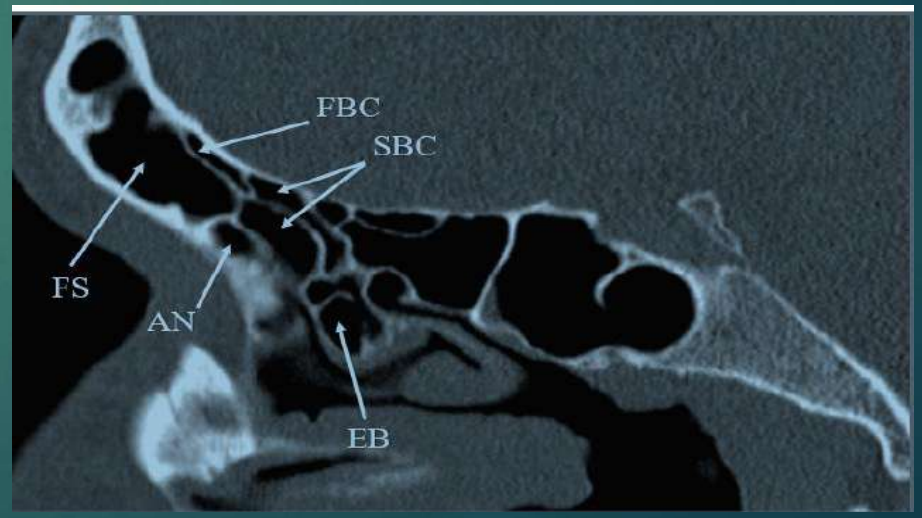
SURGICAL ANATAMIC OF PARANASAL SINUSES

DR. SEEMA MONGA

ASSOCIATE PROFESSOR

DEPARTMENT OF ENT-HNS

HIMSR



MIDDLE TURBINATE

1. **Anterior attachment :** vertically oriented, sup to the lateral border of cribriform plate.
2. **Second attachment :**Obliquely oriented- basal lamella/ ground lamella, Attached to the lamina papyracea (medial wall of orbit anterior, posterior air cells, sphenopala- tine foramen
3. **Posterior attachment** :medial wall of maxillary sinus, horizontally oriented.

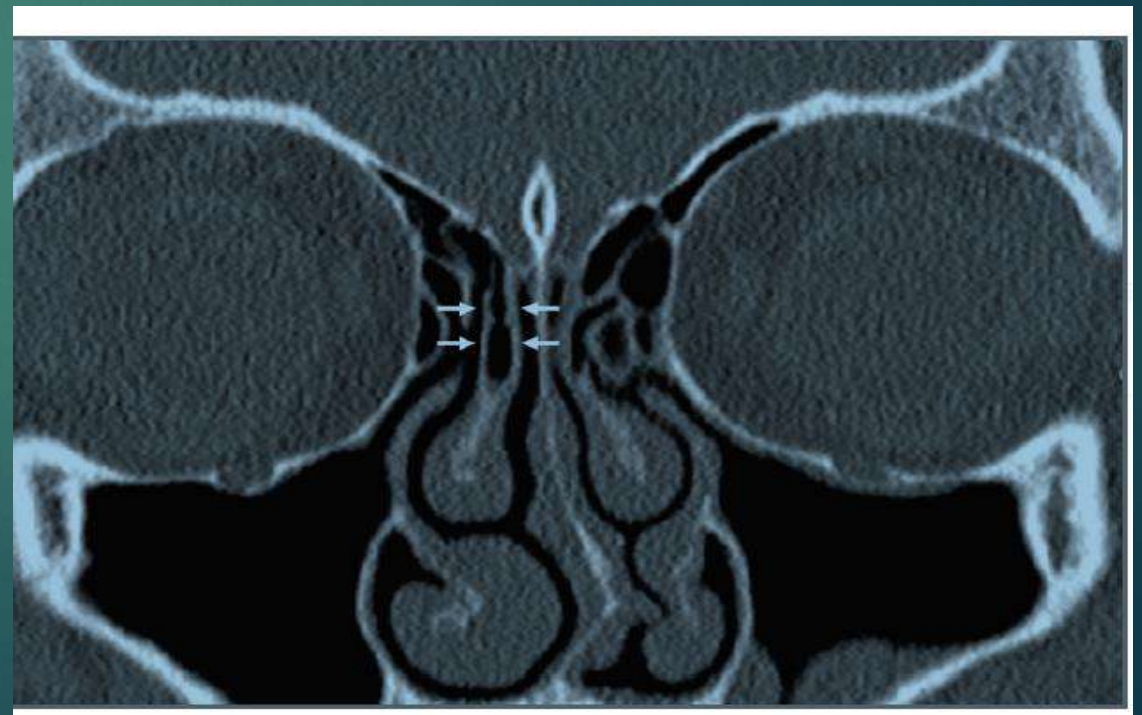
, supreme turbinate

3. Occasionally
4. fourth turbinate,
5. supreme meatus, if present
6. drains posterior ethmoid drains

- inferior, middle, superior turbinates and, occasionally, the supreme turbinate, the fourth turbinate.
- e. Lateral to these turbinates are the corresponding meatuses
- divided per their drainage systems

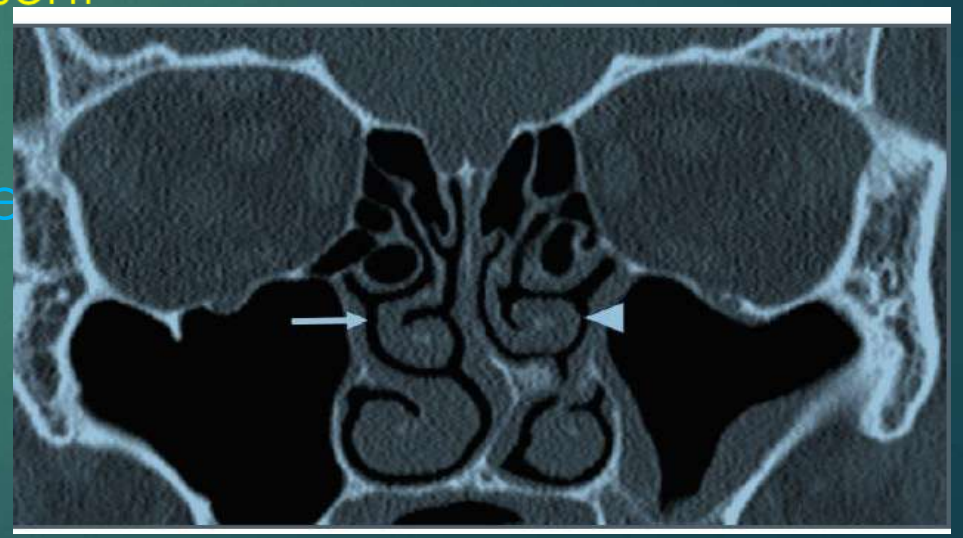
ANATOMICAL VARIATIONS OF THE TURBINATES

1. Concha bullosa, 24–55%, often bilateral,
2. Interlamellar cell of grunwald: pneumatization is limited to the vertical part of middle turbinate, usually not causing narrowing of the ostiomeatal unit



. **Paradoxic middle turbinate: 26%,.**
Occasionally, it can affect the patency of the ostiomeatal unit
4. **Pneumatized basal lamella**, falsely considered, posterior ethmoid air cell

