Osteomeatal Complex Variations and its Clinical Importance - Our Experience

Vikram Kulkarni[1], Praveen Thakur [2]
Rajeev Nishad[3]

ABSTRACT

Objective: To understand the number of variations presenting in osteomeatal complex of paransal sinus CT scan and its relationship with sinusitis.

Method: Retrospective analysis of the 100 CT scans of the patients presenting with the symptoms of sinusitis. Number of the patients presenting with 2 and more variations in osteomeatal complexes were analysed using Lund mackay scoring system for sinusitis. The unpaired 't' test was applied to find significance of this scoring for two or more anatomic variations.

Results: Though the occurrence of the variations were wide but two or more variations occurrence was statistically significant ($p<0.0001$), for the development of sinusitis.

Conclusion: CT scan evaluation of the sinusitis is important in identifying the number of variations present in the osteomeatal complex and two and more variations are considered to be significant factors predisposing to sinusitis.

Keywords: Paranasal Sinus, CT scan, Sinusitis, Osteomeatal Complex.

How to cite this Article:

Kulkarni V, Thakur P, Nishad R.Osteomeatal Complex Variations and its Clinical Importance -Our Experience. Arch CranOroFac Sc 2014;3(1):8-12

Source of Support: Nil.

Conflict of Interest:Nil.

www.acofs.com
Use the QR Code scanner to access this article online in our databse
Article Code: ACOFS0033

INTRODUCTION

Messerklinger established that mucociliary clearance of the paranasal sinuses is the most important thing to be kept in mind while treating the diseases of the sinuses [1]. Hence came the concept of reestablishing the sinus ventilation and drainage through the natural ostium using endoscopes. Basically osteomeatal complex is the key area into which the frontal, maxillary and anterior ethmoid sinuses drain. Many variations including the nasal septum deviation, concha bullosa can cause problems in drainage pathway. One of the important modes of investigations is the CT scan of paranasal sinuses which will delineate the abnormalities present in the osteomeatal complex. Here we have analyzed 100 CT scans of osteometal complexes suspected to have sinus pathology.

MATERIALS AND METHOD

A study was conducted in Department of Otorhinolaryngology, Chirayu Medical College and Hospital, Bhopal. Hundred patients with complaints of headache and repeated cold were included in this study. These patients were subjected to CT paranasal sinus(coronal and axial view) after receiving treatment for three weeks. CT scans were done using GE healthcare high speed, dual slice machine.

RESULTS

CT scans were evaluated using Lund and McKay scoring system. The results obtained were as following: Males outnumbered females by 3:2. Average age of presentation was 32years. There was slight preponderance of septal deviation towards right side (3:2). Paradoxical middle turbinate was seen in 10%(10/100). Concha bullosa was bilaterally present in 35%(35/100) (Figure.1), unilaterally in 35%(35/100). Uncinate process was seen attached to skull base in 20%(20/100) and rest of the cases attached laterally to lamina papyracea. Frontal cell was absent in 30% (30/100).Aggar nasi was absent in 10% (10/100). Bulla ehmoidalis was identified in all cases and haller cells was seen in 6% (6/100) cases (Table.1). CT scans were evaluated to identify incidence of mucosal abnormalitites and these were graded as per Lund and McKay scoring system. **Following were our findings:** Anterior group of sinuses were most commonly affected as compared to posterior group of sinuses. Among anterior group of sinuses, maxillary sinus was diseased in all cases followed by anterior ethmoids and frontal sinus. Maxillary polyp was identifiable in 10%(10/100) cases.

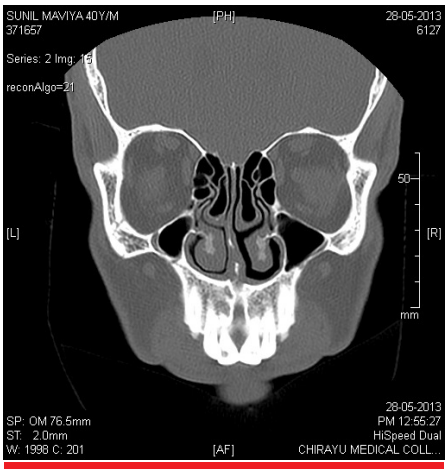

Figure.1

Table 1:Anatomic variations in CT scans of 100 patients with chronic sinusitis.

