

محاضرة التشرح الشعاعى -المرحلة الثانية

كلية المامون الجامعة

الفصل الأول

اعداد م د-عدي يوسف

NORMAL ANATOMY OF NASAL CAVITY

AND PARANASAL SINUSES

RADIOLOGY OF NASAL CAVITY AND PARANASAL SINUSES

The nasal cavity is the most superior part of the **respiratory tract**. It extends from the vestibule of the nose to the nasopharynx

The nose is the most prominent part of the human face. It has internal and external parts

The **nose** is an olfactory and respiratory organ. It consists of nasal skeleton, which houses the nasal cavity.

Function of nose:

1. Provides airway for respiration.
2. Air conditions the inspired air.
3. Kills inspired bacteria and viruses by IgA
4. Collects moisture.
5. Gives resonance of voice.
6. Filters suspended particulate.

7. Organ of smell and lastly.
8. Part of external beauty.

Nasal cavity has three divisions:

- **Vestibule** – the area surrounding the anterior external opening to the nasal cavity.
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- **Respiratory region** – lined by a ciliated pseudostratified epithelium, interspersed with mucus-secreting goblet cells.
- **Olfactory region** – located at the apex of the nasal cavity. It is lined by olfactory cells with olfactory receptors.
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- **The Nasal cavity:** The right and left nasal fossae or cavity are separated by the nasal septum.
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- Each fossa communicates with The para nasal sinuses through ostia and The nasopharynx through the posterior choanae
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Each nasal fossa is bounded by:

1. Floor.
2. Roof.
3. Medial wall.
4. Lateral wall

Lateral Wall: It is the most important part of Anatomy of nose and Nasal Sinus.

The bony lateral wall is convoluted by the Turbinates called Superior, Middle and Inferior turbinate.

Each turbinate over hangs a space called meatus. So lateral wall has got three meatus named by Superior, Middle and Inferior meatus. These meatus are important in clinical terms as all nasal sinus and paranasal sinus are open here.

- Superior Meatus: Posterior ethmoidal air sinus
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- Middle Meatus: Maxillary sinus, Anterior and Middle ethmoidal sinus, Frontal sinus.
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- Inferior Sinus: Nasolacrimal Duct.

The Sphenoid sinus drains into the Sphenoethmoid recess above the superior turbinate.

Frontal sinus drains through the Frontonasal duct.

Medial Wall:

This is the Nasal Septum. The formation of Nasal Septum is very important both for practise and examination in written and viva. It is formed mainly by

1. Quadrilateral cartilage
2. Perpendicular plate of Ethmoid bone
3. Vomer

Minor Contribution from

1. Nasal crest of Maxilla
2. Nasal crest of Palatine bone
3. Rostrum of Sphenoid bone

Roof: Roof is formed by

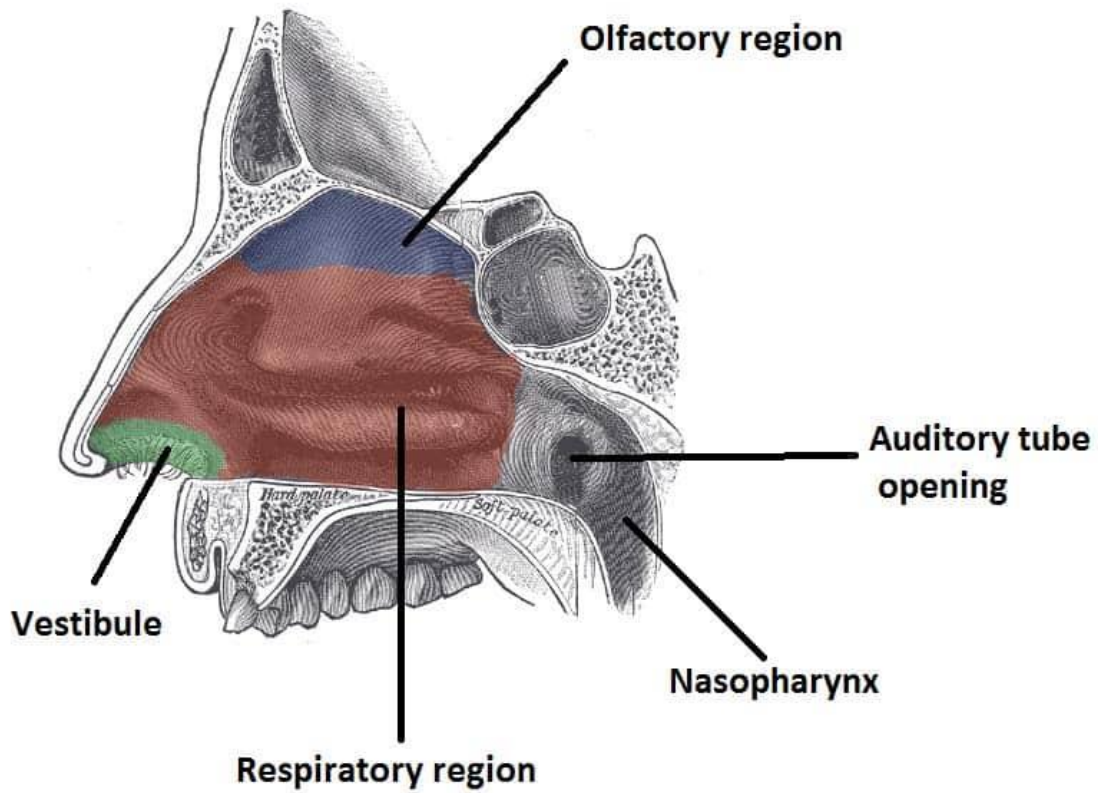
1. Nasal bone
2. Frontal bone
3. Cribriform plate of ethmoid
4. Body of Sphenoid bone

