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ORIGINAL ARTICLE

PREVELANCE OF ANATOMICAL VARIATIONS OF LATERAL WALL OF NOSE IN CHRONIC SINUSITIS PATIENTS

Vijay Bajaj[1], Bhoopendra Singh[2], J. P. Purohit[3]

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ABSTRACT: This study was done to how Anatomical Variation Of lateral Wall of the Nose responsible for chronic sinusitis. 40 patients with chronic sinusitis were enrolled into this study. However, patients with allergic sinusitis, vasomotor sinusitis, atrophic sinusitis, nasal trauma and previous h/o of nasal surgery were excluded. All patients underwent clinical examination, diagnostic nasal endoscopy & CT PNS Coronal view. The frequency of occurrence of the sinonasal anatomical variations were Skull base type- keros type-ll 62.5% septal deviation in 65%, septal spurs in 47.5%, agger nasi cells in 72.5%, frontal sinus absent in 6.25%, frontal sinus hyperneumatisation in 27.5%, frontal recess obstruction in 18%, frontal cell showed type 1 cell in 6%, type 3 cell in 2%, and type 4 also in 2% cases. No type 2 cells were seen, paradoxical middle turbinate in 8.75%, pneumatized middle turbinate in 30% superior attachment of uncinate process to middle turbinate in38.75%, medialized uncinate process in 36.25%, pneumatised uncinate process in 2.5%, ethmoidal bulla-hyperplastic in21.25%, hypoplastic in 16.25% supraorbital cells in 22.5%, accessory maxillary ostia in 15%, Haller cells in 3.75%, pneumatised superior turbinate in 6.25% and Onodi cells in 22.5%,. varitation of sphenoid sinus ostia –circular in 30.6%, oval in 45.2% and slit like in 24.2%, pneumatisation of sphenoid sinus –presellar in 22.5%, sellar in 72.5%, conchal in 2.5% and absent in 2.5 %.large inferior turbinate in 36.2% and Rathke's pouch remnant in 2.5%.
KEYWORDS: Anatomy, Anatomical variations, D.N.E, CT-Scan and E.S.S.

INTRODUCTION: The two main factors are responsible for the maintenance of normal physiology of the paranasal sinuses and their mucous membranes are drainage and ventilation. Normal drainage of the paranasal sinuses depends on effective mucociliary clearance; this is dependant, on the condition of the sinus Ostia.[1] Mucus transport from the sinuses into the nose is greatly enhanced by unimpeded nasal airflow creating negative pressure within the nasal cavity during inspiration. The secretions of the various sinuses do not reach their respective Ostia randomly, but by definite pathways which seem genetically determined.[2] The two of the largest sinuses, the frontal and maxillary, communicate with the middle meatus via narrow and delicate prechambers.[3] In each of these prechambers, the mucosal surfaces are closely oppose such that mucus can be more readily cleared by an effective ciliary action on two or more sides. However, When surfaces become more closely apposed due to mucosal swelling, the ciliary action is immobilized. This impairs the ventilation and drainage of larger sinuses, result in mucus stasis, predispose to further infection and establish a vicious cycle, causing chronic sinusitis. The key region for these changes is that part of the lateral nasal wall that encloses the sinus Ostia and their adjacent mucosa and prechambers. There is considerable anatomical variation in this area that may interfere with normal nasal function and predispose to recurrent or chronic sinusitis.[4]

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The incidence with which these variations are seen in a normal population is less frequent than in those individuals with chronic sinusitis.[5] The incidence of the sinonasal anatomical variation reported in literature shows considerable variation between populations. This study aims to study the various sinonasal anatomical variations in our population and their frequency of occurrence in patients with chronic sinusitis.

MATERIAL & METHODOLOGY: The present study was conducted from July 2011 to June 2013 in the Department of ENT, Maharani Laxmibai Medical College Jhansi, U.P. The study included 40 patients with chronic sinusitis who were undergoing endoscopic sinus surgery. Thus, a total of 80 nasal cavities were examined by diagnostic nasal endoscopy, CT scans and at the time of definitive surgery. A CT- scan pns –coronal view was used in addition to endoscopic assessment to increase the accuracy of recording of the findings. The various anatomical variations of each patient were noted and their frequency of occurrence determined.

Sample Size: 40

Sampling Procedure: Prospective study.

Inclusion Criteria: All the patients with chronic sinusitis not responding to medical treatment and willing to undergo endoscopic sinus surgery and CT scanning of the paranasal sinuses.

