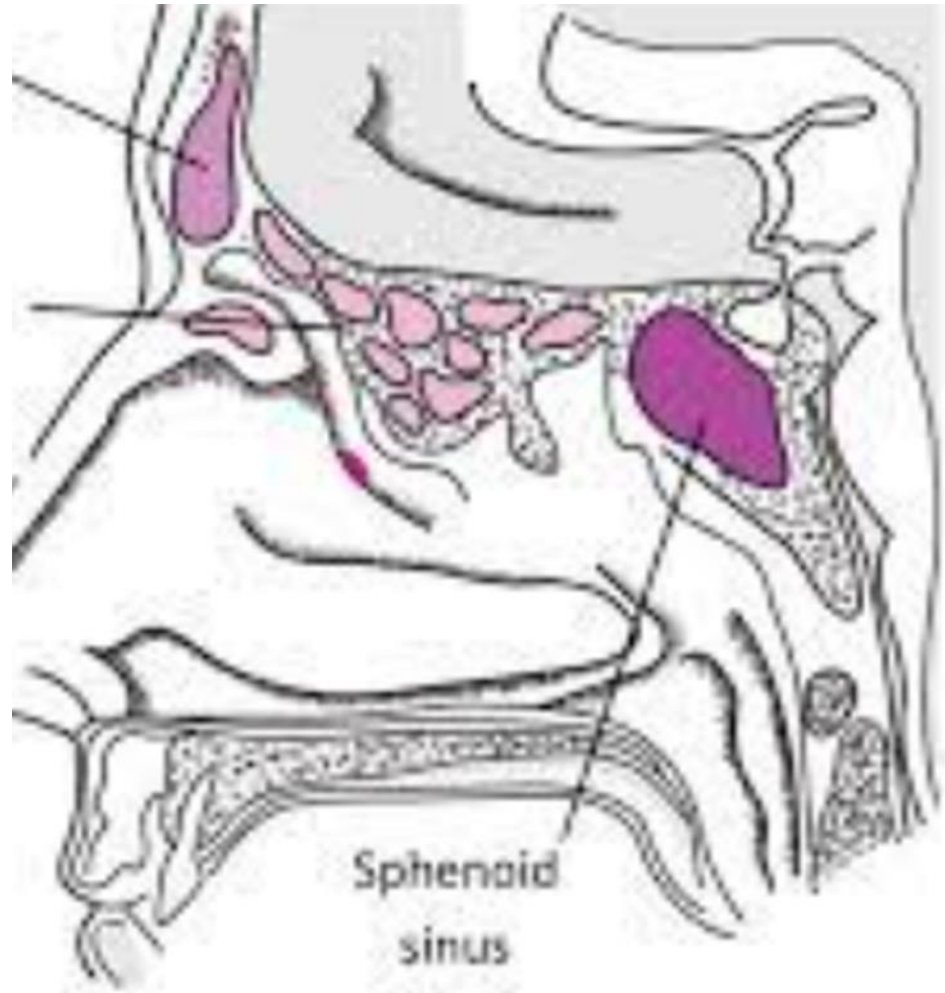
The sphenoid sinus is posterior to the ethmoid labyrinth, inferior to the pituitary fossa.


Frontal sinus
Sphenoid sinus
Ethmoid air cells
Maxillary sinus
Lateral
Frontal sinus
Sphenoid sinus
Ethmoid air cells
Maxillary sinus


Frontal sinus
Orbit
Pterygopalatine fossa
Opening into middle nasal meatus
Maxillary sinus


Brain
Frontal sinus
Nasal cavities
thmoidal cells
Nasal septum
Opening of maxillary sinus
Middle nasal concha
of
Infra-orbital
Zygomatic
Alveolar
Maxillary sinus
Inferior nasal meatus
Inferior nasal concha
ator muscle
Hard palate
r process of maxilla