3. , if present



Missed basal lamella – attaches to late

Ostiomeatal unit

Anterior ostiomeatal unit,

maxillary,

anterior ethmoid,

frontal sinuses,

(1) ethmoid infundibulum,

(2) middle meatus,

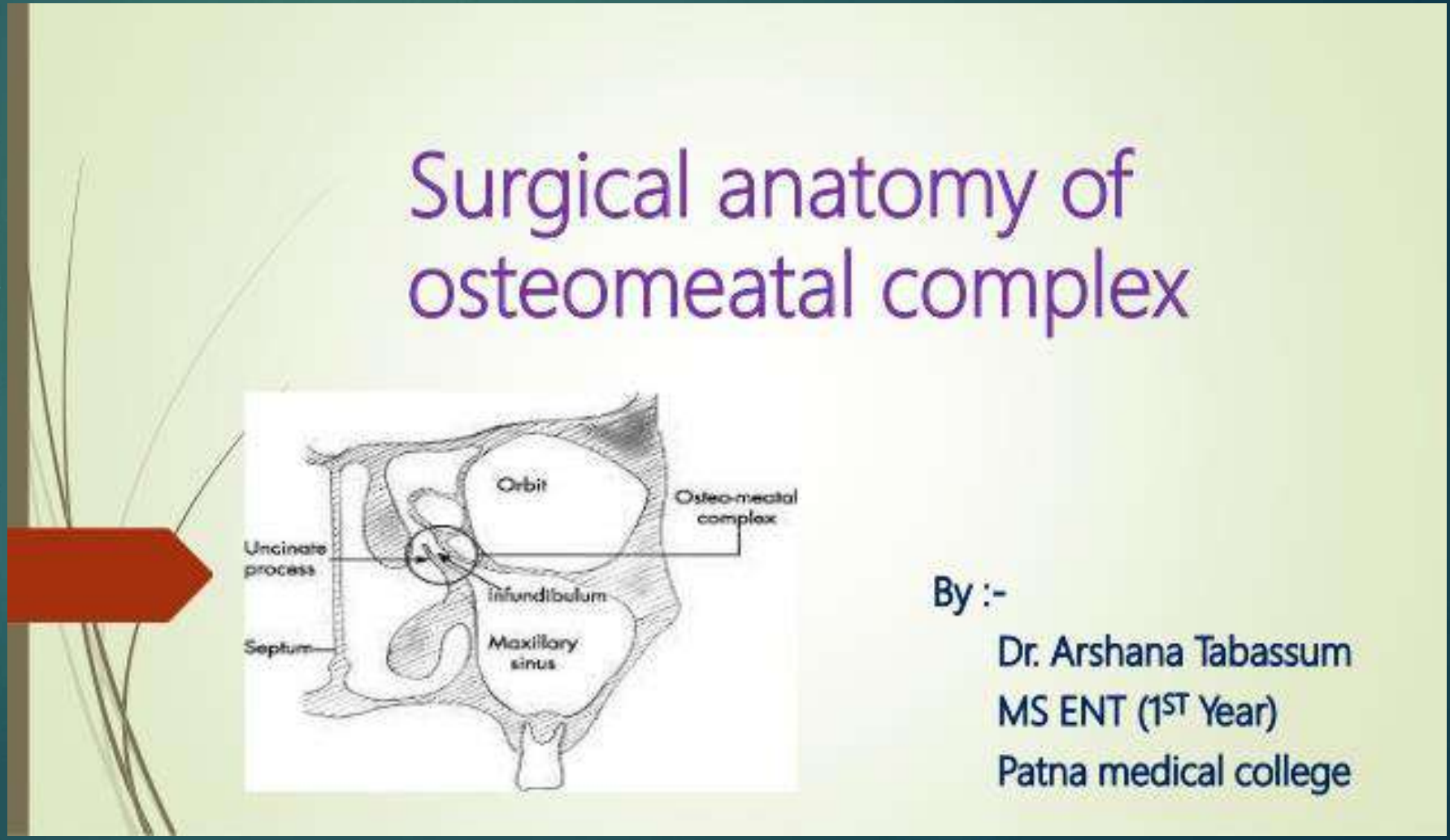
(3) hiatus semilunaris,

(4) maxillaryOstium,

(5) ethmoid bulla,

(6) frontal recess,

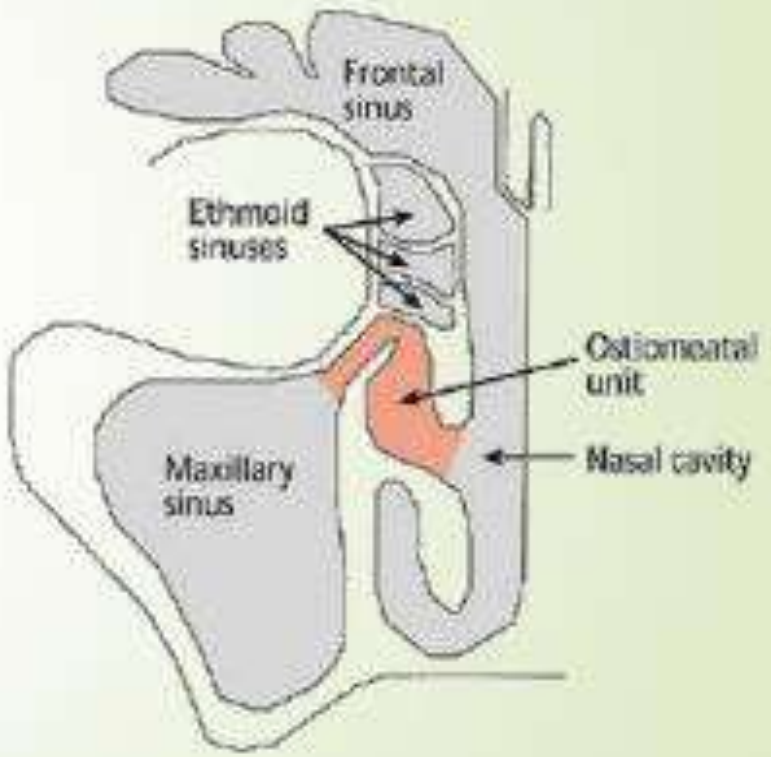
(7) uncinate process.

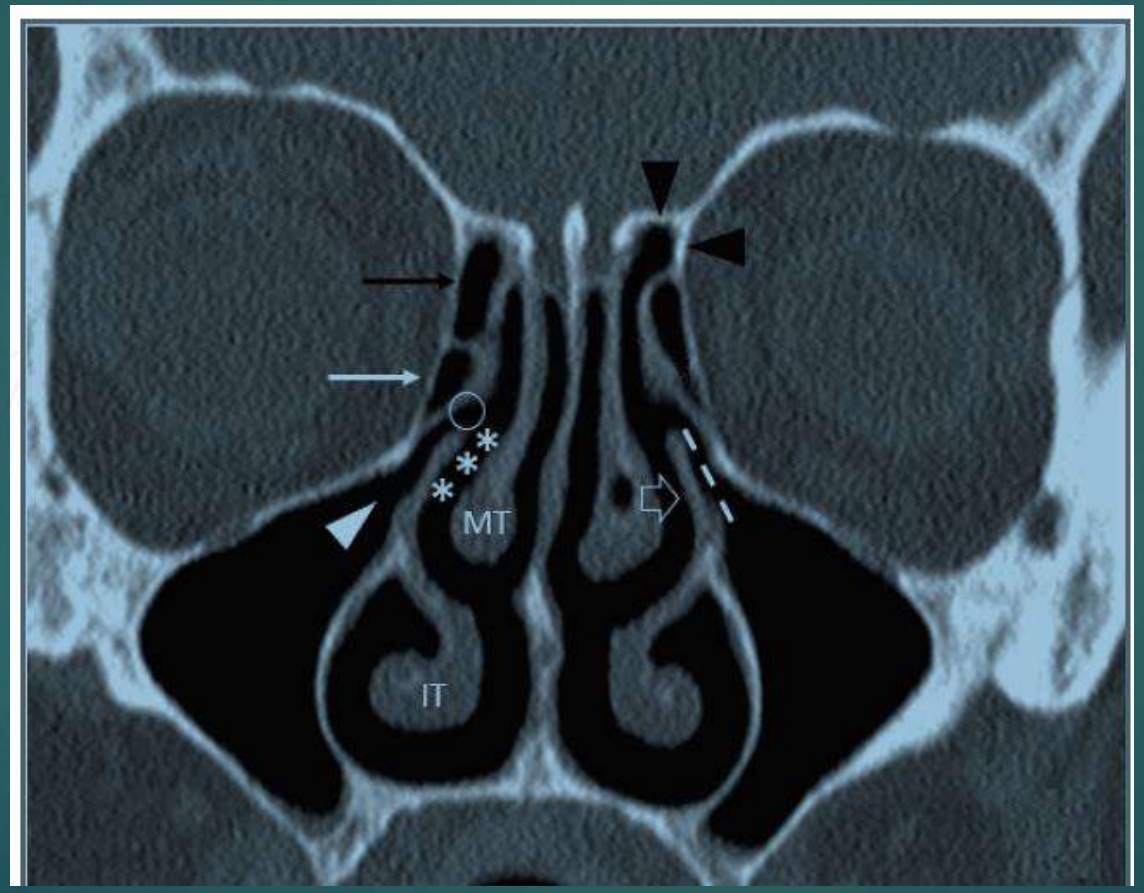


Osteomeatal complex

- Also known as ***ostiomeatal unit***
  or **key area**
  or ***critical area***

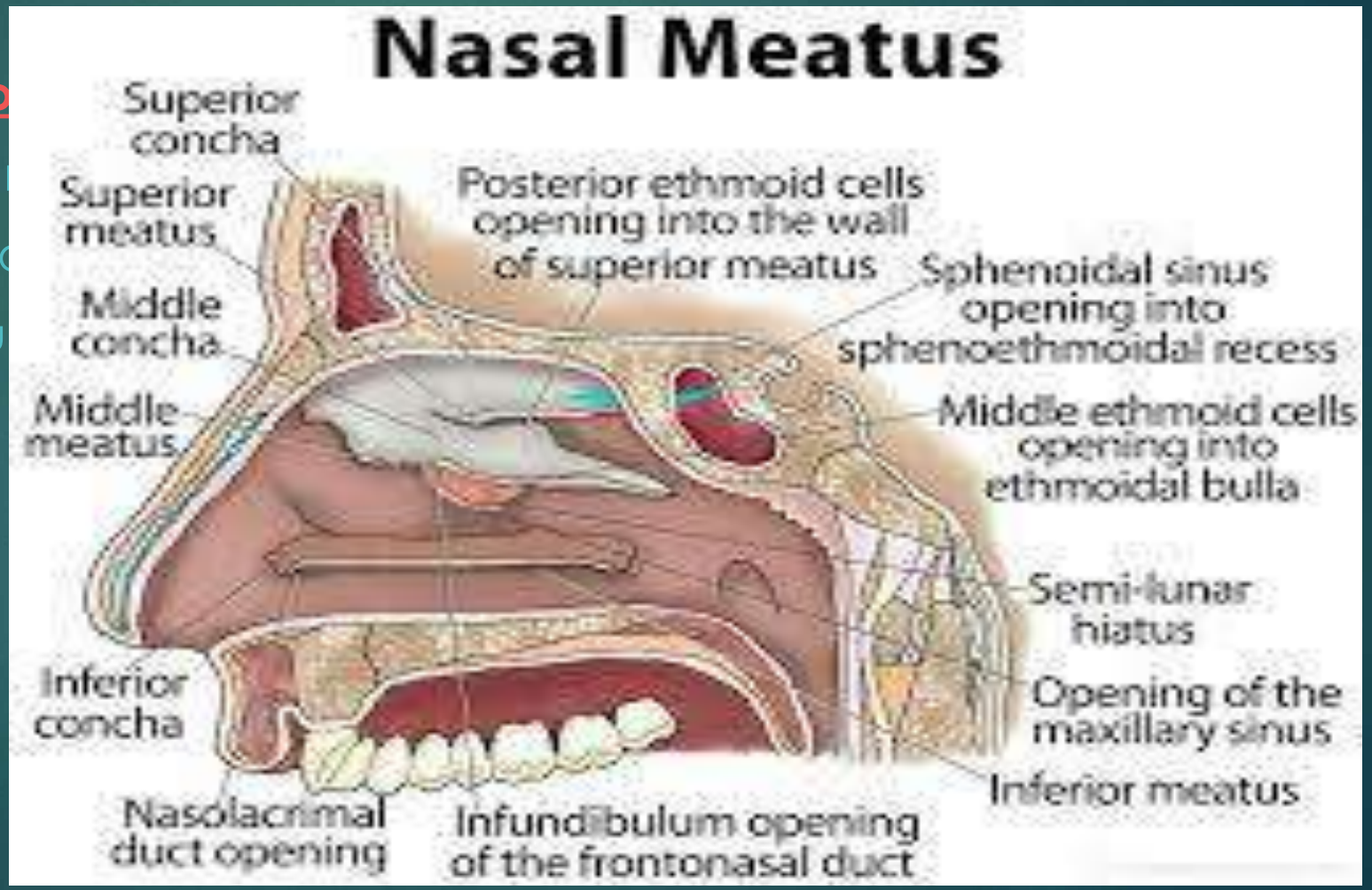
- It is final common pathway for drainage and ventilation of ethmoid, maxillary and frontal sinuses.