Exclusion Criteria: Patients who have had previous endoscopic sinus surgery and hence undergoing revision procedures, Patients who have undergone previous septal or turbinate surgery, Patients with chronic sinusitis responding to medical management and Patients not consenting to participate in the study.

Method of Collection of Data: The cases selected for the study were subjected to detailed history and evaluation, Routine investigations like hemogram, bleeding and clotting time and routine urine evaluation, HIV & HBS AG were done for the patients. Those patients in the active stage of the disease were treated with a course of antibiotics, analgesics and decongestants. But, steroids were not given either topically or systemically to any patient. The patients underwent a diagnostic nasal endoscopy using the standard 3-pass technique, patients underwent CT scanning of the paranasal sinuses. Finally, the patients underwent endoscopic sinus surgery, the extent of which was as dictated by the disease extent of the above two procedure (routine before endoscopic sinus surgery).

Equipment's Used: Nasal endoscopes: 0 degree, 30 degree and 45 degree endoscopes., Cold light source, Fiber optic light cord, single chip camera, 14 inch color monitor., antifog solution, Standard endoscopic sinus surgery instrument & microdebrider (power instrument with it remove the sinus disease like hypertrorhy nasal mucosa & anatomical variations of nose with minimal bleeding and without injury of vital structure like anterior ethmoidal artery).

RESULT & DISCUSSION: Age and sex distribution: Total 40 cases were studied, the mean age was 38.32 Years with age range 15-72 years. The majority of the patients were 9(22.5) in the fifth decade of life. There were 25 Males and 15 females with M: F ratio of 5:3. The sex distribution showed a slight male preponderance.

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Septal Variation: We found septal deviations in 26 (65%) cases. In our study, there was a slight preponderance of deviation to the left 16 cases (61.6%) compared to deviation to the right 10cases (38.4%). The reported incidence of septal deviations in the literature ranges from 40% (Calhoun et al49) to 96.9% (Takanishi et al50) The prevalence of septal spurs in our study was 19 cases (47.5%.) of those9 were to right and 10 were to left. Among these, over half 11cases (57.8%) had contact area with the turbinates. The prevalence of deviations of nasal septum as reported by various workers is 21% (Zinreich 51), 24% (Jones NS52), 38% (Yadav SPS 53), 40% (Bolger 54) and 72% (Jareoncharsri P22). Our results are comparable to the higher ranges reported. The prevalence of septal ridges or spurs is reported as 33% (Danese M, et al 21) and 25.3% (Jareoncharsri P et al 22). The results of our study are slightly higher than this. The mere presence of a septal deviation does not suggest a pathology. However, a marked deviation can force the middle turbinate laterally, thus narrowing the entrance to the middle meatus. Also, ridges and spurs coming into contact with turbinates or other areas of the lateral wall can predispose to recurrent sinusitis.[6,7,8]

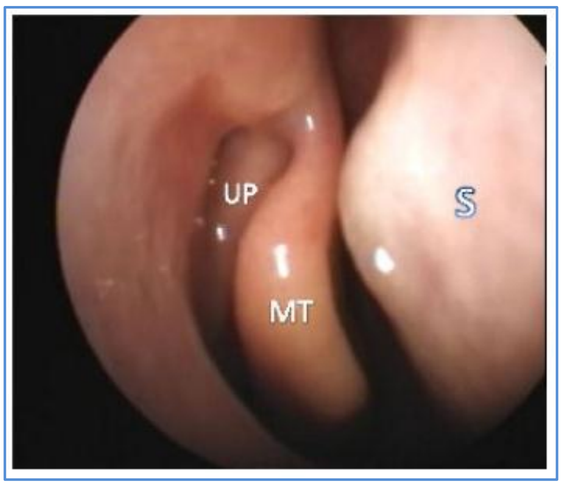

Fig. 1: endoscopic view shows uncinate, middle turbinate and deviated septum

Fig. 2: CT-CORONAL shows septal spur

Agger Nasi Cells: We found pneumatization of the agger nasi cells in 58(72.5%) nasal cavities. In all patients, the pneumatization when present was bilateral. The prevalence of agger nasi cells varies widely as reported by various workers: 10-15% (Messerklinger 18); 14% (Lloyd et al 19); 65% (Davis20); 89% (Van Alyea 22) and 100% (Kennedy and Zinreich 21). Depending on the degree of pneumatization, agger nasi cells may reach laterally to the lacrimal fossa and superiorly to cause narrowing of frontal recess.[9]