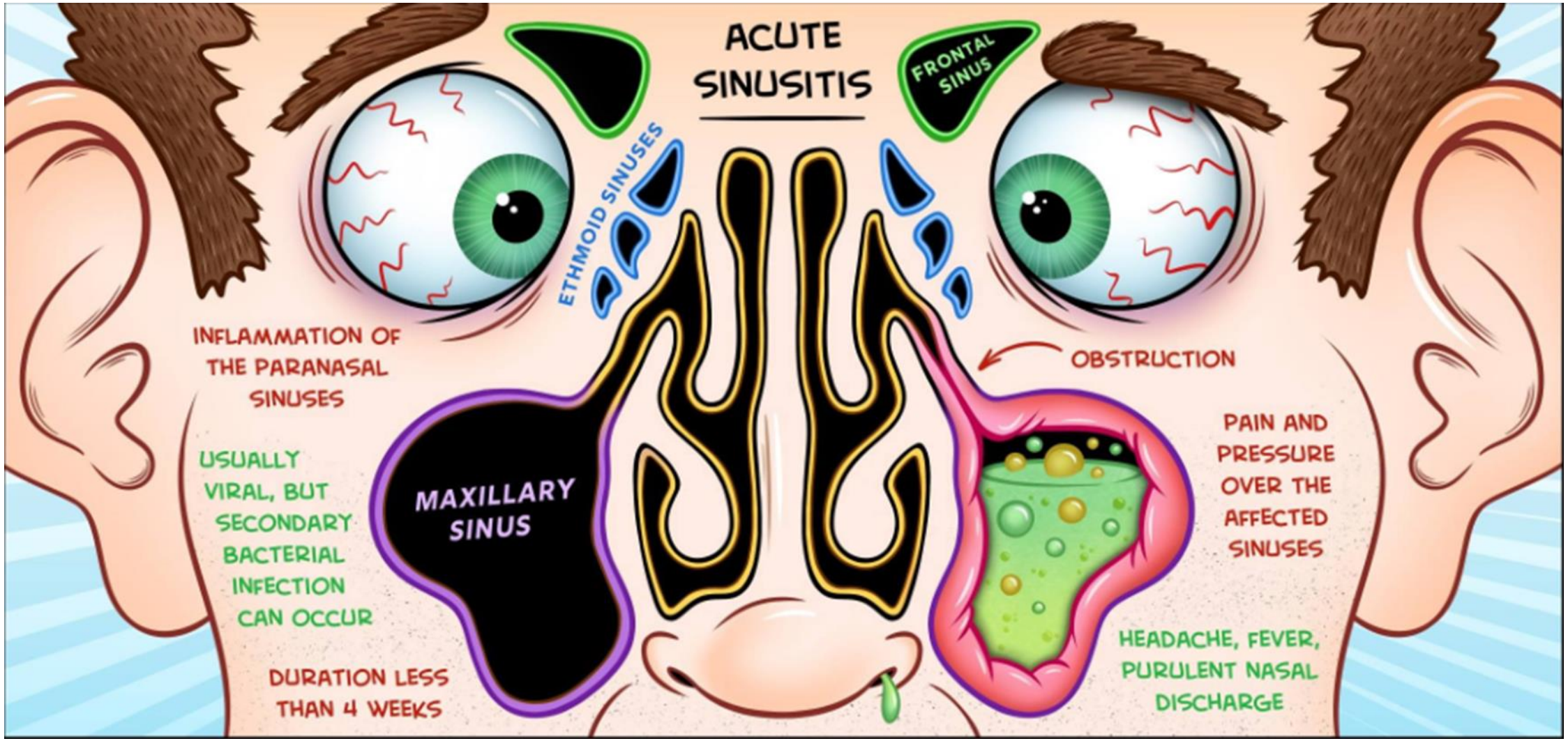

Anterior cells
Posterior cells
Sphenoid sinus
Superior meatus
Basal lamina, MT
Middle meatus
Middle turbinate
Unciform groove
(semilunar hiatus)
Uncinate process
Inferior turbinate
Frontal sinus
Agger nasi
Nasolacrimal duct
Ethmoid bulla
Maxillary sinus


Sphenoid
sinus

Diseases of the paranasal sinuses

- Any sinus may become **infected.**
- The **most commonly involved** is the **maxillary sinus.**
- **Pain** arising from the **maxillary sinus** is felt in the cheek, that from the **ethmoid labyrinth** is felt over the nasal bridge, and frontal sinus pain is felt in the forehead. **Sphenoid sinus** pain is said to be maximal at the **vertex.**
- **Acute sinusitis** is most commonly caused by **Strep. pneumoniae or H. influenzae**, and typically follows an upper respiratory infection**. Gram negative organisms** may cause sinusitis related to a dental abscess. In some parts of the world, **fungal infection** is not uncommon.