Floor: It is also known as Hard palate. It is formed by

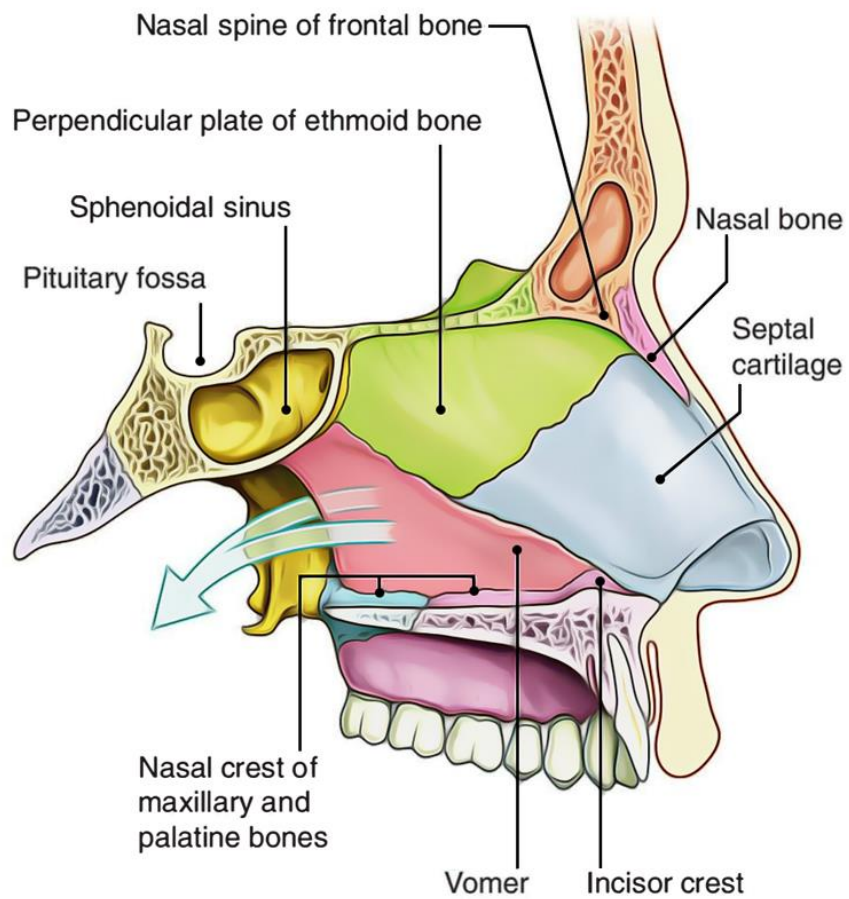
1. Palatine process of maxilla
2. Horizontal process of palatine bone.

Epithelial Lining:

1. Stratified Squamous Epithelium in Vestibule
2. Ciliated Columnar Epithelium in Nasal Cavity
3. Olfactory Neuro epithelium in roof.



