International Journal of Otorhinolaryngology and Head and Neck Surgery
Suligavi SS et al. Int J Otorhinolaryngol Head Neck Surg. 2017 Apr;3(2):327-331
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20171187

Original Research Article

A computed tomography and endoscopy assisted study of the anatomical variations of lateral wall of nose in patients of chronic rhinosinusitis- our experience at a tertiary care centre

Shashidhar S. Suligavi*, Afshan Fathima, Mallikarjun N. Patil, S. S. Doddamani

Department of ENT, S. Nijalingappa Medical College, Bagalkot, Karnataka, India

Received: 05 January 2017
Revised: 27 January 2017
Accepted: 28 January 2017

***Correspondence:**
Dr. Shashidhar. S. Suligavi,
E-mail: drshashient@gmail.com

ABSTRACT

Background: Chronic rhinosinusitis (CRS) is a common and persistent illness that ENT surgeons encounter in their day to day practice. The lateral wall of the nose contains the ostiomeatal unit which is the key area targeted in the management of CRS. The lateral wall of nose shows several variations which can alter the course of the disease. It is of utmost importance for the ENT surgeon to be aware of these variations as they decide the overall line of management. The objectives of the study was to study the anatomical variations of the lateral wall of nose using computed tomography (CT) scans and nasal endoscopy in patients of chronic rhinosinusitis.
Methods: A one year study from April 2015 to March 2016 involving 50 patients attending the ENT outpatient department clinically diagnosed as CRS using the criteria of task force on rhinosinusitis were included in the present study. Patients underwent a CT scan and DNE and the anatomical variations of the lateral wall of nose were studied.
Results: Concha bullosa was the most common anatomic variation noted in 20 (40%) of the total 50 patients. The other anatomic variations noted were uncinate process variations in 15(30%) patients, agger nasi cells in 3 (6%) patients, hypoplastic middle turbinate in 1 (2%) patient, paradoxical middle turbinate in 2(4%) patients, bulla ethmoidalis in 4 (8%) patients and Haller cells in 1 (2%) patient.
Conclusions: The lateral wall of nose is made up of several structures showing variations which can lead to the development CRS and affect the overall management. They should be evaluated pre-operatively in order to avoid intraoperative complications. CT scan and DNE both complement each other and effectively evaluate the anatomical variations of the lateral wall of nose.

Keywords: Chronic rhinosinusitis, Lateral wall of nose, Anatomical variations, Ostiomeatal unit, CT scan, Nasal endoscopy

INTRODUCTION

Chronic rhinosinusitis is one of the most common ailments encountered by an ENT surgeon in the outpatient department. The patients present with an array of symptoms such as nasal obstruction, nasal discharge, facial fullness and headache. Chronic rhinosinusitis (CRS) is defined as an infection of the sinuses that has persisted for more than twelve consecutive weeks characterized by inflammation of the mucosa of the nose and paranasal sinuses.[1]

On an average one out of five cases seen in the outpatient department is concerned with a sinus disease. In the USA the prevalence of CRS has been estimated to be 14% of the global population. In 1979, Albegger calculated the prevalence of rhinosinusitis in general population to range from 32% in young children to 5% in adults.[2]

However no conclusive studies are available about the prevalence of CRS in India.

Variations in the intranasal and sinus anatomy have been implicated in the aetiology of chronic and recurrent rhinosinusitis. Most of these pathological abnormalities are encountered in the ostiomeatal unit (OMU) - a key area in the lateral wall of nose.[3] Despite this, some patients present with symptoms and endoscopic evidence suggestive of sinonasal disease, yet demonstrate minimal abnormality on the CT scan.[4]

Both computed tomography as well as nasal endoscopy has revolutionized the overall understanding and management of chronic rhinosinusitis in recent times. These two investigative modalities have become the cornerstone in the evaluation of sinonasal diseases. These modalities also serve as medicolegal evidence.

The study was conducted with the objective to study the anatomical variations of the lateral wall of nose using computed tomography (CT) scans and nasal endoscopy in patients of chronic rhinosinusitis.

METHODS

A one year study from April 2015 to March 2016 was conducted in the department of Otorhinolaryngology at S. Nijalingappa Medical College and Hanagal Shri Kumareshwar Hospital, Bagalkot. Fifty consecutive patients presenting with complaints related to chronic rhinosinusitis were selected for the study.