- Acute sinusitis is usually **managed** medically.
- **Chronic sinusitis** may result from failure of resolution of acute infection or may arise insidiously.
- **Surgical treatment** is frequently required and includes enlargement of the natural ostium of the maxillary sinus, often with clearance of infected ethmoid cells.
- **Frontal and sphenoid sinusitis** are much less common.
- **Infection may spread** from the sinuses, usually the ethmoid or frontal sinuses, to involve other areas such as the **cranial cavity or orbit** .


ACUTE SINUSITIS
FRONTAL SINUS
ETHMOID SINUSES
INFLAMMATION OF THE PARANASAL SINUSES
USUALLY VIRAL, BUT SECONDARY BACTERIAL INFECTION CAN OCCUR
DURATION LESS THAN 4 WEEKS
MAXILLARY SINUS
OBSTRUCTION
PAIN AND PRESSURE OVER THE AFFECTED SINUSES
HEADACHE, FEVER, PURULENT NASAL DISCHARGE

Complications:

1. Mucus retention cyst, polyps
2. Mucocele
3. Osteomyelitis
4. Cavernous sinus thrombosis
5. Intracranial extension (Empyema, Cerebritis , Abscess)
6. Orbital complications

Tumors

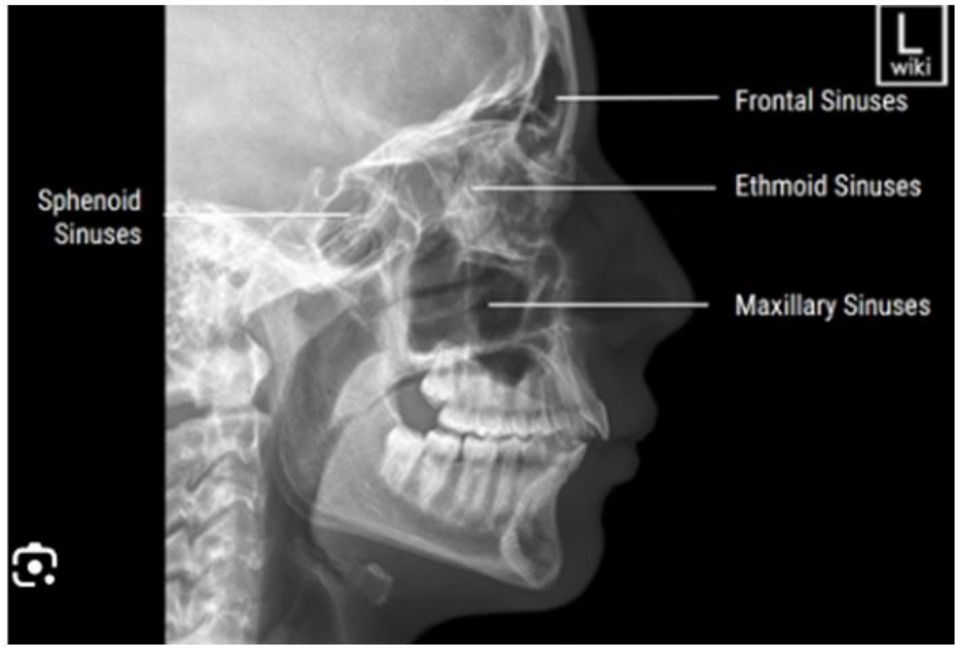
- **The most common** malignant neoplasm found in the paranasal sinuses is **squamous carcinoma.**
- **Adenocarcinomas** are seen in workers in **the furniture industry**.
- The **most common sites** of origin are the maxillary and ethmoid sinuses.
- Unfortunately, the disease has often **spread** beyond the primary site at presentation.
- These relatively uncommon tumors are **managed by a combination** of surgery and radiotherapy, or by local surgery and topical chemotherapy.

