International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Study of Various Osteomeatal Complex Abnormalities by Endoscopy and CT Scan

Dr. Harinarayana .N.[1], Dr Shreya Mahendra[2]

MBBS, MS (ENT)

PG in MS ENT

Abstract: ***This study titled "STUDY OF VARIOUS OSTIOMEATAL COMPLEX ABNORMALITIES BY ENDOSCOPY AND CT SCAN was conducted in the department of ENT, SVS Medical College & Hospital, Mahabubnagar, from july 2015 to july 2016 . Objective of the study was to study the various sinonasal anatomical variations in patients with chronic sinusitis, various sinonasal anatomical variations were noted during diagnostic nasal endoscopy, CT scanning of paranasal sinuses and during surgery.The prevalence of the various anatomical variations as detemined by our study correlated well with that of other authors studying similar patient groups.***

Keywords: computed tomography, conchabullosa, deviated nasal septum, osteomeatal complex, uncinate process

1. Introduction

Sinusitis refers to a group of disorders characterised by inflammation of mucosa of paranasal sinuses, characterised by two or more symptoms like nasal blockage, nasal discharge anterior or posterior, facial pain. reduced sense of smell, these complaints should be associated with endoscopic signs of inflammation including mucopurulent discharge primarily from middle meatus, mucosal oedema and Ct changes.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. CT scan being the modality of choice for paranasal sinuses. the inflammation of nose and paranasal sinuses, number of factors play a role in rhinosinusitis including both host and environmental factors. the main factors maintaining the physiology of paranasal sinuses is the drainage and ventilation. chronic rhinosinusitis is a therapeutic challenge more due to the high recurrence rate. in.view of the presence of significantosteomeatal complex variations, we emphasize the need for proper preoperative assessment in every patient in order to accomplish a safe and effective endoscopic sinus surgery.

2. Materials & Methods

This prospective study was conducted from July 2015 to July 2016. In the Department of ENT, S.V.S.Hospital, Mahabubnagar using diagnostic endoscopy and computed tomography. The objective of the study was to study the various sinonasal anatomical variations in patients with chronic sinusits and to determine their frequency of occurrence, in 50 patients undergoing endoscopic sinus surgery.

3. Results

Table 1: Age distribution

Age group	*No. cases*
11-20	8
21-30	12
31-40	16
41-50	9
51-60	5

22.5% were in the third decade of life.

Table 2

Age	*No.of patients*	*%*
21-30	13	26
31-40	27	54
41-50	8	16
51-60	2	4
Total	50	100

Table 3: Sex distribution

Sex	*No.of patients*	*Percentage*
Male	28	56
female	22	44

Table 4

Sex	*No.of patients*	*Percentage*
male	32	64
female	18	36
Total	50	100

Table 5: Septal variations

Variation	*Number*	*Prevalence*
Deviation	27	54%
Spur	16	32%
Thick	5	10%
Pneumatized	2	4%

Table 6: Middle turbinate variations

variation	*Number*	*Percentage*
Typical	25	50
Paradoxically curved	6	12
Pneumatized	17	34
Large non pneumatized	2	4

Table 7: Types of middle turbinate pneumatization

Type	*Number*	*Percentage*
Lamellar	22	44
Bulbous	2	4
Complete	26	52

Table 8: Uncinate variations

Variation	*Number*	*Percentage*
Typical	29	58
Medialized	22	44
Anteriorly turned	1	2
Hypertrophied	6	12
Pneumatized	2	4

Table 9: Uncinate superior attachment

Attachment	*Number*	*Percentage*
Middle turbinate	21	42
Lamina papyracea	18	36
Skull base	11	22

Table 10: Ethmoidal Bulla variations

Type	*Number*	*Percentage*
Typical	31	62
Large	11	22
Hypoplastic	8	16

Table 11: Sphenoid sinus ostium variations

Shape	Number	Percentage
Oval	23	46
Circular	15	30
Slit	12	24

Table 12: Intrasphenoidal projections

Structure	Number	Prevalence
Optic nerve	19	38
Vidian nerve	17	34
Maxillary nerve	14	28

Correlation of Diagnostic Endoscopy Finding with Computed Tomography Findings

SI.NO	1	2	3	4	5	6
parameter	Middle turbinate	Middle meatus	Bulla ethmoidalis	Hiatus semilunaris	Frontal recess	Sphenoethmid recess
Normal DE(N) +CT(N)	38	27	32	25	51	32
Abnormal DE(A) +CT(A)	35	46	13	30	27	3
False positive DE(A) +CT(N)	12	8	8	2	3	0
False negative DE(N) +CT(A)	7	13	10	22	5	8
Sensitvity	74.47	85.19	61.9	93.75	90	100
Specificity	84.44	67.50	76.19	53.19	91.07	80
Predictive +ve	83.33	77.97	56.52	57.69	84.38	27.27
Predictive –ve	76.00	77.14	80	92.59	94.44	100

4. Discussion

CT scan 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.

Age and sex distribution:
The age of the patients varied from 11 years to 60 years. The sex distribution showed a slight male preponderance with 56% males and 44% females.