Inclusion criteria included those who were willing for the study, patients willing to undergo CT scan of nose and paranasal sinuses and nasal endoscopy, patients satisfying the clinical criteria reported by the Task Force on Rhinosinusitis[5] and patients above the age of 10 years. Patients with history of previous nasal surgery, previous nasal trauma, and tumours of nose and paranasal sinuses, patients having contraindications to CT scan and patients with allergy to xylocaine anaesthesia were excluded from the study.

Study design

Hospital based case series study.

Data was collected and tabulated in an excel sheet. Results represented as proportions and percentages.

Patients were diagnosed as CRS using the criteria of Task Force on rhinosinusitis.[5] These patients underwent a C.T. scan in the radiology department of H.S.K. Hospital so as to study the anatomical variations of the lateral wall of nose from the radiological point of view. Patients also required a test dose of injection xylocaine prior to the nasal endoscopy. Diagnostic nasal endoscopy using 4% topical xylocaine as anaesthesia and decongestion using 1 ml topical adrenaline (1:1000) was done to study the anatomical variations of the lateral wall of nose from the endoscopy point of view.

RESULTS

Of the 50 patients in our study 30 were females and 20 males. Thus a male to female ratio was 2:3. The lower limit of age was set at 10 years. Maximum number of patients were found to be in the 21-30 years age group which was 17 patients (34%). The mean age of patients was found to be 28.4 years as shown in Table 1.

Table 1: Age distribution.

Age (in years)	No. of patients	Percentage
11-20	15	30
21-30	17	34
31-40	12	24
41-50	3	6
51-60	3	6
Above 60	0	0
Total	50	100

The most common symptom found in our study was nasal block in 45 of 50 patients (90%). The next commonly occurring symptom was headache (86%) followed by nasal discharge or nasal purulence (84%) as shown in Table 2. On examination of the patients deviated nasal septum was seen in 41 (82%) of 50 patients. This was followed by other examination findings such as inferior turbinate hypertrophy in 32 (64%) patients, pale nasal mucosa in 21 (42%) patients and oedematous nasal mucosa in 10 (20%) patients.

Table 2: Symptomatology of patients.

Symptoms	No. of patients	Percentage
Nasal block	45	90
Headache	43	86
Nasal discharge	42	84
Facial fullness	18	36
Cough	11	22
Fatigue	5	10
Bad breath	1	2

Using computed tomography of nose and PNS along with nasal endoscopy the anatomical variations of the lateral wall of nose were studied. In our study, of 50 patients, the typical uncinate process was found in 35 patients (70%) and variations noted in 15 patients (30%). The variations noted were medially bent uncinate process in 10 patients (20%) and laterally bent uncinate process in 5 patients (10%). Uncinate bulla was noted in 1 (2%) of our patients. The most common superior attachment of the uncinate process was to the lamina papyracea noted in 36 (72%) patients.

Table 3: Lateral wall of nose findings.

Finding	Diagnostic nasal endoscopy				Computed tomography			
	Right	%	Left	%	Right	%	Left	%
Inferior turbinate hypertrophy	25	50	15	30	25	50	15	30
Medially bent uncinate process	10	20	10	20	10	20	10	20
Laterally bent uncinate process	5	10	5	10	5	10	5	10
Pneumatized uncinate process	0	0	0	0	0	0	0	0
Concha bullosa	12	24	11	22	14	28	13	26
Paradoxical middle turbinate	2	4	0	0	2	4	0	0
Hypoplastic middle turbinate	1	2	1	2	1	2	1	2
Bulla ethmoidalis	2	4	2	4	2	4	1	2
Agger nasi cells	2	4	3	6	3	6	3	6
Haller cells	NV	0	NV	0	1	2	NV	0
Onodi cells	NV	0	NV	0	NV	0	NV	0

Other features documented using CT scan and nasal endoscopy in our study included deviated nasal septum in 41 patients (82%), inferior turbinate hypertrophy in 35 patients (70%), and concha bullosa in 7 (14%) patients unilaterally and 10(20%) patients bilaterally, paradoxical middle turbinate in 2 patients (4%), hypoplastic middle turbinate in 2 patient (4%), bulla ethmoidalis in 4 patients (8%), agger nasi cells in 2 (4%) patients bilaterally and in 1 patient unilaterally, Haller cells in 1 patient (2%) and no evidence of onodi cells in any patient. Table 3 illustrates the lateral wall findings in more detail.