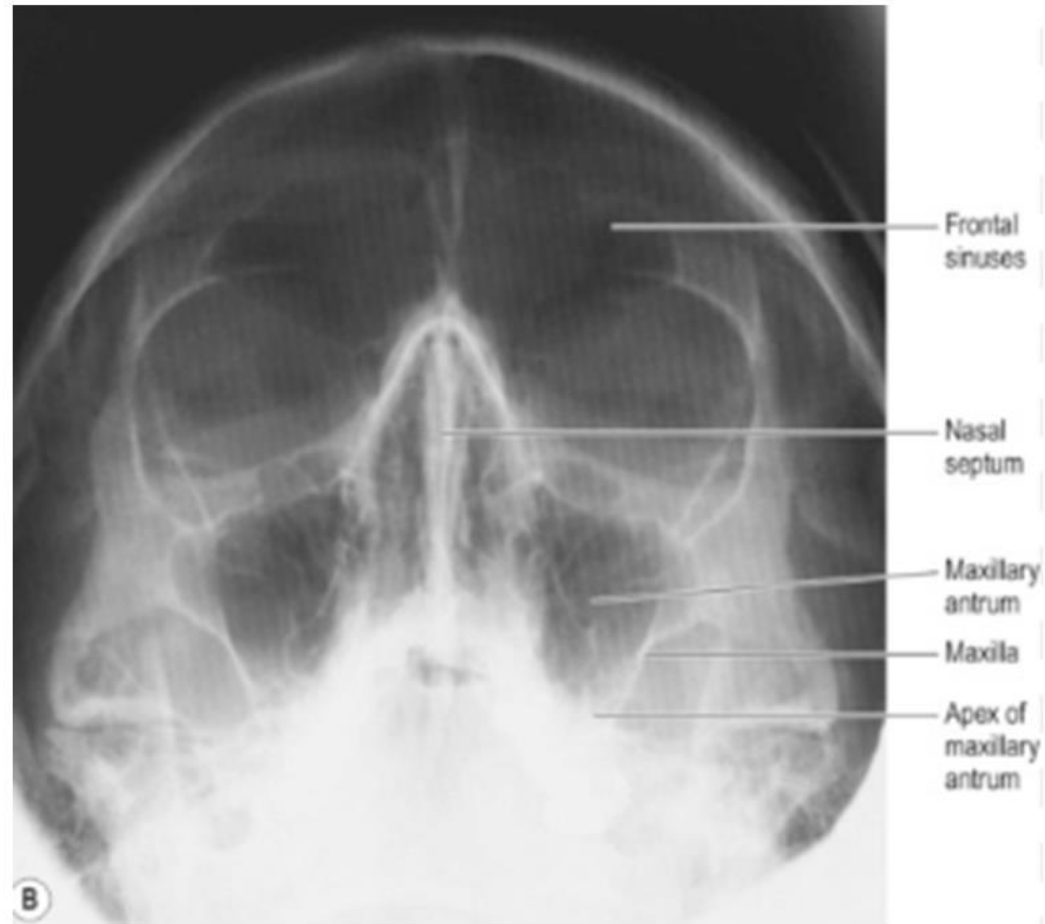
Imaging of the paranasal sinuses

- Evaluation of the paranasal sinuses is often performed in a purely clinical fashion, without the need for imaging.
- However, in certain instances imaging may be deemed valuable or even necessary in helping to solve a diagnostic dilemma, **confirm** a **suspected diagnosis**, **evaluate the extent of a known condition**, or **assess for an underlying cause of the condition**.
- X-ray , Computed tomography (CT) and magnetic resonance imaging (MRI) can be useful in confirming a suspected diagnosis or providing additional information regarding causes or complications.
- CT and MRI play complementary roles in evaluating the rare tumors that may involve the paranasal sinuses.

Plain radiograph (x-ray)

- Basic radiographic features are **occipitofrontal view** (**Caldwell view**) , **occipitomental (OM)** or **Waters view** and **lateral view**
- Sinuses are normally filled with air, so the passages will appear black on an X-ray of healthy sinuses.
- **A gray or white area** on an X-ray of the sinuses indicates a problem. This is most often due to inflammation or a buildup of fluid in the sinuses.


L
wiki
Frontal Sinuses
Ethmoid Sinuses
Sphenoid Sinuses
Maxillary Sinuses


Frontal sinuses
Nasal septum
Maxillary antrum
Maxilla
Apex of maxillary antrum
B

CT scan

The CT paranasal sinus protocol serves as an examination for the **assessment of the study of the mucosa and bone system** of the sinonasal cavities.

It is usually performed as **a non-contrast study**.