Sinusitis	Unilateral, N (%)			Bilateral, N(%)	Total, N(%)
	Right, N (%)	Left,N(%)	Total, N(%)		
Septal deviation	60 (60%)	40(40%)	100 (100%)	-	-
Enlarged Ethmoidal Bulla	20(20%)	6 (6%)	26 (26%)	14 (14%)	40 (40%)
Large Aggar nasi	6(6%)	2 (2%)	8 (8%)	10 (10%)	18 (18%)
Concha bullosa	25 (25%)	10 (10%)	35 (35%)	35 (35%)	70 (70%)
Paradoxical middle turbinate	4 (4%)	2 (2%)	6 (6%)	4 (4%)	10 (10%)
Skull base attachment of uncinate process	3 (3%)	3 (3%)	6 (6%)	14 (14%)	20 (20%)

Table 2: CT scans prevalence of sinus opacities in group of 100 patients with sinusitis

Sinusitis	Unilateral, N (%)			Bilateral, N(%)	Total, N(%)
	Right, N (%)	Left,N(%)	Total, N(%)		
Maxillary	40 (40%)	28 (28%)	68(68%)	32(32%)	100(100%)
Anterior Ethmoid	28 (28%)	14 (14%)	42 (42%)	28 (28%)	70 (70%)
Frontal	12 (12%)	6 (6%)	18 (18%)	10 (10%)	28 (28%)
Posterior Ethmoid	3 (3%)	2 (2%)	5 (5%)	8 (8%)	13 (13%)
Sphenoid	2 (2%)	1 (1%)	3 (3%)	5 (5%)	8 (8%)
Closed osteomeatal complex	20 (20%)	15 (15%)	35 (35%)	45 (45%)	80 (80%)

Pan sinusitis was present in 20%(20/100) cases as shown in (Table.2). All patients were divided in two groups. Group A with 2 or more than 2 anatomical abnormalities and Group B with less than 2 abnormalities. Seventy patients belonged to Group A (Table.3). Thirty patients belonged to group B (Table.4). LM score of Group A was compared with that of Group B. The mean of Group One minus Group Two equals 11.91. Confidence interval of this difference was 95% from 9.07 to 14.76 . The t value was 8.3128, degree of freedom was 98 and standard error of difference was 1.433. The two tailed p- value was <0.0001. By conventional criteria, this difference is considered as extremely statistically significant (p<0.0001).

DISCUSSION

Different consensus guidelines agree that CT scan of paranasal sinuses is of particular importance in evaluating the cases suspected to have chronic sinusitis[2].

CT scan of the paranasal sinuses with coronal slices of 2-3mm is very informative in assessing the anterior sinuses and the mucosal thickening to evaluate the osteomeatal complex[3].

Riello APDFL et al. compiled the various definition of the osteomeatal complex and is basically mucosal cleft seen in the lateral wall of nose consisting of uncinate process, anterior and middle ethmoidal cells, middle turbinate and ostium of the frontal, maxillary and numerous ethmoid cells[4]. Usually any variations surrounding the omc will lead to the impedence of drainage and ventilation of the frontal, maxillary and anterior ethmoidal cells.

There are various abnormalities encountered around this region namely deviated nasal septum, concha bullosa, paradoxical middle turbinate, uncinate process abnormalities, aggar nasi cells and frontal cell.

Frontal sinus drains into the frontal recess and then into the infundibulum. Frontal recess can have numerous frontal cells which can obstruct for the frontal recess drainage (Figure .2). They have been classified as type 1,2 and 3 cells according to their location and number in relation to the frontal sinus ostia [5]. Eweiss et al. has summerised that frontal cell occure in 21% to 41% of the sinus scans except his own study showing 78% of occurance[6]. In our study, Type 1 frontal cells were identified in 43% (43/100), Type 2 cells in 27% (27/100). Type 3 cells were not seen in any case. Frontal cells were absent in 30% (30/100) cases.

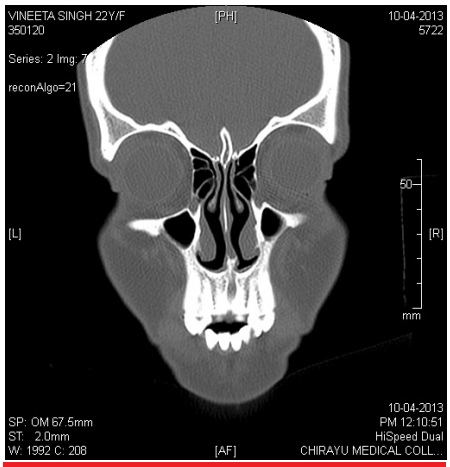

Figure.2

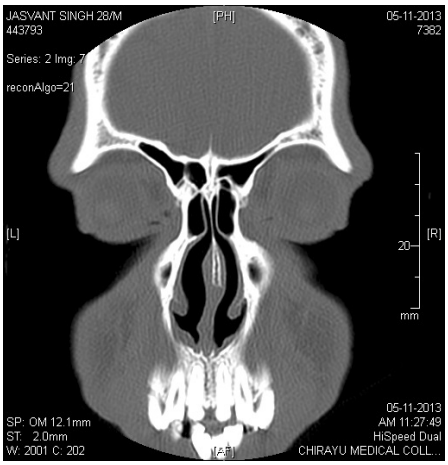

Figure.3

Frontal recess is formed by the agger nasi cells anteriorly, posteriorly by the bulla ethmoidalis, medially by the middle turbinate and laterally by the lamina papyracea.