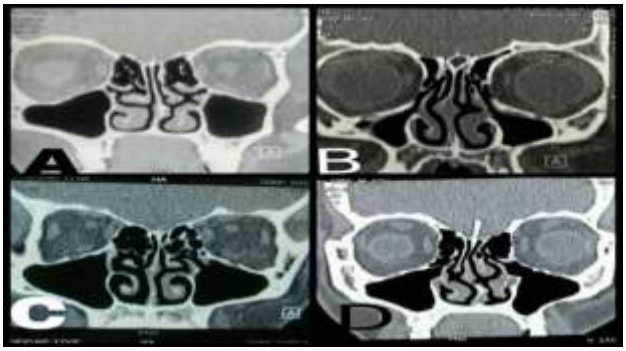

Figure 1: Uncinate process variation.

*A- uncinate process attached to lamina papayracea- right side, B- pneumatised uncinate process- left side, C- medially bent uncinate process- left side, D- medially bent uncinate process- bilateral.

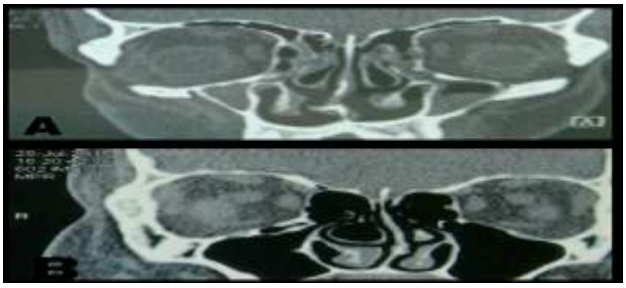

Figure 2: Concha bullosa.

*A- bilateral concha bullosa, B- unilateral concha bullosa- right side.

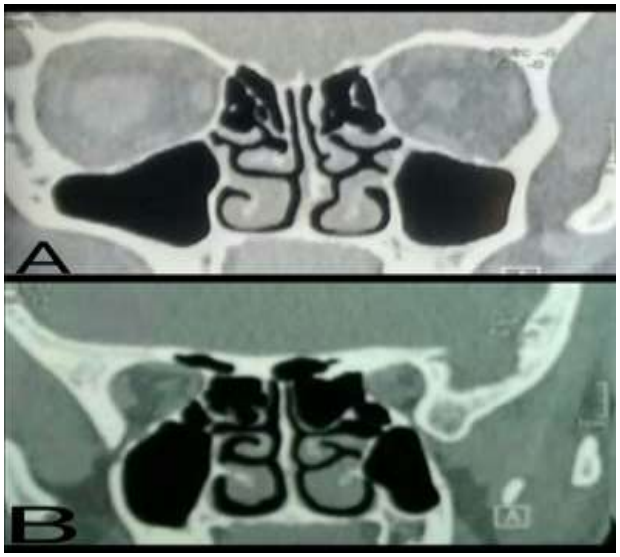

Figure 3: Other lateral wall variations

A- hypoplastic middle turbinate- left side, B- inferior turbinate hypertrophy- bilateral.

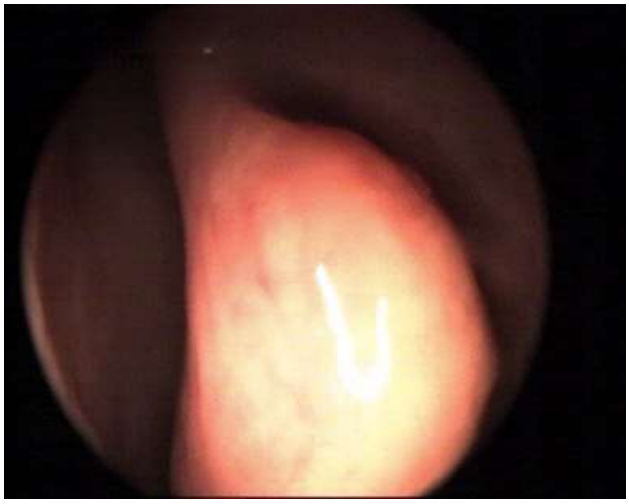

Figure 4: Concha bullosa (endoscopy).