On coronal CT, these cells appear inferior to frontal recess and lateral to the middle turbinate. Because of this intimate relationship with these cells form excellent surgical landmarks. Opening the agger nasi cells usually provides a good view of the frontal recess. Therefore, identification of this variation is important in the diagnosis and treatment of recurrent or chronic frontal sinusitis.[10]

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Fig. 3: CT-scan shows b/l agger nasi cell

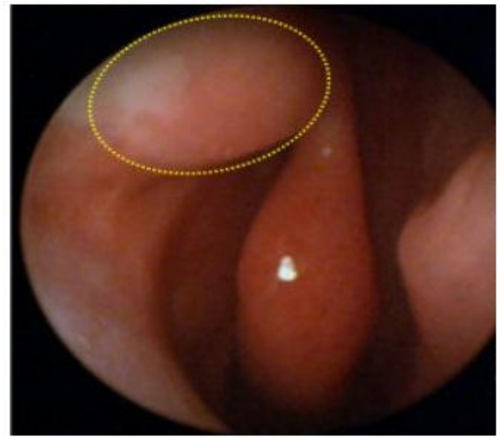

Fig. 4: Agger nasi cell (In yellow circle)

Frontal sinus: We found the prevalence of frontal sinus in 75 (93.5) sides, nonpneumatization of frontal sinus in 6.25%. This correlates with the study by Natsis K who reported a prevalence of 5%. In all our patients, frontal sinuses on either side were always asymmetrical with right being large in 47.5% and the left sinus being large in 52.5% and hyperpneumatisation in 22 (27.5) sides.

Frontal recess: As the axis of the frontal recess is tilted approximately 50 degrees to the canthomeatal line, this drainage pathway cannot be entirely included within a single coronal section. Therefore, coronal oblique views are required for complete information.[11,12,13,14]

In our study, we found that the frontal recess was obstructed in 14 to 75 (18%). Of these, 8 (57%) we're on the right side and 6 (43%) were on the left side, in 43% the obstruction was by agger nassi cells, in 28.5% by ethmoid Bulla or accessory cells and in 28.5% of polyps. As the natural ostium of the frontal sinus is very wide with average anteroposterior diameter of 7.22 mm and transverse diameter of 8.92 mm[15] the obstruction to the frontal sinus drainage and ventilation most often lies in the frontal recess rather than the ostium as is evident from our results. Therefore, merely clearing the recess is sufficient to achieve patency of frontal sinus ostium in most cases.

Frontal Cell & Its Types: Frontal cells: Frontal cells arise above the agger nasi cells and a little posterior to them. They too can obstruct the drainage of frontal sinus. Bent classified them into 4 types. Type 4 cell is completely within the frontal sinus and may completely obstruct the ostium of the frontal sinus. In such cases, frontal sinus is opaque, due to retention of its secretions while the cell it may appear as a clear and pneumatized cell like an air bubble in CT scans.[11,15]

Type of frontal cell & its prevalence.

Type of frontal cell	Frontal cell	Prevalence[3]	Our study
Type-l	Single cell above agger nasi cell.	24.2%	6%
Type-ll	Two or more cell above agger nasi cell.	4.2%	-
Type-lll	Single cell, extending into the frontal sinus.	3.1%	2%
Type-lV	Isolated cell located in the frontal sinus.	0.0%	2%

Table No. 1: Types of frontal cell & its prevalence in our study

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In our study, dissections of frontal sinus showed type 1 cell in 6%, type 3 cell in 2%, and type 4 also in 2% cases. No type 2 cells were seen Del Gaudio studied 212 sinuses in 106 patients by multiplanar CT scans and found frontal cells in 29.6% of unoperated cases. Prevalence of different types was the type I in 18.6%, type II 2%, type III 6.1% and type IV 3.1%. According to Schaefer, 12 frontal cells develop from anterior ethmoid cells after the development of frontal sinus itself.

Meyer et al in their study of 768 CT scans showed that frontal cells were present in 20.4% with type I being the most common (14.9%). Although incidence of type III and type IV cells was low, the incidence of frontal sinusitis was high in these cases.