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Vasculature

The nose has a very **rich** vascular supply – this allows it to effectively change humidity and temperature of inspired air. The nose receives blood from both the internal and external **carotid** arteries:

Internal carotid branches:

- Anterior ethmoidal artery
- Posterior ethmoidal artery

The ethmoidal arteries are branch of the **ophthalmic** artery. They descend into the nasal cavity through the cribriform plate

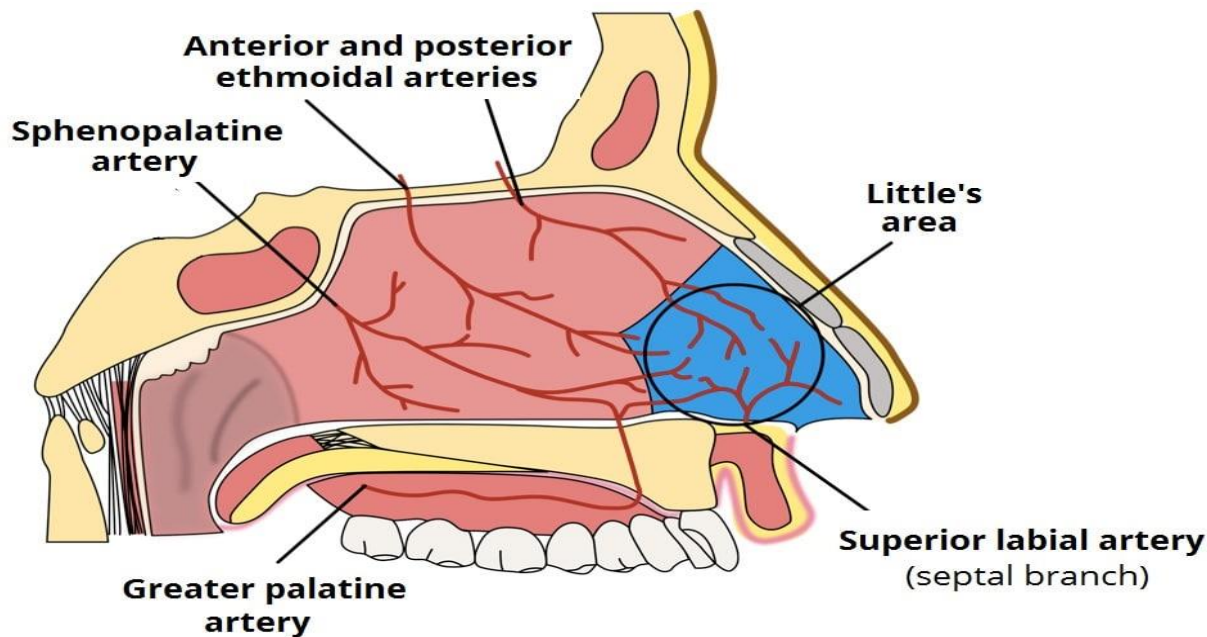
External carotid branches:

- Sphenopalatine artery
- Greater palatine artery
- Superior labial artery
- Lateral nasal arteries

In addition to the rich blood supply, these arteries form **anastomoses** with each other. This is particularly prevalent in the anterior portion of the nose .

The veins of the nose tend to follow the arteries. They drain into the pterygoid plexus, facial vein or cavernous sinus.

In some individuals, a few nasal veins join with the **sagittal sinus** (a dural venous sinus). This represents a potential pathway by which infection can spread from the nose into the **cranial cavity**.



Innervation

The innervation of the nose can be functionally divided into **special** and **general** innervation.

Special sensory innervation refers to the ability of the nose to smell. This is carried out by the **olfactory nerves**.

The olfactory bulb, part of the brain, lies on the superior surface of the cribriform plate, above the nasal cavity.

Branches of the olfactory nerve run through the cribriform plate to provide special sensory innervation to the nose.

General sensory innervation to the septum and lateral walls is delivered by the **nasopalatine nerve** (branch of maxillary nerve) and the **nasociliary nerve** (branch of the ophthalmic nerve).

Innervation to the external skin of the nose is supplied by the **trigeminal nerve**.

Blood Supply has got the most clinical importance.

Bleeding from nose is called Epistaxis.

It is a common problem and 70% of adult males have had experience epistaxis (nose bleeding) over the age of 60 years,

it is also common in children.

Trauma , fracture, foreign body, nose picking are some of the most important cause of epistaxis.