Figure 5: Bulla ethmoidalis (endoscopy).

DISCUSSION

Nasal endoscopy combined with CT of the nose and PNS has made the approach to sinonasal diseases more specific and accurate. The success rate of FESS for treating CRS has been put as 80% to 95% by various researchers.[6,7] Such high rates are possible only by accurate preoperative localization of the disease. The standard radiographs are quick and inexpensive ways to evaluate sinonasal diseases but are ineffective to localize disease in areas such as anterior ethmoids, upper two-thirds of nose and frontal recess.[8]

CT scans not only have the above mentioned advantages but also have reduction in amount of radiations exposed to patient especially to the lens of eye.[9] They have an excellent capability of delineating bone and soft tissues. These scans show the fine bony anatomy of the osteomeatal unit and can readily identify the anatomical variations and mucosal disease.[10]

Nasal endoscopy is a commonly employed office procedure which provides the ENT surgeon a complete analysis of the lateral wall of nose. It gives a three dimensional image of the various structures of the lateral of nose.

In a study conducted by Wani et al out of the total 150 patients the majority of patients were males i.e. 98 (65.5%) and 52 females (34.5%).[11] Similarly in another study conducted by Gnanavelraja et al on the status of uncinate process in patients in a south Indian population, of the total 100 patients 71 (71%) were males whereas 29 (29%) were females.[12] The above two studies clearly show a male preponderance. This is quite contrasting to our results which clearly showed that females outnumbered the males.

In the study conducted by Wani et al headache and facial pain were the most common complaints seen in 90% of patient's respectively.[11] This was followed by nasal discharge (86.6%) and nasal obstruction (85.33%). These results were contrasting to ours as nasal block was the most common symptomatology noted followed by headache and nasal discharge.

The superior attachment of the uncinate process can be divided into three types. Type 1- attached to lamina papyracea, type 2- attached to roof of ethmoid and type 3- attached to middle turbinate. The other variations that are noted are medially bent uncinate process, laterally bent uncinate process and an uncinate bulla or pneumatised uncinate process. In a study done by Gnanavelraja et al type 1 uncinate process was found in 94 sides (59%), type 2 uncinate processes was found in 38 sides (24%) and type 3 uncinate process was noted in 28 sides (17%) out of the total 160 sides they evaluated.[12] They concluded that sound knowledge about the anatomical variations in the superior attachment of uncinate process is necessary for operating surgeons to prevent intraoperative and postoperative complications.

In a similar study done by Tuli et al the superior attachment of the uncinate process was identified in 84 sides of the 100 sides they evaluated.[13] The superior attachment of the uncinate process was type 1 in 67 sides (79.8%), type 2 uncinate processes in 14 sides (16.67%) and type 3 uncinate process in 3 sides (3.57%). The medially bent uncinate process was noted in 24 patients (24%), laterally bent uncinate process in 2 patients (2%) and pneumatised uncinate was seen in 4 patients (4%). They concluded that anatomical variations of the uncinate process did not appear to influence the occurrence of the rhinosinusitis and thus indiscriminate uncinectomy should not be practised.

In a study done by Maru et al on 61 patients, they noted the presence of agger nasi cells in 54 patients (88.5%), deviated septum in 34 patients (55.7%) and concha bullosa in 26 patients (42.6%).[14] They also found a high number of patients with Haller cells i.e. 22 patients (36.1%). Other significant findings included paradoxical middle turbinate in 7 patients (11.5%), onodi cells in 6 patients (11.5%) and uncinate process variations in 6 patients (9.8%). Their conclusion was that chronic sinusitis is a common disease affecting all age groups and combination of radiology and endoscopy is excellent for evaluation of sinus disease. In the study done by Wani et al the anatomical variations of the ostiomeatal complex were noted in 150 patients which included an incidence of concha bullosa in 45 patients (30%), paradoxical middle turbinate in 14 patients (9.33%), Haller cells in 13 patients (8.66%), agger nasi cells in 14 patients (9.33%) and posterior septal deviation in 38 patients (25.33%).[11] They concluded that preoperative detection of the various anatomical variations is essential as it significantly influences the selection of the technique and also helps in avoiding complications.