MT
IT

, sphenoethmoidal recess

- Other draining o
- posterior in the
- posterior ethmo
- lateral to the su
- . sphenoid Sinus



Uncinate Process

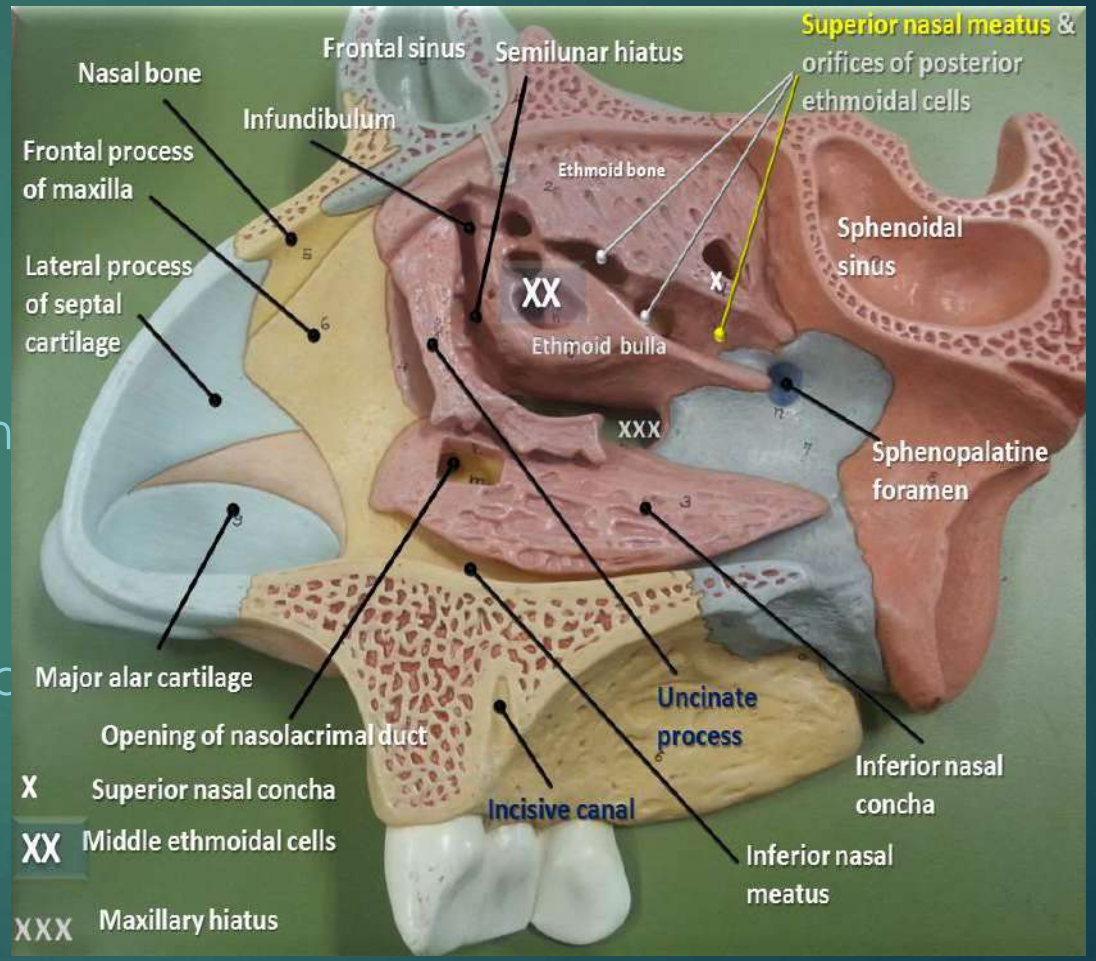
Crescent-shaped, **thin individual bone**

inferiorly- ethmoidal process of inferior turbin

anterior, lacrimal bone,

posteriorly- hiatus Semilunaris,

medial -ethmoid infundibulum, laterally, mic



superior attachment- variability, direct effect on frontal sinus drainage pathway.
Three patterns of attachment

1.Attachment to the lamina papyracea:

Most common site, **50%,**

frontal sinus drains- middle meatus,

lateral blind pouch b/w uncinate and the lamina papyracea, **terminal recess, recessus terminalis**

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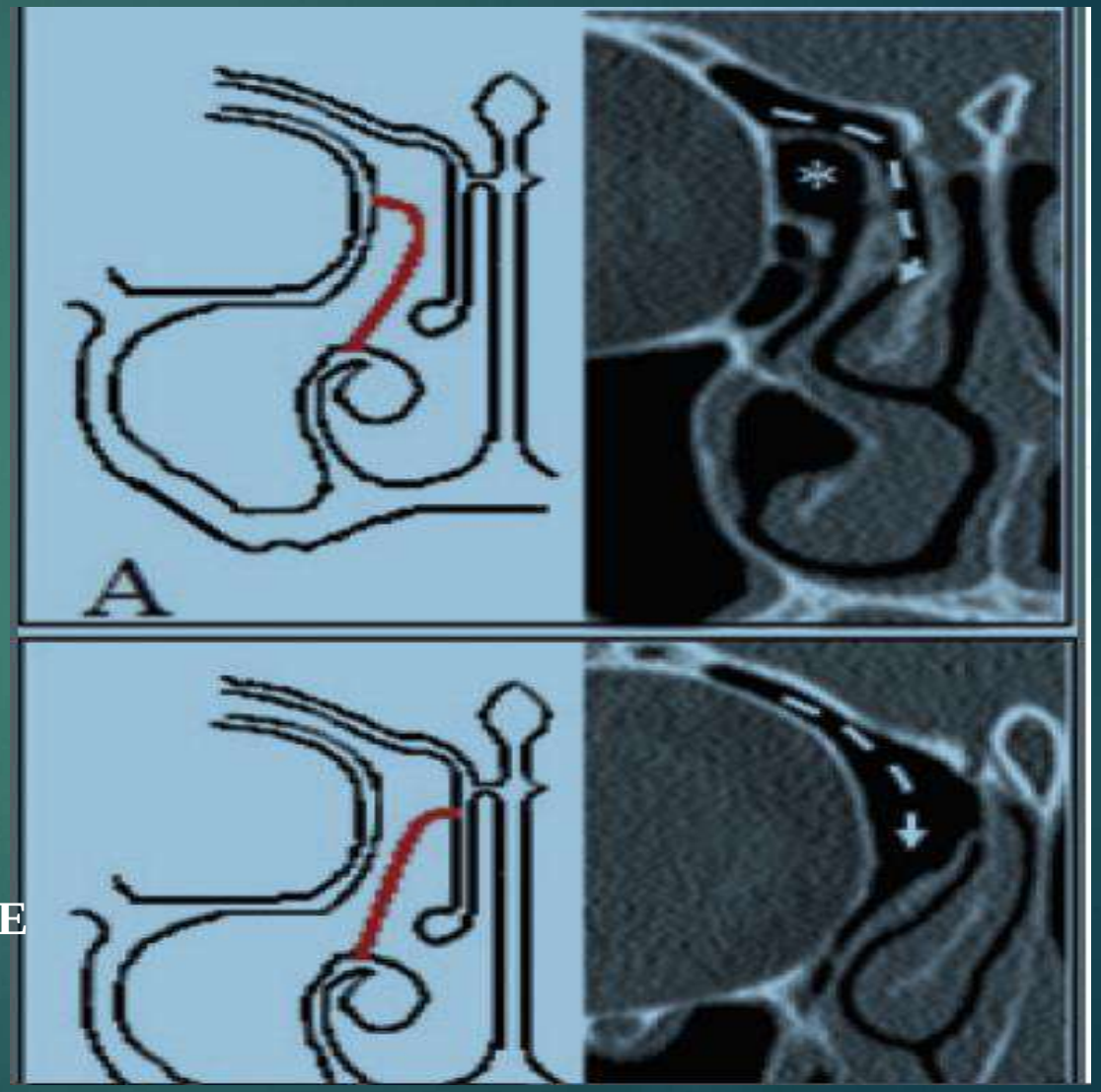
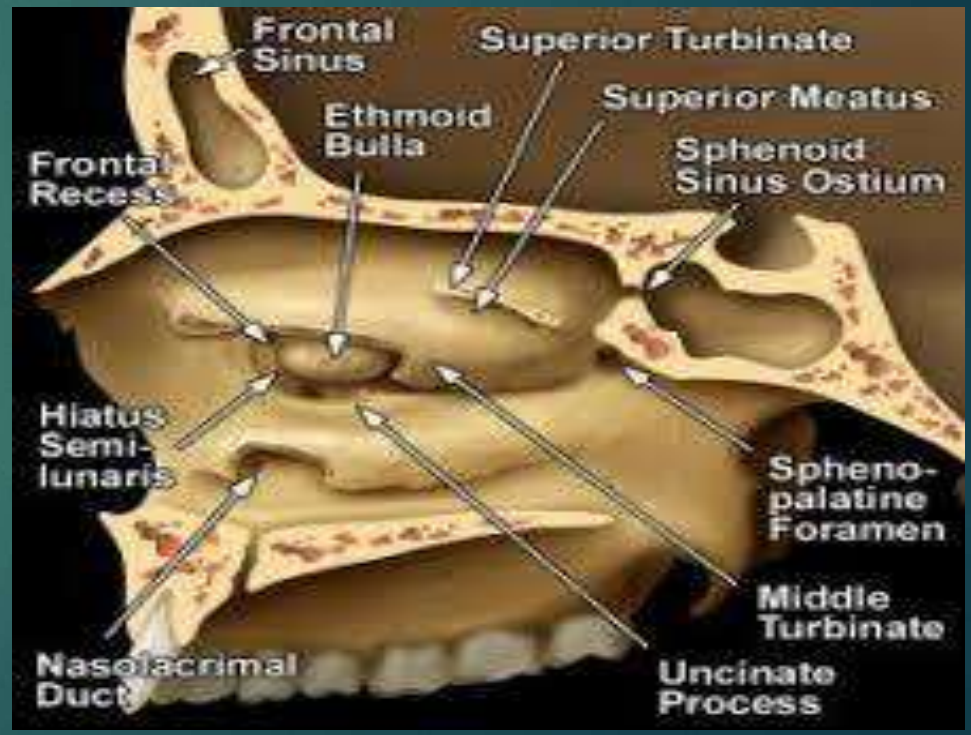
ATTACHMENT TO THE MIDDLE TURBINATE