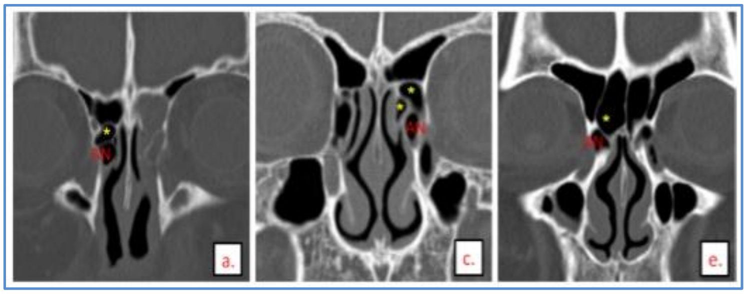

Fig. 5: CT-scan shows a) type-l, b)type-ll & c) type-lll frontal cell

Middle Turbinate: Typically, the middle turbinate is said to have convex medial and concave lateral surfaces with smooth uniform curvature with no obstruction to middle meatus and adequate space between the turbinate and septum[1] However several vartions of, the middle turbinate. These were.

Pneumatized Middle Turbinate: We found pneumatized middle turbinate in 24(30%) sides of these, 7(29.1%) were on the right and 17(70.8%) were on the left. In 7(29.1%) patients, it was bilateral. Of these, 41.6% showed lamellar pattern, 4.2% showed bulbous pattern and 54.2% showed true concha bullosae. The origin of the pneumatization can sometimes be seen as depressions on the lateral surface. Literature reports a wide variation in the incidence of middle turbinate pneumatization and is a follows: Joe JK28 et al -15%; Liu X27 et al – 34.85%, Basic N30 et al -42%, Lothrop 61-9%, Davis 58 -8%, Shaeffer 62-11%. Our results are close to that reported by Lie X et al. The presence of a Concha bullosa does not suggest a pathological finding. However, in the setting of chronic sinus disease, resection of the Concha bullosa should be considered to improve paranasal sinus access.[16] Further, the Concha bullosa interior may be affected by disease in other sinuses.

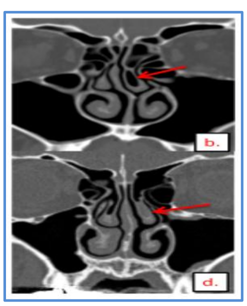

Fig. 6: CT –scan shows Concha bullosa

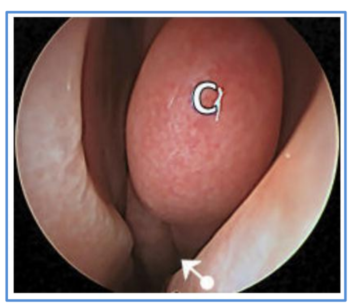

Fig. 7: Endoscopic views of middle turbinate pneumatisation

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Paradoxically Bent Middle Turbinate: A middle turbinate which is distorted such that the convex surface faces towards the meatus is in itself not pathologic but can contribute to severe narrowing of the middle meatus if other mucosal derangements are present. We found paradoxical curvature of middle turbinate in 7(8.75%) sides. Of these, 5(71.4%) were on the right and 2(28.6%) were on the left. In 2 patients, it was bilateral. This correlates well with that reported by Calhoun 49(7.9%) and Lusk 63(8.5%).

Bulla Ethmoidalis: We defined a hypoplastic bulla as one in which the distance between the lateral surface of the middle turbinate and summit of bulla was more than 4 to 5 millimeters. We found hypoplastic in 13(16.25%) sides. An enlarged bulla ethmoidalis was defined as one that contacts or extends beyond the free margin of the uncinate and middle turbinate. This can result in a narrow hiatus semilunaris. We found the large ethmoidal bulla in 17(21.25%) sides. This correlates with the reported frequency by Lloyd 57 (17%) and Lund VJ 64(18%).[17]

Fig. 8: Endoscopic views show uncinate process (*), ethmoid Bulla & middle turbinate

UNCINATE PROCESS:

The Superior Attachment: The superior attachment of uncinate process is important for the following reasons. When the uncinate process is attached to the skull base or middle turbinate, the frontal recess opens into the ethmoidal infundibulum and can be involved in infundibular disease. When the superior attachment is to the lamina papyracea, the frontal sinus opens into the middle meatus directly and can be spared from infundibular disease. Further, during surgery, this attachment needs to be cleared before gaining access to frontal recess. In our study, we found that the superior attachment was to middle turbinate in 31(38.75%) sides, lamina papyracea in 28(35%) sides and skull base in 21(26.25%).