The Nasal Septum is supplied by the following arteries:

1. Anterior Ethmoid
2. Posterior Ethmoid
3. Sphenopalatine
4. Greater palatine
5. Superior labial branch of facial artery.

The first two are the branch of internal Carotid artery and the last three are External carotid artery. These arteries form a plexus at the anteroinferior part of nasal septum. This is called **Little's area of epistaxis** or **Kiesselbach's Plexus**.

The branch of Sphenopalatine artery forms a plexus at the posterior part of the nasal septum called **Woodruff's Plexus**.

Anatomy of Paranasal Sinus

Para nasal air sinus:

These are air filled cavities, arranged in pairs. Paranasal air are sinuses grouped as—

Anterior group:

1. Maxillary sinuses.

2. Frontal sinuses.
3. Ant. group of ethmoidal sinuses.

Posterior group:

1. Posterior group of ethmoidal sinuses.
2. Sphenoidal sinuses.

The Maxillary sinus is rudimentary at birth and gradually expands.

The frontal sinus varies in size, divided by septum.

The Ethmoidal air sinuses are 8-15 in number. They are large at birth.

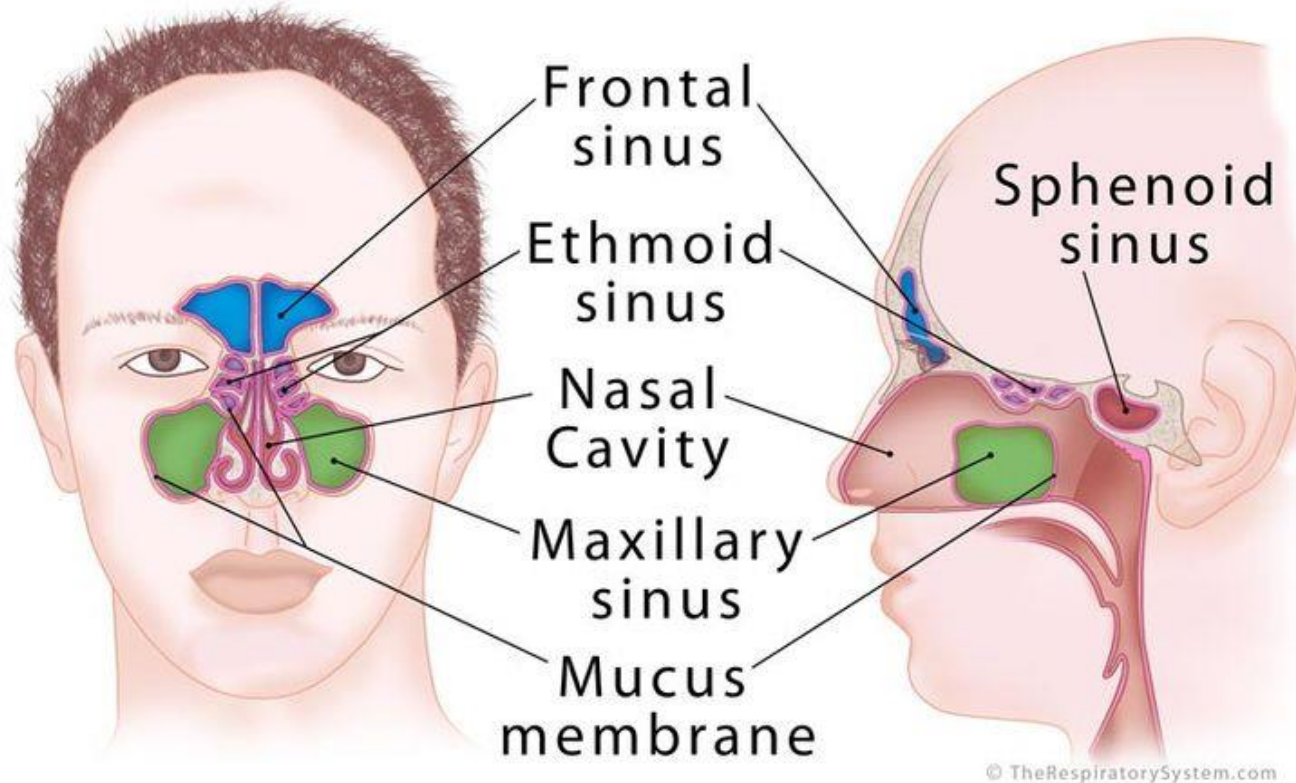
Frontal: Paired sinuses, lying anteriorly in frontal bone and draining into semilunar hiatus of middle meatus