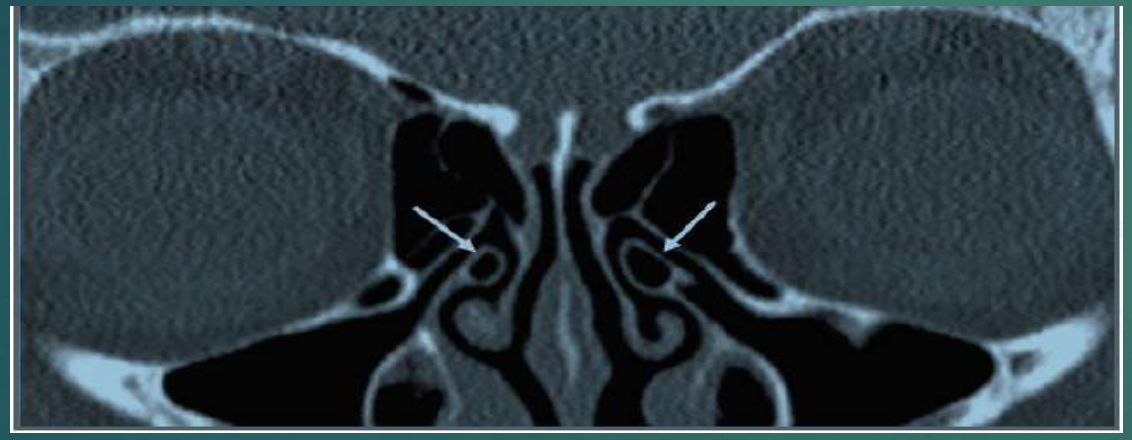


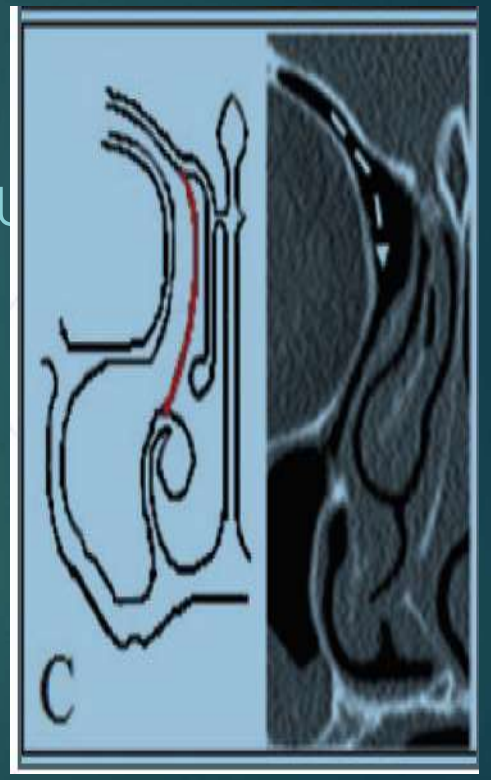
Frontal sinus drains, ethmoid infundibulum



ATTACHMENT TO THE SKULL BASE:

LEAST OFTEN, SUPERIORLY TO THE SKULL BASE, ETHMOID INFUNDIBU





ANATOMICAL VARIATIONS OF UNCINATE PROCESS

Pneumatized uncinate process (uncinate bulla, 0.4%, if it large enough, affect the patency

ATELECTATIC UNCINATE PROCESS

ADHERENT TO THE INFEROMEDIAL WALL ORBIT, MAXILLARY SINUS HYPOPLASIA, SILENT SINUS SYNDROME, RISK OF VIOLATION OF THE ORBITS

HORIZONTAL UNCINATE PROCESS: LARGE ETHMOID BULLA.

HIATUS SEMILUNARIS AND ETHMOID INFUNDIBULUM

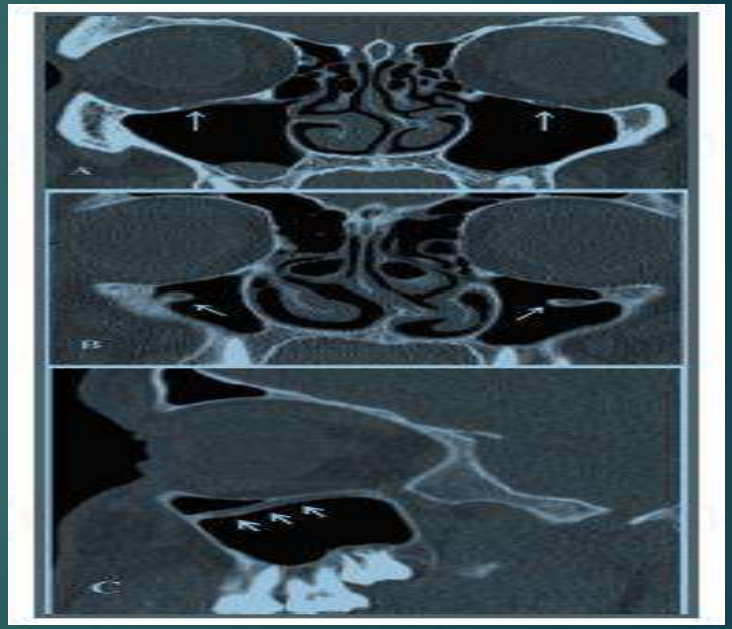
Space anterior wall of ethmoid bulla, free edge of uncinate process, opens anterosuperiorly, cavity, ethmoid

Infundibulum, drainage from the ethmoid bulla, maxillary sinus, frontal sinus,

OLFACTORY FOSSA

Olfactory bulbs, blood vessels, inferiorly the cribriform , medially the crista galli, literally, thinnest bone in the anterior skull base, lateral lamella of the cribriform plate.

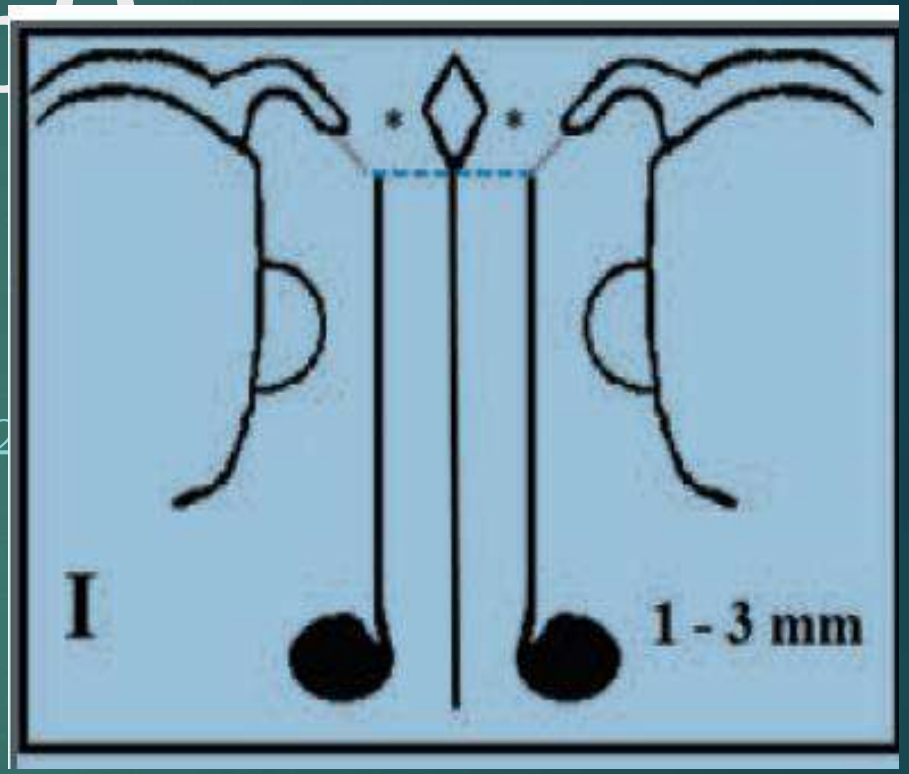
Superiorly communicates with the anterior cranial



KEROS IN 1960

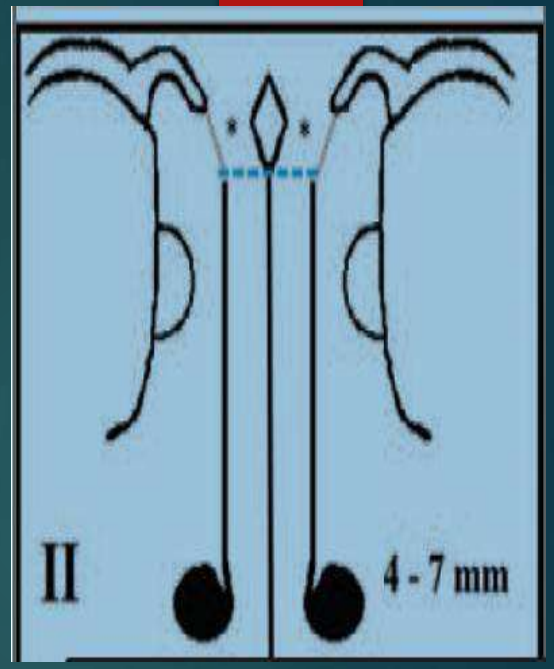
Depth of olfactory fossa,

Type 1: lateral lamella is 1–3 mm, shallow olfactory, 12

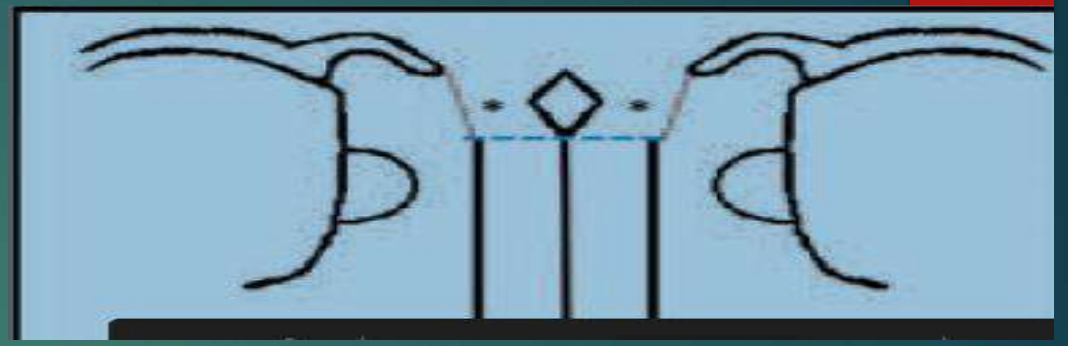


Type 2:

Lateral lamella is 4–7, moderately deep olfactory, 70%



Type 3:



Lateral lamella, 8-16, deep olfactory fossa, 18%

BOTH TYPE 1 AND TYPE 3 OLFACTORY, INCREASED RISK FOR INJURY,

Type 1 the angle between the medial and lateral lamellae, plate is greater, type 3 of the olfactory fossa is lower.