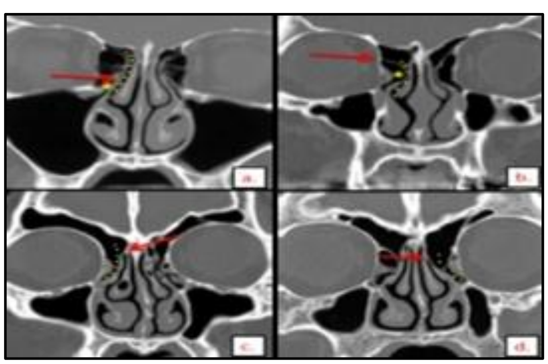

Fig. 9: Superior attachment of uncinate process

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Deviated Uncinate Process: In our study, we found medially turned the uncinate process in 29(36.25%) sides and anteriorly turned uncinate process in 2(2.5%) sides. This correlates well with 45.27% deviations reported by Liu X et al and 31% deflection reported by Danese M.21.

Fig. 10: Medial bent uncinate process

Normally, the uncinate is a sagitally-oriented structure with adequate space between it and bulla ethmoidalis, middle turbinate and lamina papyracea. The medial deflection may contact the middle turbinate or can narrow the middle meatus. A lateral deflection of the uncinate process will make the infundibulum narrow. Because of the reduced distance between the lateralized uncinate process and lamina papyracea, care needs to be taken while performing uncinectomy to prevent orbital injury. An anteriorly bent uncinate process gives the impression of double middle turbinate on endoscopy.[18]

Pneumatized Uncinate Process: We found this variation in 2(2.5%) sides. This correlates with the prevalence reported by Kennedy (0 to 4%) and Bolger et al (2.5%). 54 The pneumatized uncinate is called uncinate bulla and can narrow the infundibulum, frontal recess and middle meatus.[19]

Maxillary Intrasinus Septa: An intrasinus maxillary septum can convert the maxillary sinus into two chambers reported a prevalence of 2.38% in his study. In our study, we found maxillary sinus septation in 4(5%) sides of these 1(25%) was on the right and 3(75%) were on the left, which is consistent with that reported by Prahlada NB. All the intrasinus septae were running obliquely along the longest diameter. This finding is important in that a part of the maxillary sinus can have impaired drainage while the rest of it is normal.

Accessory Ostia: The accessory ostia of the maxillary sinus are present in the anterior and posterior nasalfontanelles, the bone deficient areas in lateral nasal wall behind and below uncinate process.

In our study, accessory ostia were present in 12(15%) of nasal cavities. Earwaker has reported an incidence of 13.75%. Our results are very close to that of Earwaker. Inning 8%. in 2(2.5) of patient, there was multiple accessory ostia.

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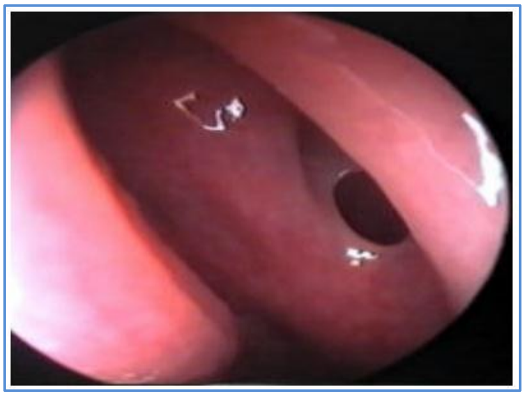

Fig. 11: Endoscopic view shows maxillary sinus ostia–natural

Fig. 12: Endoscopic view shows maxillary sinus ostia- Accessory Ostia

Inferior Turbinate Hypertrophy: We found inferior turbinate enlargement in 29(36.2%) sides. of these 14(48.2) were on the right and 15(51.8) were on the left in 8(20%) of the patient, it was b/l Of these, in 22(75.8%) sides, the large inferior turbinate was associated with ipsilateral maxillary sinus pathology. While the incidence of inferior turbinate enlargement in patients with nasal obstruction and with septal deviations is reported widely in literature, we did not find any studies reporting its prevalence in patients with chronic sinusitis. However, Stammberger2 stated that in a vast majority of their cases of inferior turbinate enlargement, there was inflammatory disease in other parts of the nose. In almost all their cases, inferior turbinate enlargement resolved after sinusitis was treated. Grevers G et al found a significant increase in inflammatory cells in inferior turbinates in patients with chronic sinusitis. The high incidence of ipsilateral maxillary sinus pathology associated with inferior turbinate enlargement in our study could be related to the above phenomenon.