Ethmoid: Paired anterior and middle draining into middle meatus (hiatus semilunaris and ethmoid bulla, respectively) and posterior draining into superior nasal meatus

Sphenoidal: Paired sinuses, in sphenoid bone, draining into sphenoidal recess

Maxillary: Paired sinuses, in maxilla, draining into middle meatus (semilunar hiatus); largest sinus (20–30 ml)

Paranasal Sinuses



Blood supply

Same to nasal cavity

Nerve Supply:

NERVES OF COMMON SENSATION

- Maxillary division of the trigeminal.
- Ophthalmic nerve through its lateral and medial internal nasal branches.

NERVES OF SPECIAL SENSATION

- Olfactory Nerve.

AUTONOMIC NERVE SUPPLY

- Sympathetic- Causes vasoconstriction and diminishes secretion.

- Parasympathetic-Produces vasodilatation and increase secretion.

Nasal Conchae

Projecting out of the lateral walls of the nasal cavity are curved shelves of bone. They are called **conchae** (or turbinates).

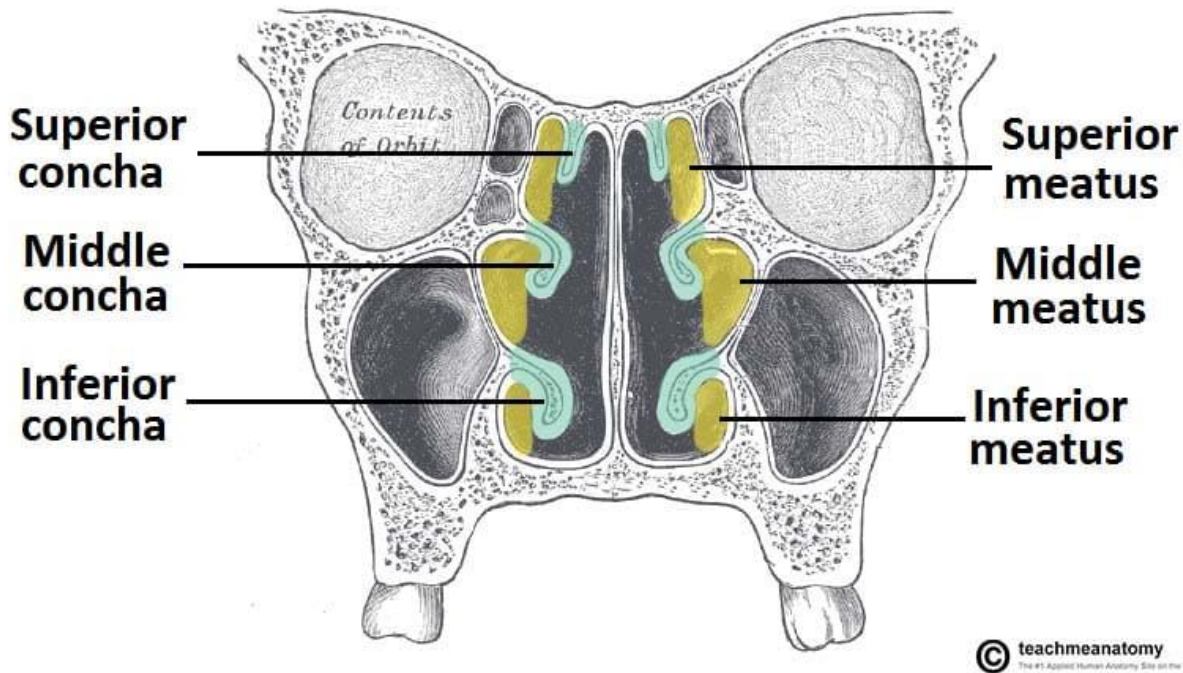
There are three conchae – inferior, middle and superior.

They **project** into the nasal cavity, creating four pathways for the air to flow. These pathways are called meatuses:

- **Inferior meatus** – between the inferior concha and floor of the nasal cavity.
- **Middle meatus** – between the inferior and middle concha.
- **Superior meatus** – between the middle and superior concha.
- **Spheno-ethmoidal recess** – superiorly and posteriorly to the superior concha.