Maxillary Sinus

Pyramidal base facing medially,

Medial wall of the maxilla , large bony defect, "the fontanelle,"

Uncinate process, divided it into a small anterior fontanelle, larger posterior fontanelle, premolar teeth to the

Third molar, volume 15–22 ml, hyperpneumatized sinus, apices of the molars, premolars, separated by a thin

Bone from even project into the sinus, occasionally, very thin or even absent, extraction, risky, fistula, posterior to the maxillary sinus, infratemporal fossa laterally, pterygopalatine

Fossa medially

Infraorbital Nerve

Branch, maxillary division “V2” of the trigeminal nerve, roof of maxillary sinus, bony canal, infraorbital foramen, 1 cm, infraorbital rim, inferior wall of the infraorbital canal can be extremely thin, average thickness,0.2 mm, completely dehiscent, 12 and 16% of, abnormally

Protruded within

Maxillary sinus natural ostium

Opens at the posterior end of the hiatus semilunaris, below the ethmoid bulla, 2-4 mm, can be as wide as 10 mm,

Ethmoid Sinus

Ethmoid bone, crista, cribriform, perpendicular

Plate, two ethmoidal labyrinths, ethmoid air cells, anterior and

Posterior ethmoid, anterior ethmoid contains, posterior ethmoid air cells are larger, 3–7 air cells in the anterior ethmoid sinus, 2–4 in the posterior ethmoid, anterior ethmoid air cells drain into

The middle meatus, posterior ones drain into the superior meatus.

Ethmoid Bulla

Largest air cell of anterior ethmoid, extends from the lamina

Papyracea laterally and bulges medially into the middle meatus, ostium, upper margin of the posterior wall, drains into the middle

Meatus, 8% underdeveloped, rare, non-pneumatized, bony projection, torus lateralis,

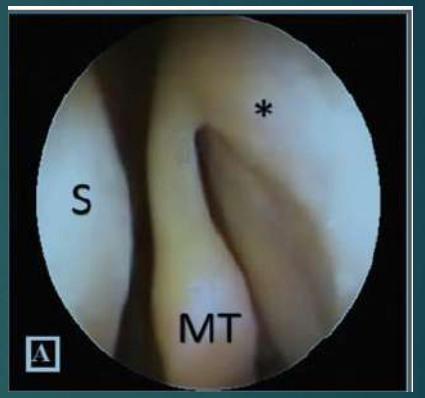
Anterior ethmoidal artery

Critical structures, branching from the ophthalmic artery within the orbit, upper, lamina, roof of anterior ethmoid sinus, bony canal (approximately 2–3 mm behind the face of the ethmoid bulla, pierces the lateral lamella, enter the olfactory fossa, descends into nasal cavity through a slit on the side

Of the crista galli, foramen in the lamina, about 24 mm posterior

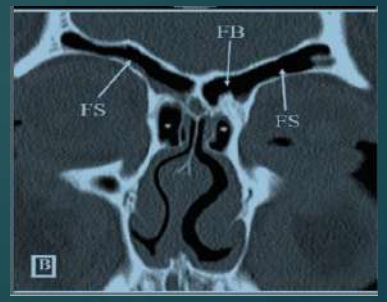
To the anterior lacrimal crest, might be dehiscent or totally absent.

Anatomical variations of the ethmoid sinus



AGGER NASI CELL, MOST ANTERIOR ETHMOID AIR CELLS., PROMINENCE ANTERIOR TO THE VERTICAL (ANTERIOR) ATTACHMENT OF MIDDLE TURBINATE

93%, DIRECT EFFECT ON THE DRAINAGE, FRONTAL SINUS



Suprabullar recess and retrobullar recess

- When the upper border of the ethmoid bulla is
- not reaching the skull base, the space between them suprabullar
- Recess, posterior wall, basal lamella, posteriorly, this space is called "retrobullar recess"

SUPRABULLAR CELL

ETHMOID AIR CELL LIES ABOVE THE ETHMOID BULLA, SO, THE ANTERIOR BORDER OF THE SUPRABULLAR

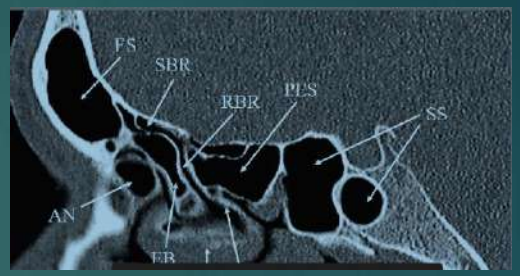
CELL IS MADE BY THE FRONTAL RECESS.

Supraorbital cell:

Lateral extension of pneumatization from the suprabullar recess into the orbital plate of frontal bone over the orbit, 15%, if it is large it can displace the

Anterior ethmoidal artery posteriorly, can be mistaken as the frontal sinus

Sphenoethmoidal cell (Onodi’s cell

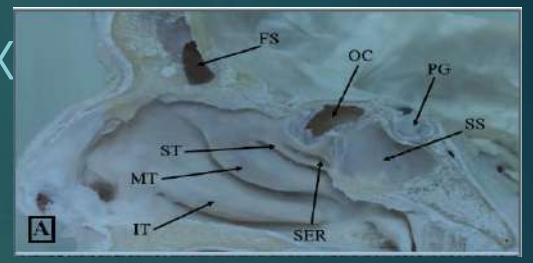


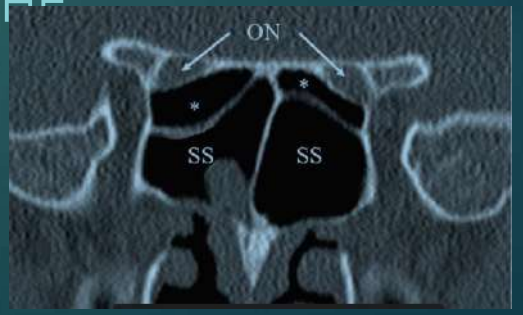
POSTERIOR ETHMOID AIR, PNEUMATIZED FURTHER POSTERIORLY, EX
SUPERIORLY LATERALLY TO SPHENOID SINUS.

3.4 TO 14%,, CLOSELY RELATED TO THE OPTIC

NERVE ON ITS SUPEROLATERAL WALL, EVEN BE ENGULFED WITHIN THE
AIR,

,

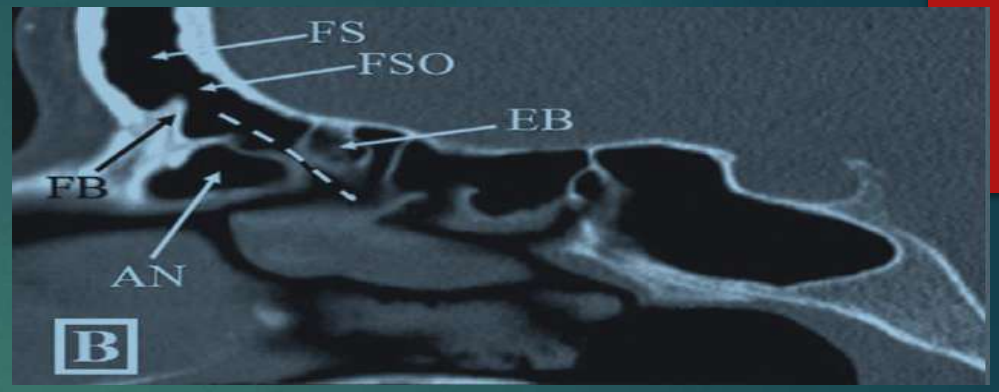




Pneumatized Crista Galli:

13%, RARELY CAN OBSTRUCT THE FRONTAL OSTIUM

Frontal sinus



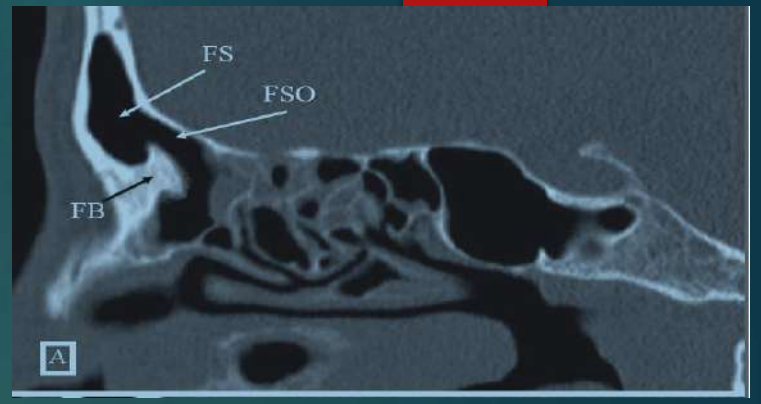
Squamous part of the frontal bone., Bony septum, each sinus (right and left) develops independently, asymmetrically pneumatized. Outer and inner frontal, inner table is a relative thin bony, frontal sinus from the anterior cranial

Fossa posteriorly, outer table is a considerable thick bony wall, on the posterior wall (inner table) of the sinus, venous drainage channels called

“Foramina of breschet, spreading the infection, mucosal

Invagination, mucocele. Floor, anterior roof of the orbit.

Frontal ostium and frontal recess (frontal sinus drainage pathway



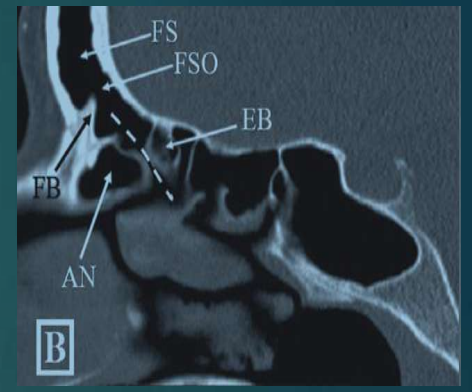
Drainage pathway hour- glass shape, narrowest point of this pathway, frontal beak, represents the frontal sinus ostium, superior to the frontal beak is frontal sinus, inferior to the

Beak is frontal recess, inverted funnel, apex, boundaries of frontal recess, as follows, anterior and inferior

Side, the posterior wall of agger nasi cell; from the posterior side, the face of ethmoid bulla, lateral boundary, lamina papyracea, side formed by lateral wall, olfactory fossa, upper portion of middle turbinate, superiorly, fovea ethmoidalis.