Pneumatized superior turbinate: Pneumatization of superior turbinate can occur from posterior ethmoid cells. Of the 48% incidence reported by Ariyurek OM et al46 in their study, 40% of cases showed pneumatization in the form a small air cell minimally expanding the superior Concha-he called this as a grade I pneumatization. In the remahich correlates to the prevalence of marked pneumatization reported by Ariyurek OM et al Markedly pneumatized superior turbinates can narrow the nasal cavity predisposing the patient to chronic sinusitis. A pneumatized superior turbinate may also contain polyps, cysts, mucoceles and pyoceles. In our study, superior turbinate pneumatization was seen 5(6.25%) sides, of these, 3(60%) sides were on right & 2(40%) sides were on the left. In 1(2.5%) patient, it was bilateral.

Supreme Turbinate: We could not discern the presence of supreme turbinate in any of our cases. However, a Study, by Kim SS47 which was based on cadaver dissections found evidence of basal lamella of supreme turbinate in 15%.

Onodi Cell: This is a posterolateral pneumatization of posterior ethmoidal cell coming into intimate relationship with optic nerve. On coronal CT, an Onodi cell is seen above the sphenoid sinus. Endoscopically, these cells appear as outgrowths of posterior ethmoids posteriorly and superiorly.

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They have a pyramidal configuration with the tip of the pyramid pointing away from the endoscopist. It is said to have a higher incidence is Asians. In our study the prevalence of Onodi cells was 18(22.5%) sides, of these 10(55%) were on right & 8(45%) were on the left. In 7(17.5%) of patient, it was bilateral. The prevalence of Onodi cells, according to various workers, are: Earwaker -24%, Aibara -7%, Basic -10%. Our results are comparable to that of Earwaker.

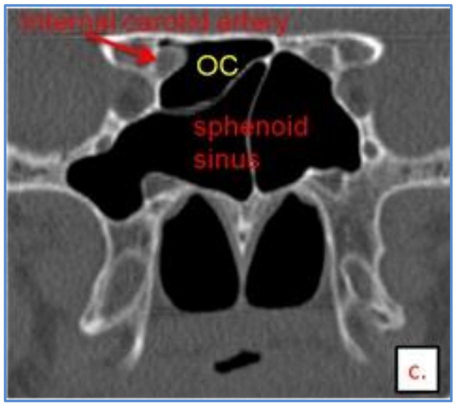

Fig. 13: CT-scan shows onodi cell

Haller cells: Also called infraorbital ethmoidal cells, these are anterior ethmoidal cells pneumatising the floor of the orbit or the roof of the maxillary sinus. In view of their location precisely above the region of the maxillary sinus ostium and infundibulum, they can cause narrowing of maxillary sinus ostium or infundibulum, thus predisposing to recurrent maxillary sinusits[7,8] In our study, Haller cells were present in 3(3.75%) sides. The frequency with which these cells are encountered varies in the literature from 1% to 45.1% and is as follows. Liu X- 1%; Jones 52-6%; Shroff 69- 6%; Zinreich 51-10%; Lloyd 57-15%; Yadav 53-28%; Stackpole andEdelstein 40-34%; Bolger 54-45.1%.

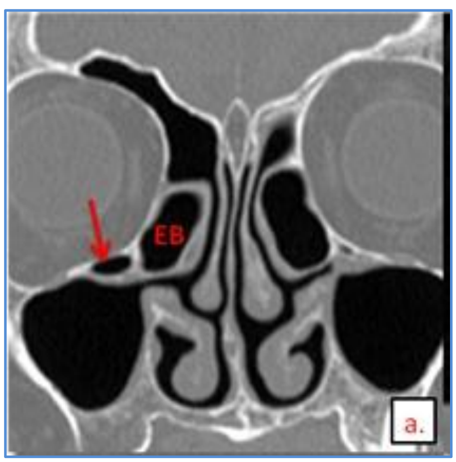

Fig. 14: CT –scan shows Hallercell

The wide discrepancy noted on the literature in the prevalence of these cells may be related to the differences in the interpretation of these cells: -Ethmoidal labyrinth cells which outwardly excavate the os planum and os maxillae.

Albert Van Haller Cell inferior to ethmoid bulla adhering to the roof of the maxillary sinus, in continuity with the proximal infundibulum which formed part of the lateral wall of the infundibulum: Zinreich and Kennedy.

In addition to the above description, cells precisely in the region of the maxillary sinusostium: Stammberger.