The function of the conchae is to increase the **surface area** of the nasal cavity – this increases the amount of inspired air that can come into contact with the cavity walls.

They also disrupt the fast, laminar flow of the air, making it slow and turbulent. The air spends longer in the nasal cavity, so that it can be humidified.



Openings into the Nasal Cavity

One of the functions of the nose is to **drain** a variety of structures. Thus, there are many openings into the nasal cavity, by which drainage occurs.

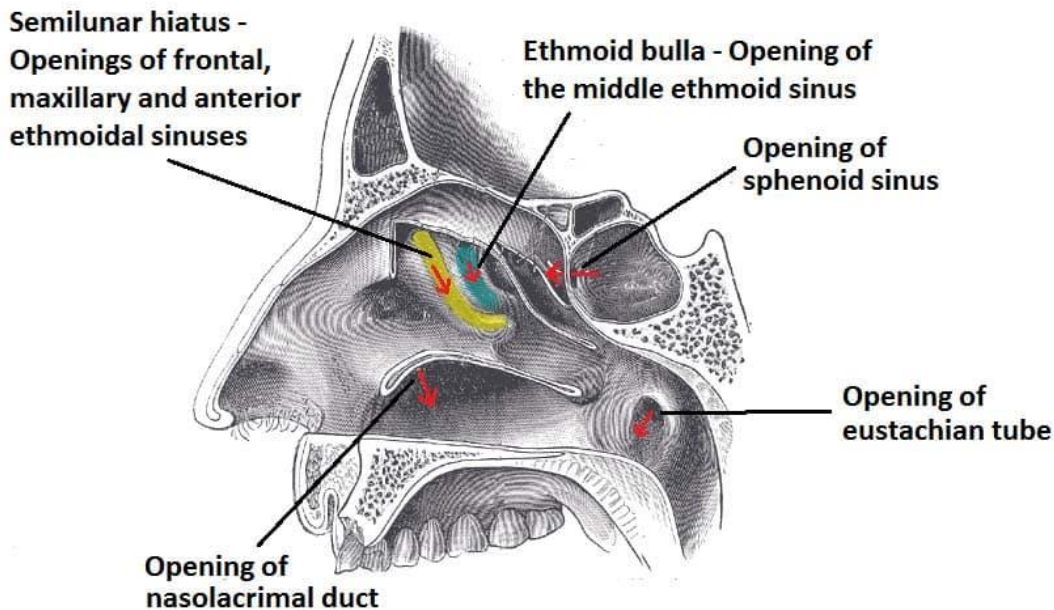
The paranasal sinuses drain into the nasal cavity. The frontal, maxillary and anterior ethmoidal sinuses open into the middle meatus. The location of this opening is marked by the semilunar hiatus, a crescent-shaped groove on the lateral walls of the nasal cavity.

The middle ethmoidal sinuses empty out onto a structure called the **ethmoidal bulla**. This is a bulge in the lateral wall formed by the middle ethmoidal sinus itself. The posterior ethmoidal sinuses open out at the level of the superior meatus.

The only structure not to empty out onto the lateral walls of the nasal cavity is the **sphenoid sinus**. It drains onto the posterior roof.

In addition to the paranasal sinuses, other structures open into the nasal cavity:

- **Nasolacrimal duct** – acts to drain tears from the eye. It opens into the inferior meatus.
- **Auditory (Eustachian) tube** – opens into the nasopharynx at the level of the inferior meatus. It allows the middle ear to equalise with the atmospheric air pressure.



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The cribriform plate is part of the ethmoid bone. It forms a portion of the roof of the nasal cavity. It contains very small perforations, allowing fibres of the olfactory nerve to enter and exit,

The incisive canal is a pathway between the nasal cavity and the incisive fossa of the oral cavity. It transmits the nasopalatine nerve and greater palatine artery.

Function of Paranasal Sinus:

Functions of the sinuses are uncertain. But there are some theories.

1. Result of facial development.
2. Air conditioning.
3. Lightening of skull.
4. Resonance of voice.
5. Humidification of inspired air.
6. Protection of eye from trauma.

Where are my paranasal sinuses located?