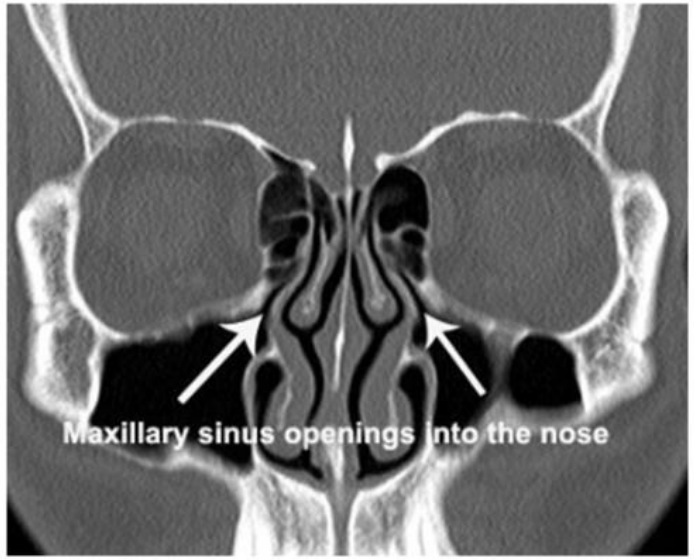
Typical indications include the following:

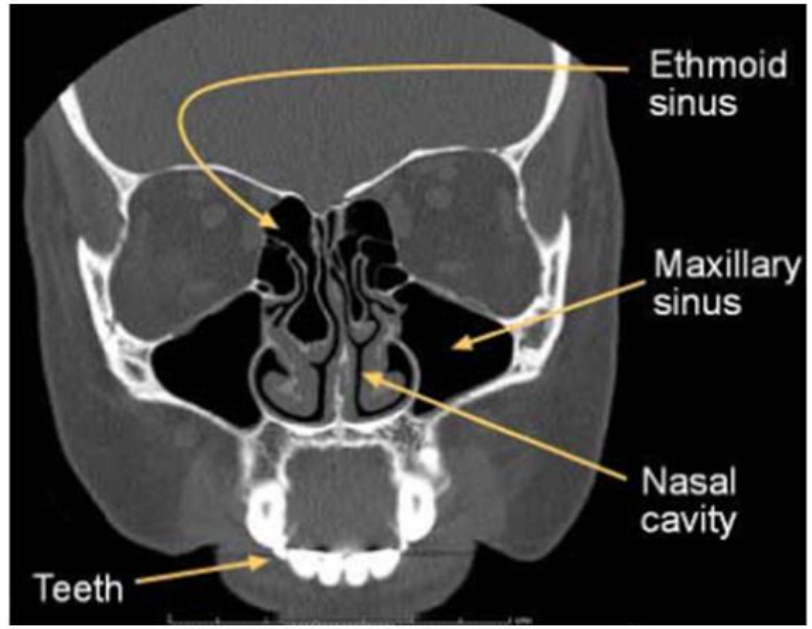
1.Inflammatory disease (acute rhinosinusitis , gas-fluid levels , mucosal disease , chronic sinusitis , cysts and polyps , mucoceles)