We are in total agreement with the above studies as it is crucial from the diagnosis point of view to utilize both radiology and endoscopy to evaluate the anatomical variations of lateral wall of nose to decide the line of

management and prevent any complications in the intraoperative period.

CONCLUSIONS

From this study we can conclude that it is of utmost importance to understand about the various anatomical variations of the lateral wall of nose in the preoperative period as they prevent many complications in the intraoperative period. Using CT scan and nasal endoscopy gives a very good overall analysis of the anatomical variations of the lateral wall of nose. Both CT scan and DNE are complimentary to each other overall in detecting variations of the lateral wall of the nose. They help in guiding the ENT surgeon in individualising the line of management for each patient.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Benninger MS. Rhinosinusitis. In: Browning GG, Burton MJ, Clarke R, Hibbert J, Jones NS, Lund VJ et al, editors. Scott-Brown's Otorhinolaryngology, Head and Neck Surgery. 7th ed. Great Britain: Edward Arnold Ltd; 2008.
2. Cauwenberge PV, Watelet JB. Epidemiology of chronic rhinosinusitis. Thorax. 2000;55(2):20-1.
3. GAS Llyod, VJ Lund, GK Scadding. CT of the paranasal sinuses and functional endoscopic surgery: a critical analysis of 100 symptomatic patients. J Laryngol Otol. 1991;105:181-5.
4. Vining EM, Yanagisawa K, Yanagisawa E. The importance of preoperative nasal endoscopy in patients with sinonasal disease. Laryngoscope, 1993;103:512–9.
5. Lund VJ, Kennedy DW. Staging for rhinosinusitis. Otolaryngol Head Neck Surg. 1997;117(2):35-40.
6. Levine HL. FESS, evaluation of surgery and follow up of 250 patients. Laryngoscope. 1990;100:79-84.
7. Kennedy DW. Prognostic factors, outcomes and staging in ethmoid sinus surgery. Laryngoscope. 1992;102(12):1-18.
8. Weir DG et al. Infective rhinitis and sinusitis. In: IS Makay, TR Bull, editors. Scott Brown Rhinilogy. 7th edition. Butterworth & Co; 1997: 4/8/3-20.
9. Metson R, Gliklich RE, Stankiewicz JA, Kennedy DW, Duncavage JA, Hoffman SR, et al. Comparison of sinus computed tomography satging systems. Otolaryngol Head Neck Surg. 1997;117:372-9.
10. Bolger WE, Butzin CA, Parsons DS. Paranasal sinus bony anatomic variations and mucosal abnormalities: CT analysis for endoscopic sinus surgery. Laryngoscope. 1991;101(1):56-64.
11. Wani AA, Kanotra S, Lateef M, Ahmad R, Qazi SM, Ahmad S. CT scan evaluation of the anatomical variations of the ostiomeatal complex. Indian J Otolaryngol Head Neck Surg. 2009;61(3):163-8.
12. Gnanavelraja C, Senthilnathan V, Vijaykumar M, Rajajevakumar M, Subramaniam TK. Status of the Uncinate process in patients with sinusitis in a south Indian population- CT scan assisted anatomical and clinical study. MedPulse Int Med J. 2014;1(6):246-8.
13. Tuli IP, Sengupta S, Munjal S, Kesari SP, Chakraborty S. Anatomical Variations of Uncinate Process Observed in Chronic Sinusitis. Indian J Otolaryngol Head Neck Surg. 2013;65(2):157-61.
14. Maru YK, Gupta V. Anatomical variations of the bone in Sinonasal C.T. Indian J Otolaryngol Head Neck Surg. 2001;53(2):123-8.

Cite this article as: Suligavi SS, Fathima A, Patil MN, Doddamani SS. A computed tomography and endoscopy assisted study of the anatomical variations of lateral wall of nose in patients of chronic rhinosinusitis- our experience at a tertiary care centre. Int J Otorhinolaryngol Head Neck Surg 2017;3:327-31.