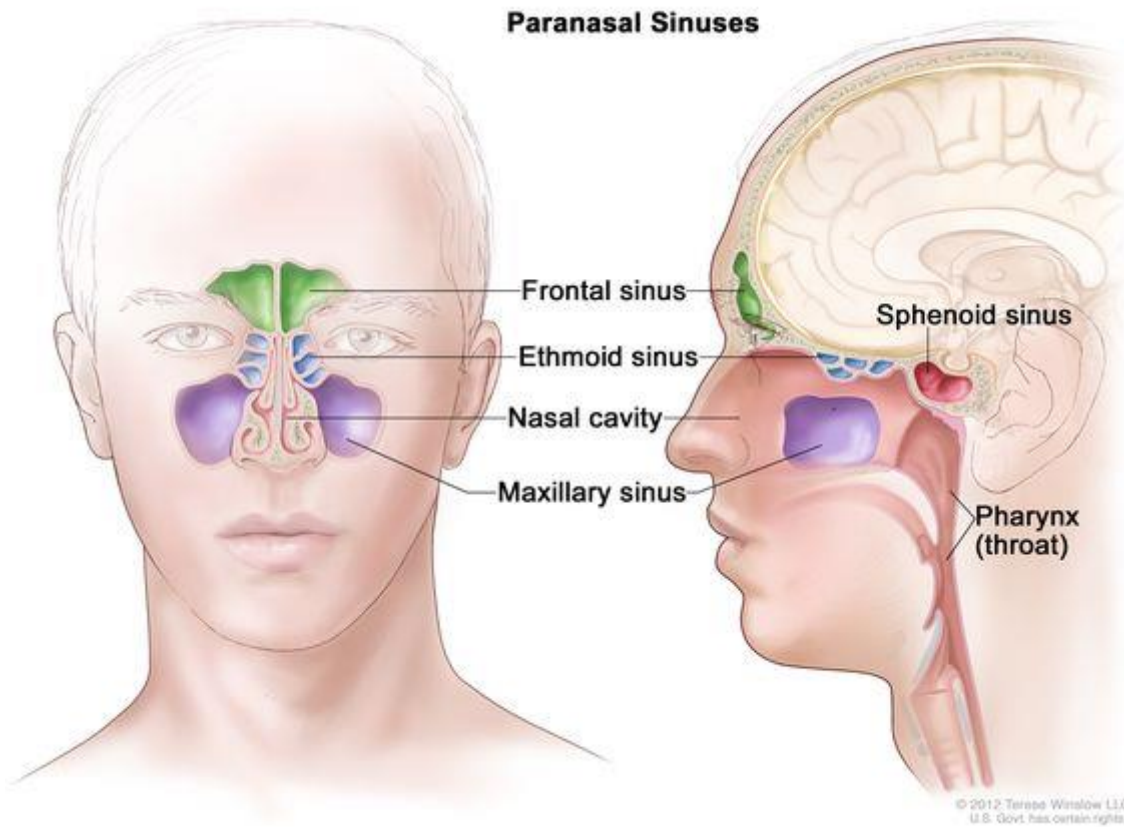
There are four paranasal sinus cavities.

They're paired, so we have one on the left side of our face and one on the right side. Each is named after the facial bone where it's located. Together, they form a mucus drainage system that empties into nasal cavity, the air-filled space behind the nose.

From top to bottom, the paranasal sinuses include:

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- **Frontal sinus**: the frontal sinuses are in the frontal bone (forehead area), above the eyebrows. They're triangle-shaped but rarely symmetrical.
- The average frontal sinus in an adult is big enough to hold about 4 to 7 milliliters (mL) of air.
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- **Sphenoid sinus**: the sphenoid sinuses are inside the sphenoid bone, behind the [eyes](#). Of all the sinuses, it's the one deepest inside the head. They vary greatly in size depending on age, sex and ethnicity.
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- **Ethmoid sinus**: the ethmoid sinuses are between the eyes, behind the bridge of the nose.
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- Unlike other sinuses, each ethmoid sinus cavity consists of many tiny cavities (or pockets) called air cells. ethmoid sinuses hold between 2 to 3 mL of air.
-
- **Maxillary sinus**: the maxillary sinuses are in the maxillary bone, the bone that makes up the upper jaw.
- They're symmetrical, pyramid-like cavities, located beneath eyes, on either side of the nose.
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- the maxillary sinuses are the largest paranasal sinuses and the most common site for a sinus infection to start. They hold between 15 to 20 mL of air.



1 Radiographic features

Plain radiograph

MRI

Normal mucosa of the paranasal sinuses appear hyperintense on T2-weighted images ⁴.