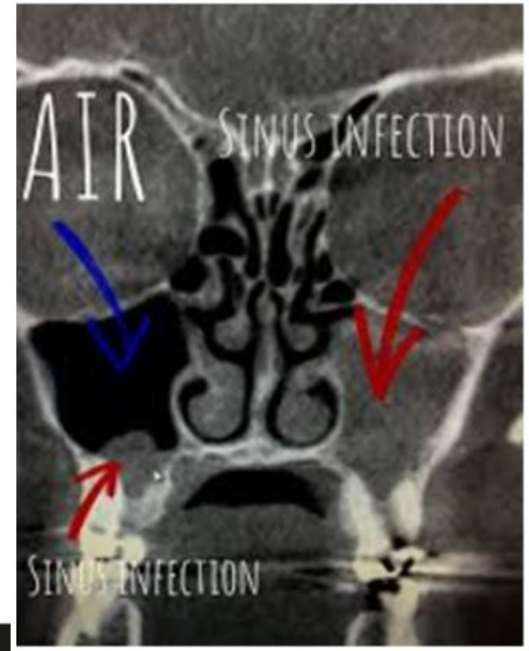
2.Foreign body

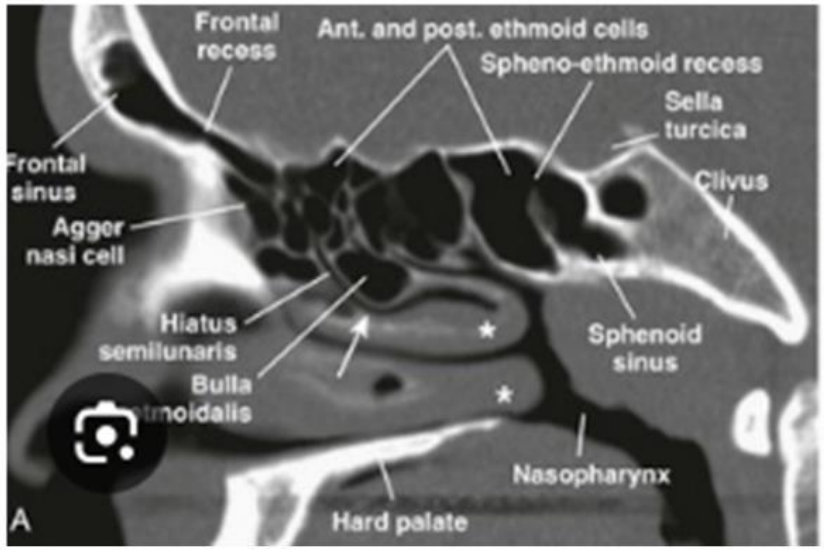
3.Malignancy

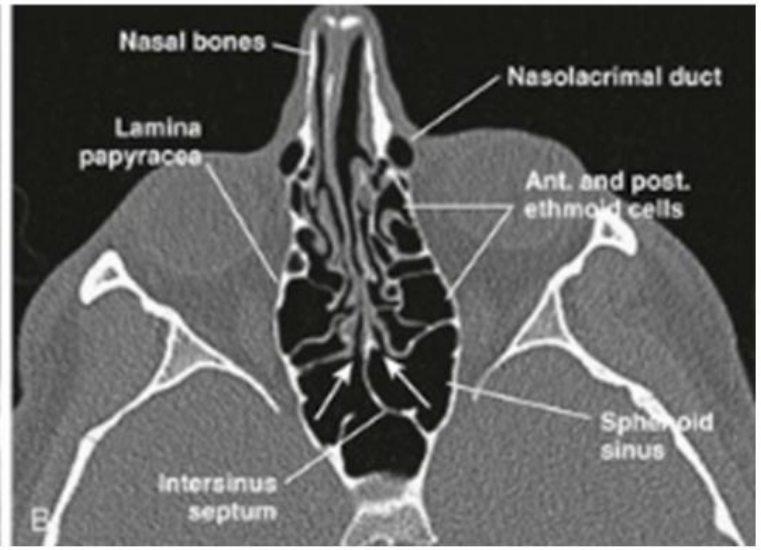
4. Preoperative assessment


Maxillary sinus openings into the nose


Ethmoid sinus
Maxillary sinus
Nasal cavity
Teeth


AIR
SINUS INFECTION
SINUS INFECTION


Frontal recess
Ant. and post. ethmoid cells
Spheno-ethmoid recess
Sella turcica
Clivus
Frontal sinus
Agger nasi cell
Hiatus semilunaris
Bulla ethmoidalis
Sphenoid sinus
Nasopharynx
Hard palate
A


Nasal bones
Nasolacrimal duct
Lamina papyracea
Ant. and post. ethmoid cells
Sphenoid sinus
Intersinus septum
B

In neoplastic, inflammatory and infectious disorders, a CT scan of the paranasal **sinuses is performed to demonstrate**

bony erosions, osteolytic lesions, and calcifications.

If neoplasia is suspected, the use of an intravenous contrast medium is indicated.

CT is of value for determining **anatomic landmarks** and variants. This information is of vital importance to the ENT-surgeon.

In addition, we need it **to identify erosive processes and acquired developmental deficiencies of the bone.**

CT is also excellent for determining whether there **is intraorbital extension of sino-nasal disease** in the ventral 2/3 of the orbit.

If additional imaging is necessary, **orbital MRI** is the next step. The real value of unenhanced CT is the following: **if you see an opacified sinus with hyperdense contents**, it is usually a sign of benign disease. Tumor is not hyper-dense.