Depending on the superior attachment of the uncinate process, frontal sinus drainage

Pathway drains into the middle meatus, ethmoid infundibulum



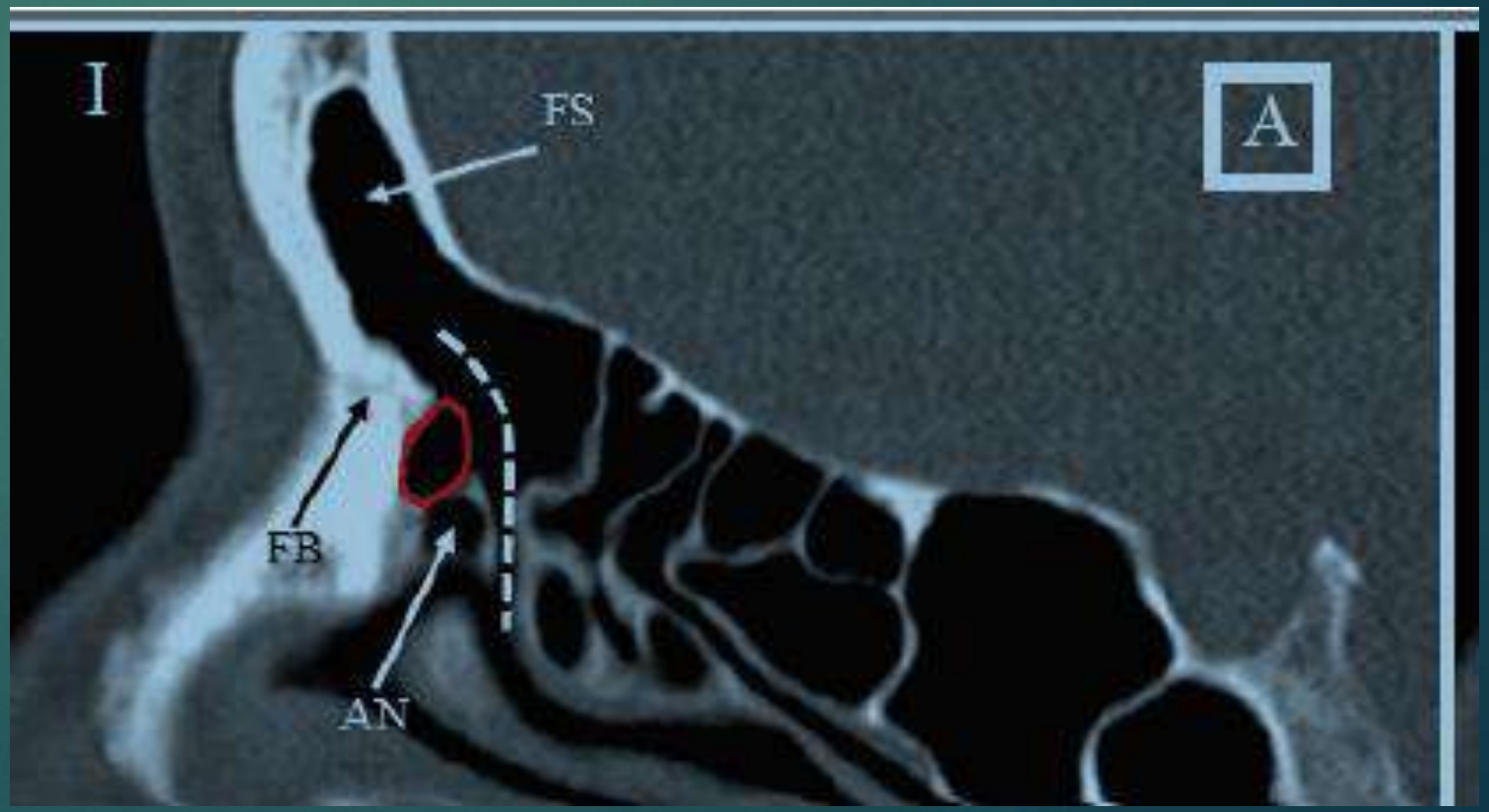
Anatomical variations of frontal sinus

FRONTAL SINUS APLASIA, (TOTALLY ABSENT) 5%, HYPOPLASTIC, 4%

Frontoethmoidal cells (Frontal cells

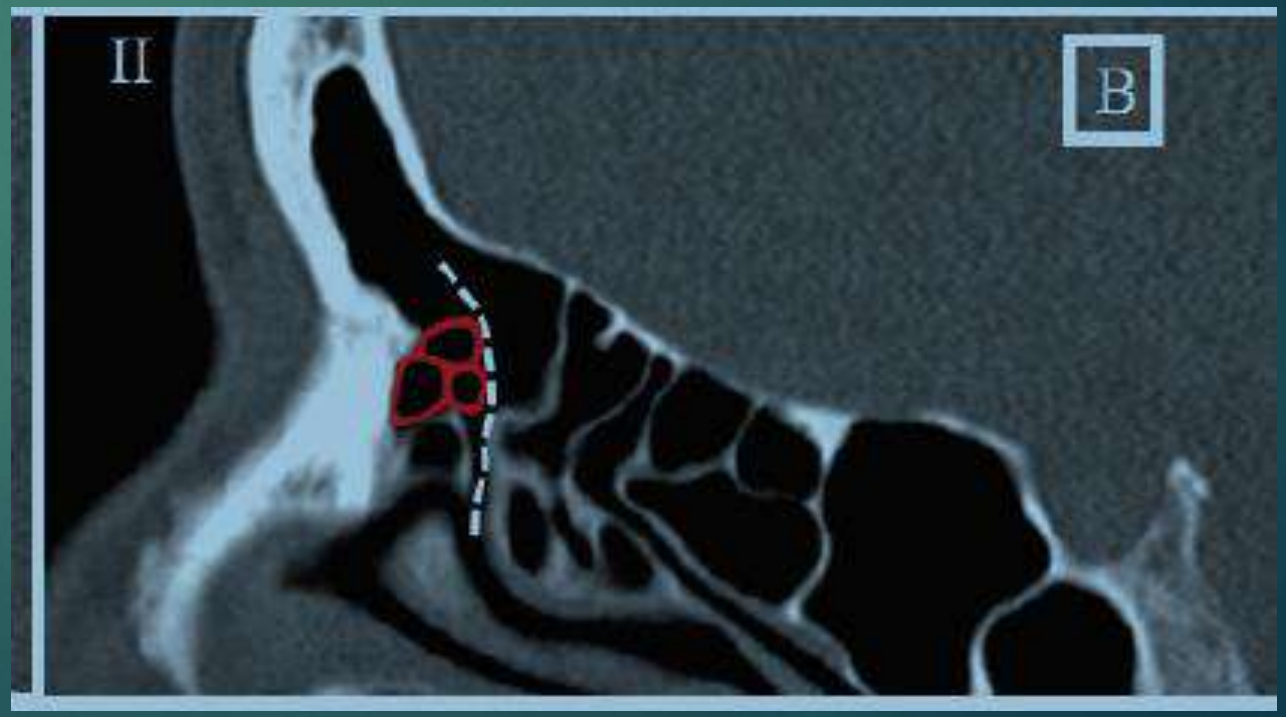
FIRST DESCRIBED BY KUHN, WORMALD MODIFIED

Type 1: frontal cell: single frontal recess cell (above agger nasi cell below the frontal ostium



TYPE-2

TWO OR MORE CELLS IN FRONTAL RECESS (ABOVE AGGER NASI CELL A BELOW THE FRONTAL OSTIUM)