A large cell representing a point of access between the inferior part of the ethmoid base and the posterosuperior part of the nasal surface of the maxilla behind and above the hiatus semilunaris: Kimpoti, Nemanic, et al.

Ethmoid Bulla occupying a lower position than normal, whereby the outer wall of the lower cell is formed by the orbital wall of the superior maxilla instead of the lamina papyracea: Skillern.

Air cells located below the ethmoid Bulla, along the maxillary sinus roof and a most inferior portion of lamina papyracea, including air cells located within the infundibulum: Bolger et al.

Supraorbital ethmoidal cells: The ethmoid air cells can extend supraorbitally and is said to be present in 15% to 21% according to Bhatt NJ. 39 In our study, we found a prevalence of 18(22.5%) sides of these 10(55.5%) sides were on right & 8(44.5%) sides were on left. In 8(20%) sides patient it was bilateral. So our results corresponds to that reported by Bhatt NJ.

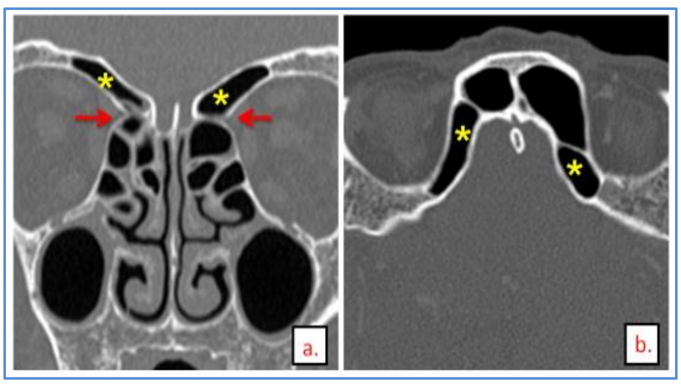

Fig. 15: Supraorbital Ethmoidal cell (*)

Intrasphenoidal Projections: Due to extensive pneumatization, a certain vital structure that is normally in the neighborhood of sphenoid, actually project inwards. We found the following prevalence of intrasphenoid projections: Optic nerve in 22(27.5%) sides, maxillary nerve in 23(28.7%) sides and vidian nerve in 24(30%) sides. The true prevalence of internal carotid artery projections or dehiscence could not be ascertained as axial CT sections were not obtained in our patients. The prevalence of intrasphenoid projections, according to Van Alyea is optic nerve in 40%, maxillary nerve in 40% and vidian nerve in 36%. According to Lang, they are as follows: Optic nerve in 19%, maxillary nerve in 28.6%, vidian nerve in 14.3%. Our results are closer to that reported by Lang than to Van Alyea. The high incidence of these projections means that in addition to the optic nerve and carotid artery, even maxillary nerve and vidian nerve are at risk during sphenoid surgery.

Sphenoid Sinus Pneumatization: The pneumatization of the sphenoid sinus can vary from total nonpneumatization to hyperpneumatization including clinoid processes, sphenoid wings and pterygoid plates. The sphenoid sinus ostium could be visualized in 62(77.5%) sides. The ostium was circular in 19(30.6%) sides, oval in 28(45.2%) sides and slit in 15(24.2%) sides. In the 18(22.5%) sides in which it could not be visualized, 12(66.6%) sides were due to narrow sphenoethmoidal recess and 6(33.3%) sides were due to polyp. In our study, we found absent pneumatization 2.5%, conchal type in 2.5%, presellar type in 22.5% and sellar in 72.5%. These findings compare well with that reported by Lang 43 (conchal 0%, presellar 23.8%, sellar 76.2%) and by Congdon (conchal 5%, presellar 28%, sellar 67%).

Skull Base Configuration: The roof of the ethmoid bone is formed by the fovea ethmoidalis laterally and the cribriform plate medially. The lateral lamella of the cribriform plate is thin and may be of substantial height making it vulnerable to injury.[20,21,22] The anatomy of the anterior ethmoid is critical for two reasons. First, this area is most vulnerable to iatrogenic cerebro-spinal fluid leaks. Second, the anterior ethmoid artery is vulnerable to injury which can cause devastating bleeding into the orbit.

Kero"s Classification[2]	Depth of Olfactory Fossa	Prevalence in our Study
Type-I	1-3 mm	12.5%
Type-ll	4-7mm	62.5%
Type-lll	8-16 mm	25%

Table No. 2: Kero"s classification for depth of olfactory fossa & its prevalance in our study.