Septal variations:
Prevalence of septal deviations

Author	Prevalence%
Zinreich	21
Jones NS	24
Yadav SPS	38
Bolger	40
Jareoncharsri P	72
Our study	54

Prevalence of agger nasi cells

Author	Prevalence%
Messerklinger	10 to 15%
Lloyd	14%
Davis	65%
Van Alyea	89%
Kennedy and Zinreich	100%
Our study	72.5%

Frontal sinus:
We found the prevalence of nonpneumatization of frontal sinus in 6.25%. This correlates with the study by Natsis K60 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%.

Frontal recess
In our study, we found that the frontal recess was obstructed in 18%. Of these, in 43% the obstruction was by agger nasi cells, in 28.5% by ethmoid bulla or accessory cells and in 28.5% by polyps. 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.

Table 14: Prevalence of pneumatized middle turbinate

Author	*Prevalence*
Joe JK	15%
Liu X	34.85%
Basic N	42%
Lothrop	9%
Davis	8%
Shaeffer	11%
Our study	50%

Table 15: Prevalence of paradoxical middle turbinate

Author	*Prevalence*
Calhoun	7.9%
Lusk	8.5%
Our study	12%

Table 16: Prevalence of large ethmoidal bulla

Author Prevalence	*Author Prevalence*
Lloyd	17%
Lund VJ	18%
Our study	22%

Uncinate process:

The superior attachment
In our study, we found that the superior attachment was to middle turbinate in 42%, lamina papyracea in 36% and skull base in 22%.

Deviated uncinate process
In our study, we found medially turned uncinate process in 44% and anteriorly turned uncinate process in 2 %. This correlates well with 45.27% deviations reported by Liu X et al and 31% deflection reported by Danese M.

The medial deflection will narrow the middle meatus and lateral defection will narrow the infundibulum. Because of the reduced distance between laterised uncinate process and lamina papyracea, care needs to be taken during uncinectomy.

Pneumatized uncinate process
We found this variation in 4%. 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.

Maxillary intrasinus septa
According to Prahlada NB, 65 this is present is 1% to 6% of the population. Earwaker reported a prevalence of 2.38% in his study. In our study, we found maxillary sinus septation in 5% which is consistent with that reported by Prahlada NB.

Accessory ostia
In our study, accessory ostia were present in 15% of nasal cavities. Earwaker has reported an incidence of 13.75%. Our results are very close to that of Earwaker.

Inferior turbinate hypertrophy
We found inferior turbinate enlargement in 36.2%. Of these, in 75.8%, the large inferior turbinate was associated with ipsilateral maxillary sinus pathology. We did not find any studies reporting its prevalence in patients with chronic sinusitis. However, Stammberger 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 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 al in their study, 40% of cases showed pneumatization in the form a small air cell minimally expanding the superior concha. In our study, we found a prevalence of superior turbinate pneumatization of 6.25% which correlates to the prevalence of marked pneumatization reported by Ariyurek OM et al.

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%.

Table 17: Prevalence of Onodi cell

Author	*Prevalence*
Aibara	7%
Basic	10%
Earwaker	24%
Our study	22.5%

Table 18: Prevalence of Haller cell

Author	*Prevalence*
Bolger	45.1%
Stackpole and Edelstein	34%
Yadav	28%
Lloyd	15%
Zinreich	10%
Shroff	6%
Jones	6%
Liu X	1%
Our study	3.75%

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 22.5% which corresponds to that reported by Bhatt NJ.

Intrasphenoidal projections

We found the following prevalence of intrasphenoid projections: Optic nerve in 38%, maxillary nerve in 28 % and vidian nerve in 34%. 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 Alyea33 is optic nerve in 40%, maxillary nerve in 40% and vidian nerve in 36%. According to Lang,43 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.

Sphenoid sinus pneumatization

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 Lang43 (conchal 0%, presellar 23.8%, sellar 76.2%) and by Congdon (conchal 5%, presellar 28%, sellar 67%).

Skull base configuration

The anatomy of the anterior ethmoid is critical for two reasons. First, this area is most vulnerable to iatrogenic cerebrospinal fluid leaks. Second, the anterior ethmoid artery is vulnerable to injury which can cause devastating bleeding into the orbit. In our study, we found Keros type I (1 to 3 mm deep) olfactory fossa in 12 %, type II (4 to 7 mm) in 64% and type III (8 to 16 mm) in 24%. 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 al20 reported that
average depth was 8 mm on right side and 9.5 mm on the left side.

Conclusion

All the variations of sinonasal anatomy described in literature except the presence of supreme turbinate were encountered in our study. The medialised uncinate process was most common uncinate process variation and pneumatized middle turbinate was the most common middle turbinate variation. Extramural pneumatization like septal, supraorbital, sphenoid wing and pterygoid plates was quite common. Inferior turbinate enlargement in association with ipsilateral maxillary sinusitis was common. The depth of olfactory fossa was of Keros Type II in majority of patients. There was also a high prevalence of optic nerve, maxillary nerve and vidian nerve lying bare in the sphenoid sinus. 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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Author Profile

Dr. Harinarayana. N is MBBS, MS (ENT), Assistant Professor in SVS Medical College & Hospital, Mahabubnagar, Telangana State. Ccompleted MBBS & MS (ENT) from Kakathiya Medical College, Warangal, India

Dr. Shreya Mahendra, MBBS is Post Graduation Student, pursuig MS ENT in SVS Medical College & Hospital, Mahabubnagar, Telangana State.