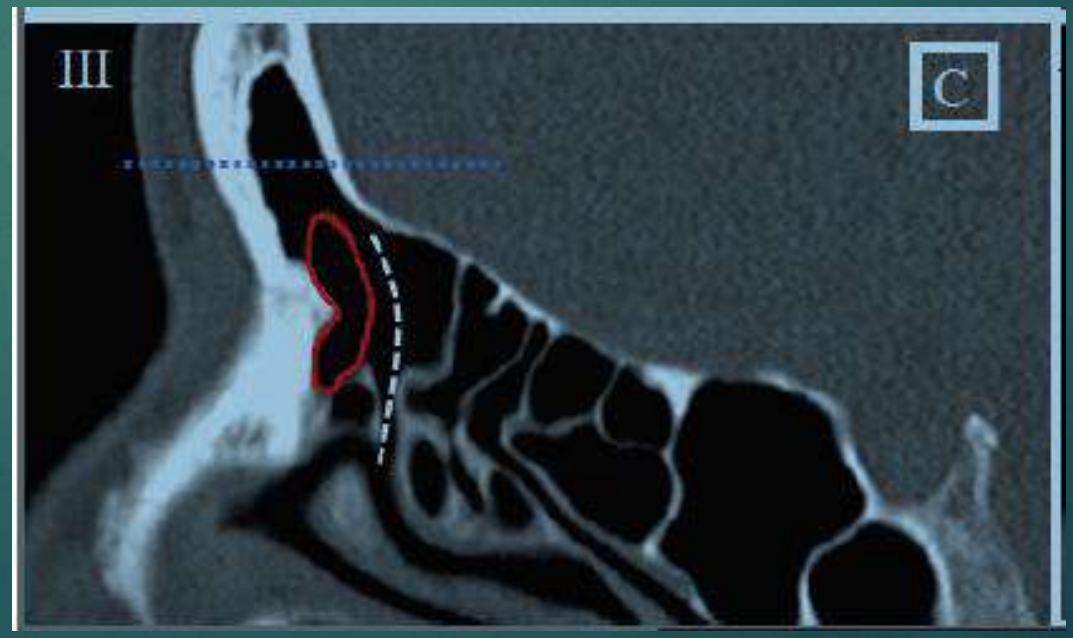


TYPE-3

Single cell above the agger nasi with extension into the frontal

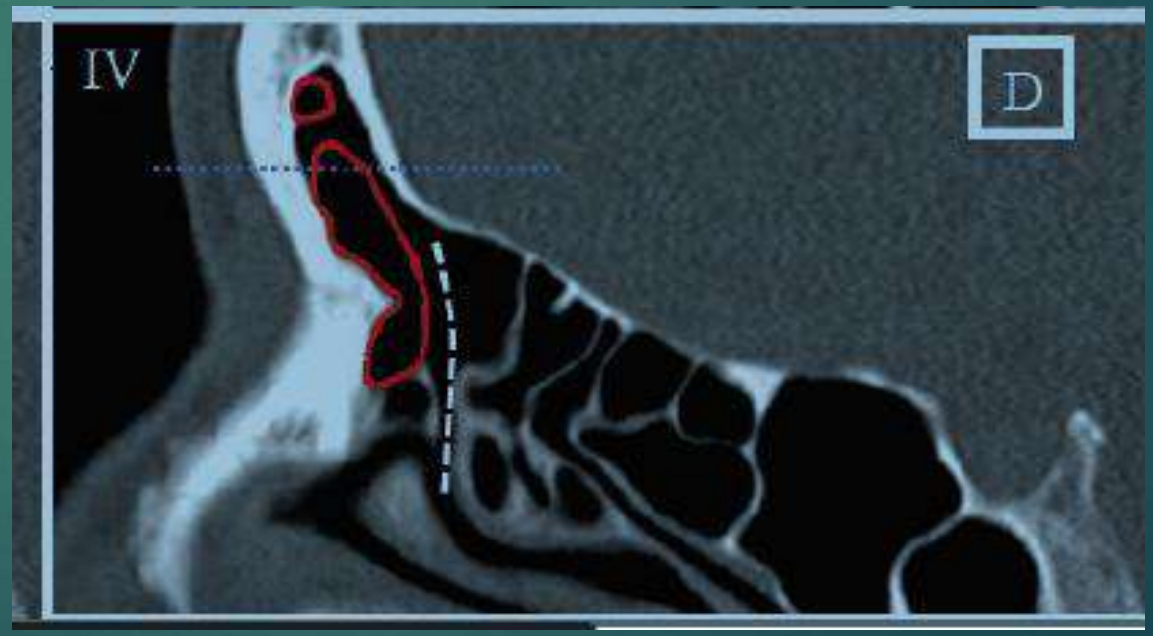
Sinus through the frontal ostium but not exceeding 50% of the vertical height of the

Ipsilateral frontal sinus

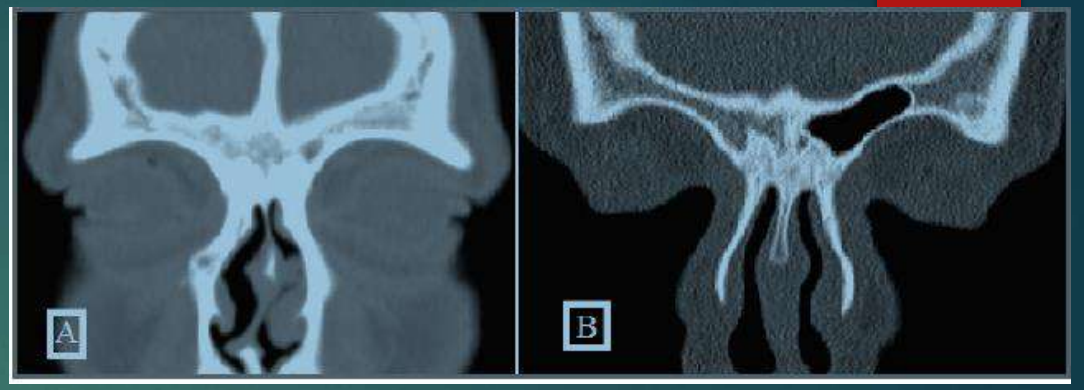


TYPE-4

EITHER SINGLE CELL ABOVE THE AGGER NASI EXTENSION INTO THE FRONTAL SINUS



Frontal bullar cell:

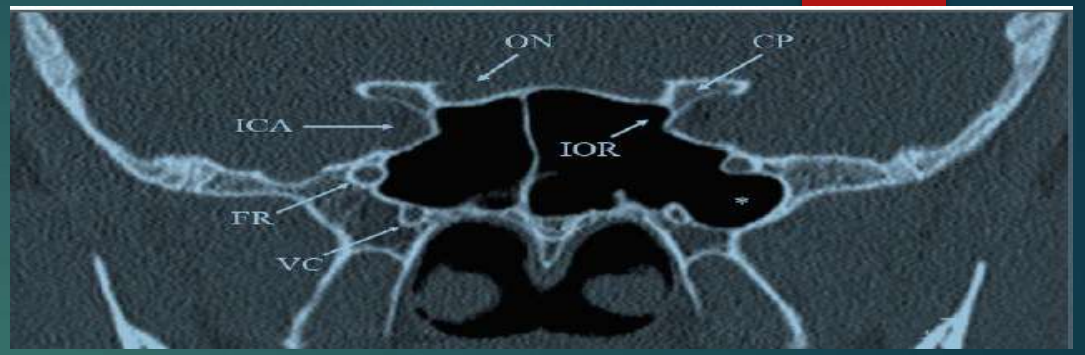


Extends from the suprabullar region along the posterior wall

Of frontal recess and extends into the frontal sinus, superiorly. Differentiates the suprabullar cell, does not extend into the frontal sinus, posterior wall, related to anterior cranial fossa, anterior wall, Frontal sinus, caution opening, trauma to anterior skull base. Intersinus septum is pneumatized, might compromise the frontal sinus ostium

Patency

Sphenoid sinus



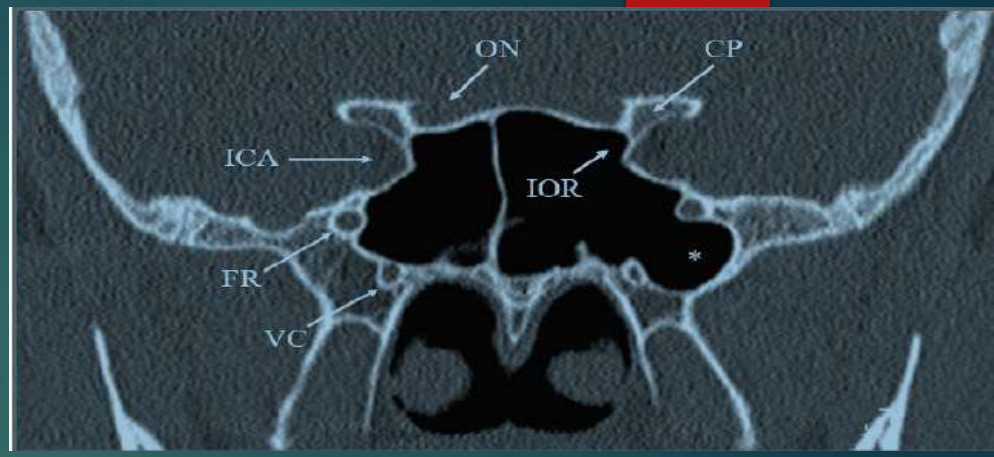
Two asymmetrical sinuses separated by off-midline intersphenoid bony, sphenoid sinus drains into the sphenoethmoidal recess, single sphenoid ostium sinus's anterior wall, medial to superior turbinate, medial portion of sphenoidal face, about 10–12 mm superior to the upper border

Of the choana. Located be measuring 7 cm from anterior nasal spine at an angle of 30° with the nasal, posteroinferior end (the tail) of superior turbinate can be

Used to locate the ostium, just superomedial to the tail of superior

Turbinate,

SPHENOID SINUS



SPHENOID NATURAL OSTIUM, THE POSTERIOR SEPTAL ARTERY (A BRANCH OF SPHENOPALATINE

ARTERY) CROSSES THE SPHENOID FACE

EITHER IT BIFURCATES INTO SUPERIOR AND INFERIOR,

65%, OR CROSSES

AS MAIN ARTERY THEN BIFURCATES (35%). EVEN IF IT, AVERAGE DISTANCE, 5MM, DURING WIDENING, SAFER TO DISSECT AND WIDEN THE SPHENOID OSTIUM HORIZONTALLY, SUPERIORLY, ALTERNATIVE, TO USE THE ELECTROCAUTERY

Vital structures surrounding the sphenoid sinus

Pituitary gland, optic nerves, cavernous sinuses and carotid arteries,

Maxillary divisions (V2) of the trigeminal nerves within the foramina rotundum, and vidian

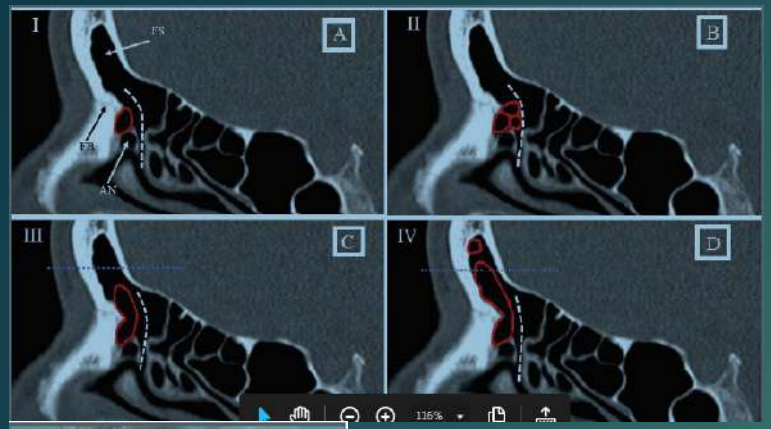
Canals are closely related to the sphenoid body, depending on the degree of pneumatization of

The sinus, these structures could be seen as indentations on the sinus's roof and walls, internally, roof of, pituitary gland, middle cranial, posteriorly, posterior cranial, optic nerve canal crosses, roof and the lateral, posterolateral

Walls, internal carotid artery canals (cavernous, as bony prominences, lateral sphenoid walls, maxillary division of trigeminal nerves pass through the

Foramina rotundum toward the pterygopalatine fossae in both sides, vidian nerves cross the

Lateral sides of the sinus floor within the vidian canals


I
A
FS
EB
AN
II
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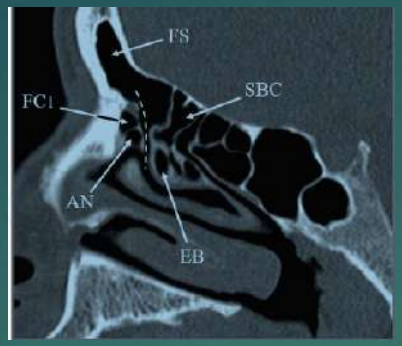
III
C
IV
D