The hyperdensity is due to one or a combination of the following:

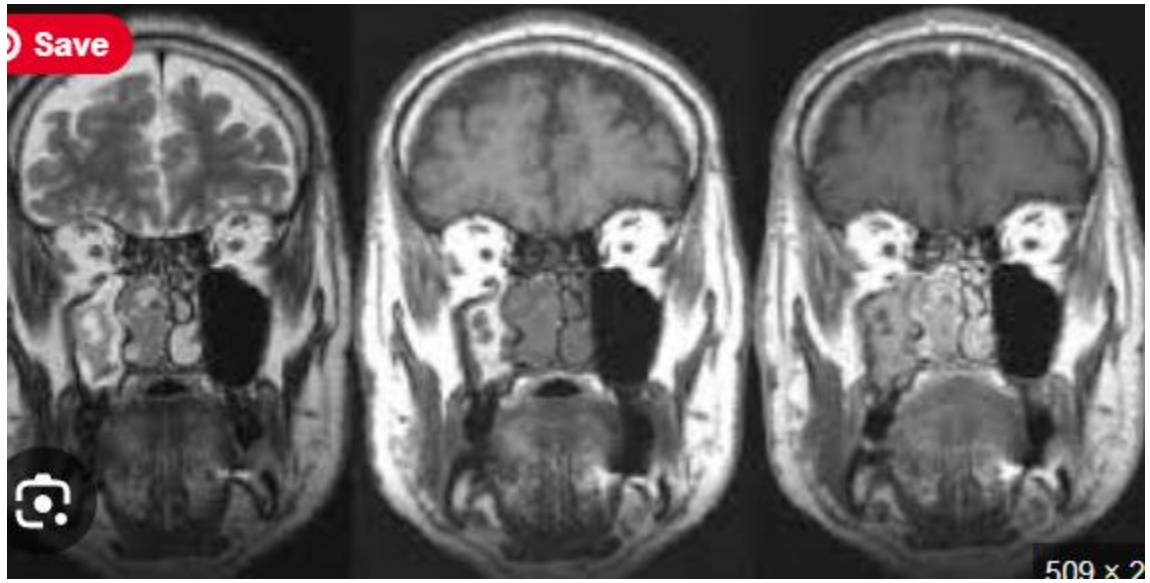
1.inspissated secretions

2.fungus

3.blood

MRI

- MRI is extremely helpful in complicated sinonasal disease.
- MRI can discern **secretions and mucosa from masses**.
- When you understand the **signal characteristics**, you are readily able to distinguish soft tissue masses from inspissated secretions.
- **The signal intensity of secretions can vary a**nd depends mainly on the water-to-protein ratio and viscosity.
- Different protein contents result in different signal intensities on T1 and T2W images.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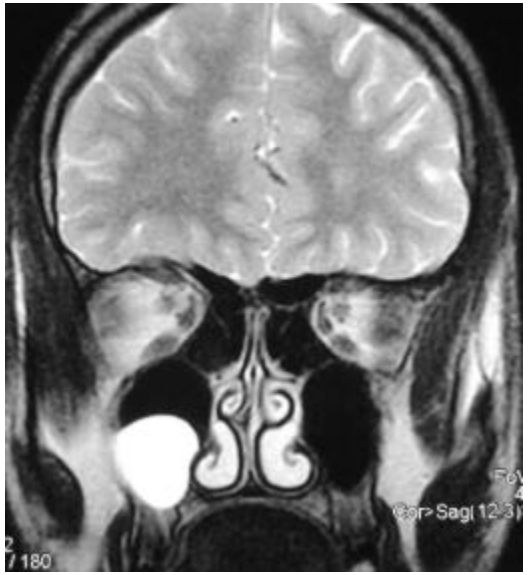
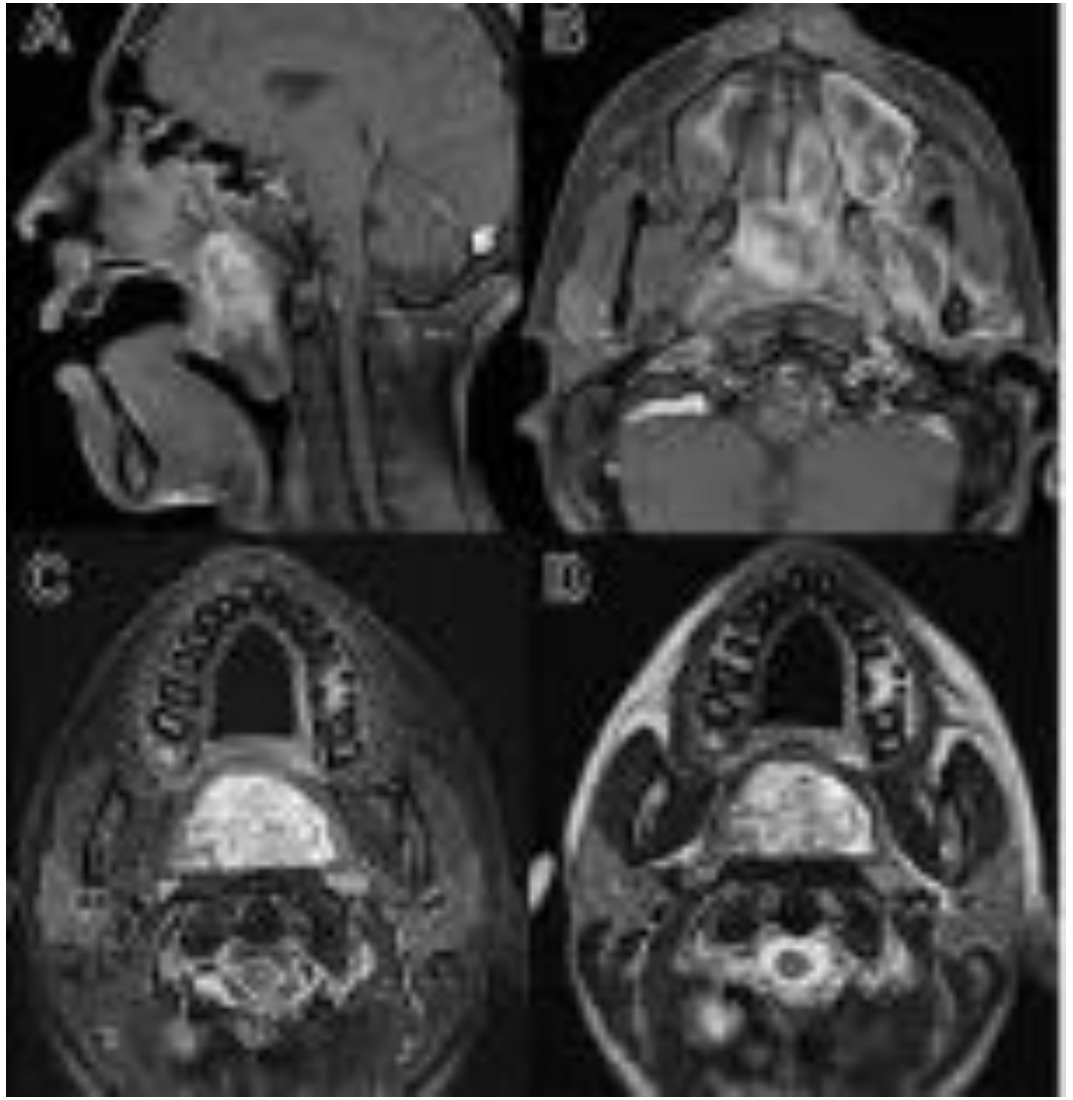
509 x 2


Cor> Sag(12-3)
7 180


A
B
C
D

- Fungus usually has a high protein content of more than 28% and can mimic an aerated sinus because it is low on T1- and T2WI.
- MRI is also useful for determining invasion of the skull base.
- Involvement of the skull base is seen as replacement of the high signal of the fatty marrow on T1WI by hypointense signal of the tumor.
- Also look for foraminal extension, whether by perineural spread or direct invasion of the tumor

- MRI is also the study of choice for detecting intracranial extension of sinonasal disease.
- In general bright signal on T2 is a sign of benign disease, since fluid and mucosal disease usually have a high water content. Secretions do not have solid enhancement.
- If you have an enhancing mass, you must rule out tumor.
- After the administration of i.v. contrast there is only enhancement of the circumferential mucosa and no solid enhancement.
- In complicated cases both CT and MR are needed to demonstrate the extension of the disease.