In our study, we found Keros type I (1 to 3 mm deep) olfactory fossa in 10(12.5%) sides, type II (4 to 7 mm) in 50(62.5%) sides and type III (8 to 16 mm) in 20(25%) sides. Though several authors draw attention to the importance of deep skull base conformation, we did not find any studies reporting the incidence of various types of conformations. Arslan et al 20 reported that average depth was 8 mm on the right side and 9.5 mm on the left side.

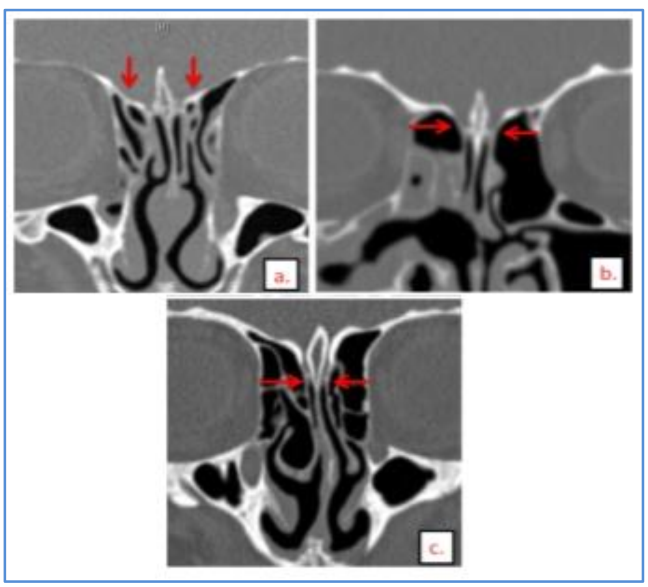

Fig. 16: Kero's classification of skull base a) type-l,b) type-ll &c) type-lll

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Rathke's Pouch Remnant: Rathke's pouch remnant was seen on endoscopy in 1(2.5%) of cases. This is a small slit or the round opening seen in nasopharynx that enters into a small depression or even into a superiorly directed passage. In such a Rathke's pocket can be seen as adrop of viscous seceretion.[15]

CONCLUSION: All the variations of sinonasal anatomy described in literature except the presence of supreme turbinate were encountered in our study. In our study the most anatomical variation was agger nasi cell and least was Rathke's pouch remanent. The medialised uncinate process was most common uncinate process variation and pneumatised middle turbinate was the most common middle turbinate variation. Inferior turbinate enlargement in association with ipsilateral maxillary sinusitis was common. We found Haller Cell in 3 sides which affect the maxillary sinus drainage. The depth of olfactory fossa was of Keros Type II in majority of patients. We found frontal recess obstruction by agger nasi cell, ethmoid bulla & accessary cell but most common by agger nasi cell. In our study, we found the different type of frontal cell that affect the frontal sinus drainage, in which the most common was type 1 cell in 6%. And no type 2 cells were seen. Variation of sphenoid sinus pneumatisation from nonpneumatisation to hyper pneumatisation in which most common was sellartype. & also a variation of sphenoid sinus Ostia, most common was oval type in some case it was hidden. By sphenoethmoidal recess.

We found the following prevalence of intrasphenoid projections: Optic nerve, maxillary nerve and vidian nerve, but most common was vidian nerve in 30%. Means that in addition to the optic nerve and carotid artery, even maxillary nerve and vidian nerve are at risk during sphenoid surgery. There was also a high prevalence of the optic nerve, maxillary nerve and vidian nerve lying bare in the sphenoid sinus. Onodi Cell was also found in our study, but its incidence was not quite as high. Extramural pneumatization like septal, supraorbital, sphenoid wing and pterygoid plates was quite common. These anatomical variations affect the drainage and ventilation of paranasal sinus due to infection lead to stasis of secretion cause recurrent and chronic sinusitis. In view of the presence of these significant variations, we reemphasize the need for proper preoperative assessment in every patient in order to accomplish a safe and effective endoscopic sinus surgery.

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AUTHORS:
1. Vijay Bajaj
2. Bhoopendra Singh
3. J. P. Purohit

PARTICULARS OF CONTRIBUTORS:
1. Lecturer, Department of ENT, Government Medical College, Kannauj.
2. Junior Resident, Department of ENT, M. L. B. Medical College, Jhansi.
3. Professor & HOD, Department of ENT, M. L. B. Medical College, Jhansi.

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NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Vijay Bajaj,
Block 13, House No. 103,
Govind Nagar, Kanpur-208006.
E-mail: vijay.bajaj66@gmail.com

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