FS
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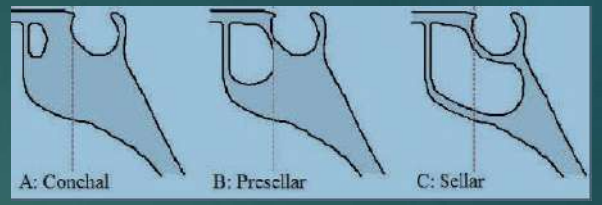
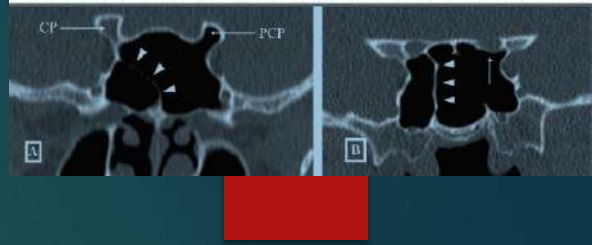
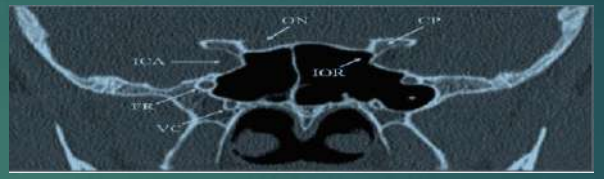

A: Conchal
B: Presellar
C: Sellar


CP
PCP
A
B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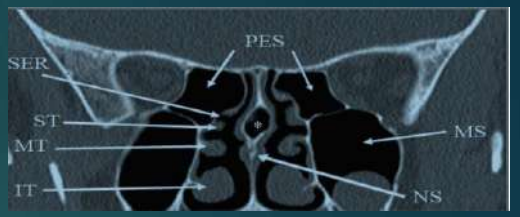
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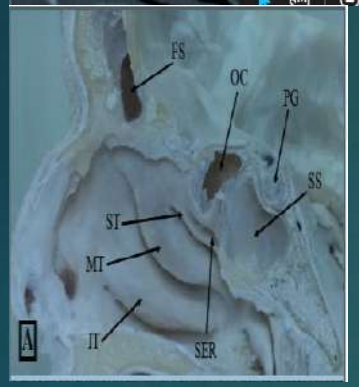
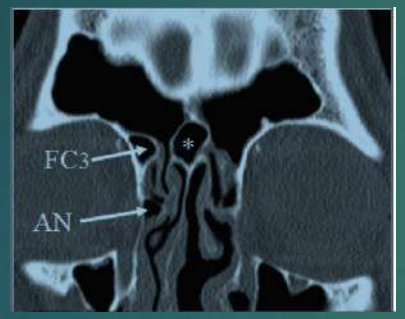
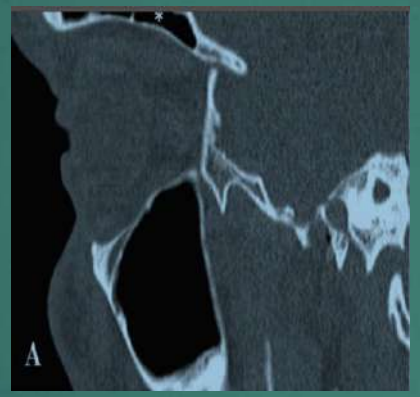
MS
NS

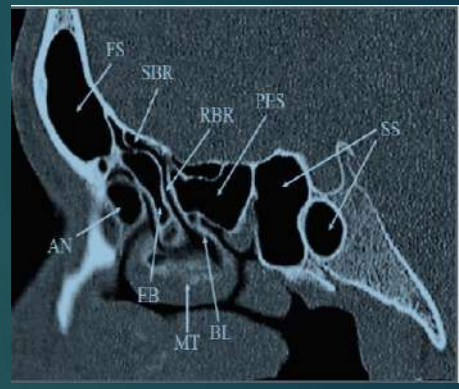

FS
OC
PG
SS
ST
MT
II
SER
A

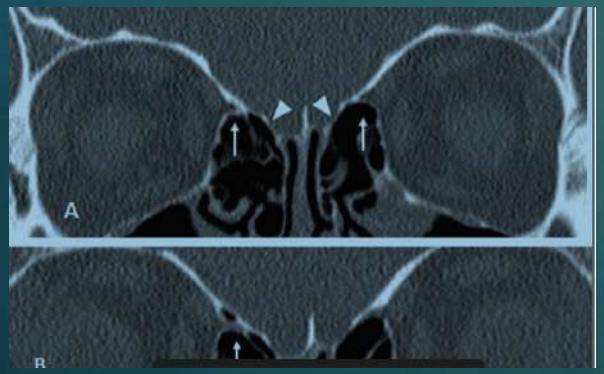

FC3
AN

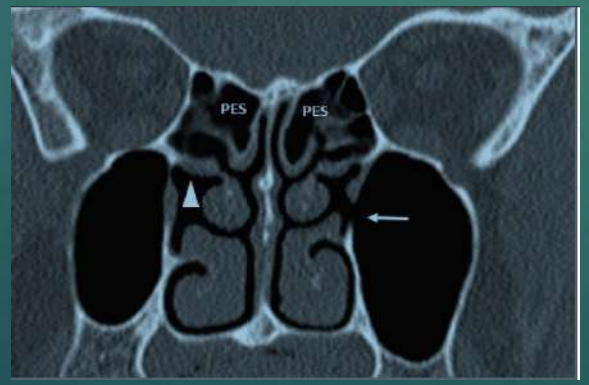

A


SS
SS
B

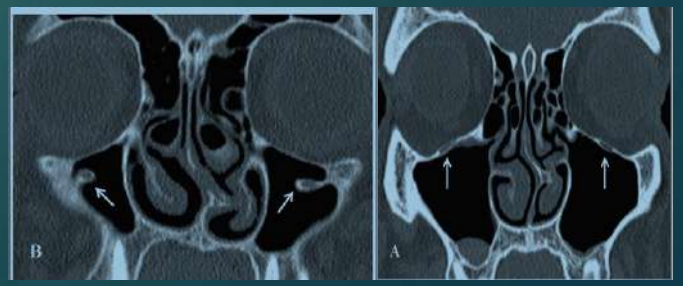

R

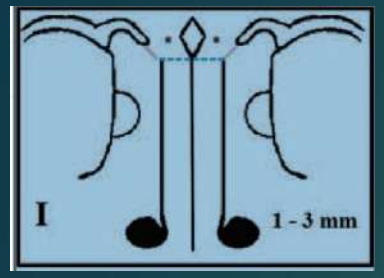

FS
SBR
RBR
PES
SS
AN
EB
MT
BL

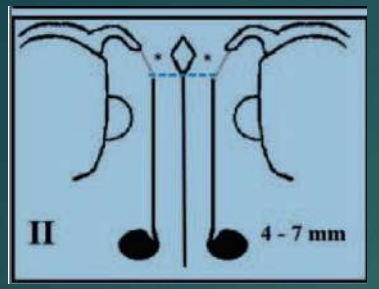

A
B

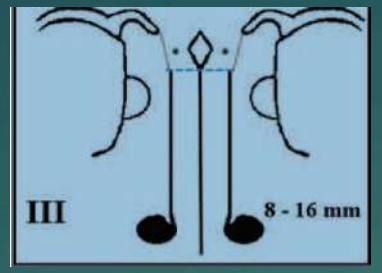

PES
PES

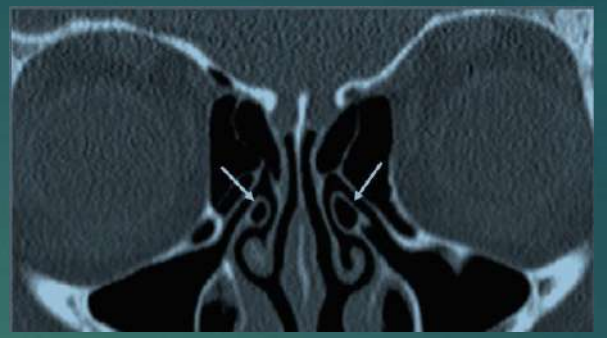

C

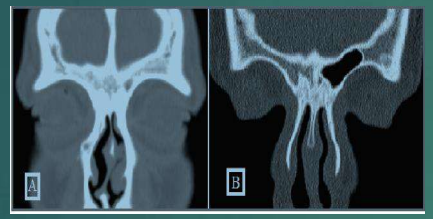

B
A

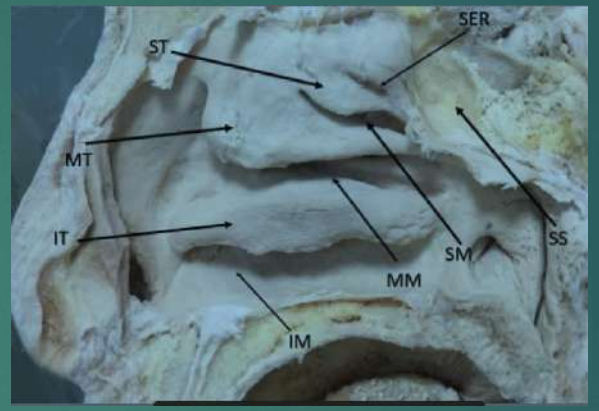

I
1 - 3 mm

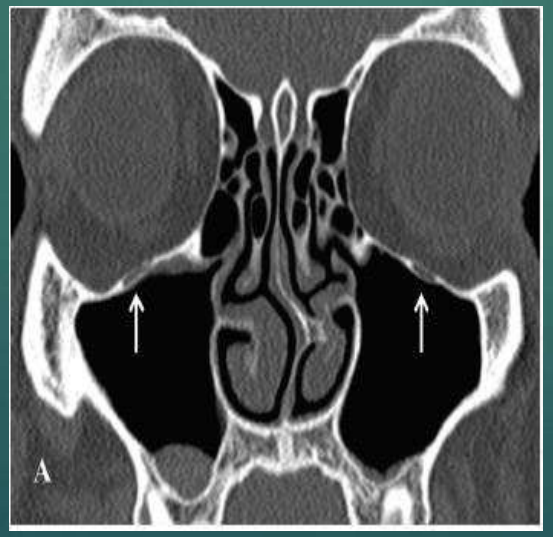

II
4 - 7 mm


III
8 - 16 mm




A
B


SER
ST
MT
IT
SM
SS
MM
IM


A