Agger nasi cells are the initial cells to be identified in the coronal ct scan before the attachment of the

Table 3: 'Correlation between number of abnormalities and LM score for Group A'.

S. No.	Number of abnormalities	L M Score	S. No.	Number of abnormalities	L M Score
1	6	18	36	2	4
2	8	18	37	8	24
3	4	14	38	6	24
4	2	8	39	2	4
5	3	6	40	3	6
6	2	6	41	6	20
7	4	14	42	8	24
8	8	20	43	6	20
9	6	22	44	3	4
10	2	6	45	3	4
11	3	6	46	2	4
12	2	6	47	10	24
13	6	20	48	8	22
14	3	8	49	6	18
15	6	20	50	2	6
16	2	6	51	3	10
17	3	8	52	6	18
18	8	24	53	8	22
19	6	22	54	10	24
20	3	6	55	8	22
21	2	4	56	6	20
22	3	6	57	8	24
23	6	20	58	3	8
24	2	4	59	3	8
25	6	22	60	10	24
26	3	8	61	2	4
27	3	6	62	2	4
28	8	24	63	3	8
29	8	24	64	8	22
30	2	6	65	8	22
31	4	12	66	6	20
32	3	8	67	6	20
33	8	22	68	3	8
34	6	18	69	3	8
35	2	4	70	8	24

Table 4: Correlation between number of abnormalities and LM score for Group B

S. No.	Number of abnormalities	LM score
1	1	2
2	1	2
3	1	2
4	1	2
5	1	2
6	1	2
7	1	2
8	1	2
9	1	2
10	1	2
11	1	2
12	1	2
13	1	2
14	1	2
15	1	2
16	1	2
17	1	2
18	1	2
19	1	2
20	1	2
21	1	2
22	1	2
23	1	2
24	1	2
25	1	2
26	1	2
27	1	2
28	1	2
29	1	2
30	1	2

middle turbinate and are constant in location(Figure.3). Aggar nasi cells form the important anterior wall of the frontal recess which vary from 7% to the 98.5% by different investigators[7]. In our study agger nasi cells are present in 90% of the scans analysed.

Pneumatisation of the middle turbinate is called as concha bullosa and first described by zuckerkandle in 1862[8]. It is again classified as lamellar, bulbous and extensive concha bullosa. In lamellar variant, only vertical portion of the middle turbinate is pneumatised, in bulbous variant inferior portion of the middle turbinate is pneumatised, in extensive variant both segments are pneumatised. In present study we included bulbous portion pnematisation only as it leads to obstruction of the osteomeatal complex . In the literature its occurance varies from 14% to 53%[9]. In our study, concha bullosa was bilaterally present in 35%(35/100), unilaterally in 35%(35/100).

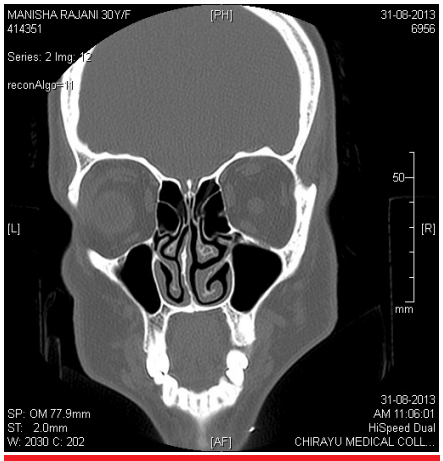

Figure.4

Bulla ethmoidalis is not a discrete individual ethomidal cell as it did not have a complete or discrete posterior bony wall (Figure.4). Rather, the posterior wall of this pneumatisation tract was formed by basal lamella and space between them is called as retrobullar recess [10]. Haller cells are situated beneath the bulla and extent on to the floor of the orbit and may block the maxillary sinus ostium. The occurance of these cells have been varied and summarised as upto 45% by Riello in the literature[4]. In our study, bulla ehmoidalis was identified in all cases.

Uncinate process is boomrang shaped structure occupying the medial wall of the ethmoidal infundibulum and prevents direct exposure of the sinus ostium to the inspired air and redirects the expired air into the sinuses for ventilation[11]. It has got varied attachments superiorly, which makes the frontal sinus drainage variable and vulnerable for chronic sinusitis. Other variations include medial bend, laterlly bent, and pneumatised uncinate process[12]. In our study, uncinate process was seen attached to skull base in 20%(20/100) and rest of the cases attached laterally to lamina papyracea.

Other variations of interest in obstruction of osteomeatal complex in our study, there was slight preponderance of septal deviation towards right side. Paradoxical middle turbinate was seen in 10% (10/100). Anterior group of sinuses were most commonly affected as compared to posterior group of sinuses. Sphenoid sinus was least commonly involved. among anterior group of sinuses, maxillary sinus was diseased in all cases followed by anterior ethmoids and frontal sinus.

Important scoring system used for scoring the severity of mucosal obstruction of these sinuses pathways is Lund and McKay system which records 0 for no occlusion of the osteomeatal complex and 2 for complete occlusion of the osteomeatal complex [13].

In present study, Lund McKay scores of group A(anatomical abnormalities >2) was correlated with that of group B (anatomical abnormalities <2), which was statistically significant (p value< 0.0001). This emphasizes that individuals with greater number of anatomical abnormalities(>2) are predisposed to develop sinusitis as compared to those with fewer anatomical variations.

SUMMARY

Functional endoscopic sinus surgery involves removing any of the abnormality present in osteomeatal complex variations to restore the phsiological pathways draining the frontal and maxillary sinus cells which are commonly involved in chronic sinusitis.

CT scan of the paranasal sinuses with special interest in osteomeatal complex delineation forms important preoperative work up to avoid any untoward complications during functional endoscopic sinus surgery.

Further, two or more variations in osteomeatal complex are associated with higher Lund mackay score and thus develop sinusitis more commonly.

REFERENCES

1. East CA. Functional endoscopic surgery to the sinuses, A minimally invasive treatment for sinusitis. BMJ 1989; 299:694.
2. Meltzer EO, Hamilos DL. Rhino-sinusitis diagnosis and management for the clinician: A synopsis of recent consensus guidelines. Mayo clin proc 2011;86(5): 427-443.
3. Cashman EC, Mac Mohan PJ, Smyth D. Computed Tomographic scans of paranasal sinuses before functional endoscopic sinus surgery. World J Radiol 2011; 3(8): 199-204.
4. Riello APDFL, Boasquevisque EM. Anatomic variations of the osteomeatal complex; tomographic findings in 200 patients. Radiol Bras 2008;41(3):149-154.
5. Wormald PJ. Surgery of the frontal recess and frontal sinus, Rhinology 2005;43: 82-85.
6. Eweiss AZ, Khalil HS. The prevalence of frontal cells and their relation to frontal sinusitis: a radiological study of frontal recess area, ISRN otolaryngology:vol 2013, Article ID 687582, 4 pages, 2013. doi:10.1155/2013/687582.
7. Orhan M. Anatomical analysis of prevalance of agger nasi cells in Turkish population. Kulak Burun Bogaz Ihtis Derg 2009;19(2):82-86.
8. Fadda GL, Rosso S, Aversa S, Petrelli A, Ondollo C, Succo G. Multiparametric statististical correlation between paranasa sinus anatomic variation and chronic rhinosinusitis. Acta otorhinolaryngologica italica 2012; 32: 244-251.
9. Stallman JS, Lobo JN, Som PM. The incidence of concha bullosa and its relationship to the nasal septal deviation and paranasal sinus disease. Americal J Neuroradiol 2004;25:1613-1618.
10. Wright ED, Bolger WE, The bulla ethmoidalis: lamella or a true cell. J Otolaryngol 2001;30(3): 162-6.
11. Nayak DR, Balakrishnan R, Murthy KD. Functional anatomy of the uncinate process and its role in endoscopic sinus surgery. Indian journal of otolaryngol and head and neck surgery 2001;53:27-31.
12. Tuli IP, Sengupta S, Munjal S, Kesari SP, Chakrobarty S. Anatomic variations of uncinate process observed in chronic sinusitis. Indian journal of otolaryngology and head and neck surgery 2013; 65(2):157-161.
13. Bhattacharrya N, Jones DT, Hill M, Shapiro NL. The diagnostic accuracy of computed tomography in pediatric chronic rhinosinusitis. Archives of otolaryngol head neck surgery 2005;130(9):1029-32.

AUTHORS

1. Dr.Vikram Kulkarni,M.S(ENT)
   Associate Professor and Unit Head*,
2. Dr.Praveen Thakur,M.S(ENT)
   Assistant Professor*,
3. Dr.Rajeev Nishad,M.S(ENT)
   Assistant Professor*,

*Department of Otorhinolaryngology
and Head and Neck Surgery,
Chirayu Medical College Hospital
and Research Centre,
Bhopal-Indore Highway,
near Bairagarh, Bhopal,M.P,India

CORRESPONDING AUTHOR

Dr. Praveen Thakur,

Assistant Professor,

Department of ENT,

Chirayu Medical College Hospital and Research Center,

Bhopal, M.P -462030 (India)

Email:docmgm@gmail.com

Mob: +91-8989873044