Original Article
MVP Journal of Medical Sciences, *Vol 7(1), 90-97, January-June 2020*
ISSN (Print) : 2348–263X
ISSN (Online) : 2348-2648
DOI: 10.18311/mvpjms/2020/v7i1/22936

Study of Correlation between Endoscopic Assessment and Radiological Evaluation in Chronic Nasal Obstruction

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Abstract

Introduction: Chronic nasal obstruction is one of the most common chronic diseases and affects nearly 50 million individuals every year the world over. The diagnosis of diseases associated with chronic nasal obstruction relies heavily on the clinical judgment. However the degree of accuracy in diagnosis of many reported cases with chronic nasal obstruction has exponentially increased owing to modern diagnostic methods like computed tomography of paranasal sinuses and diagnostic nasal endoscopy. The aim of the study is to implement the consistency among the findings of CT, X ray soft tissue and endoscopic findings of the PNS. This will help in a better understanding of the disease, its diagnosis and management. **Methodology**: This was a prospective observational study. The study was conducted in all the patients coming to the department of ENT in a tertiary health care centre. Patients of any age group with a history of nasal obstruction > 3 months not resolved in spite of medications were included in the study. An informed consent was obtained from the participants. Diagnostic nasal endoscopy and CT Scan PNS and or x-ray nasopharynx was done in 35 patients, suffering from chronic nasal obstruction. **Results**: A highly significant positive correlation was found between nasal endoscopic and radiological findings. **Conclusion**: A detail assessment of radiological and endoscopic findings is necessary for tailoring surgical plan .No single procedure can be sufficient in accurately diagnosing chronic nasal obstruction and both the preoperative CT and endoscopic examination are complementary to each other.

Keywords: Chronic Nasal Obstruction,Computed Tomography, Diagnostic Nasal Endoscopy

1. Introduction

Nasal obstruction is defined as sensation of insufficient airflow through the nose.[1] Nasal airway obstruction is the source of significant patient discomfort and financial burden; hence, otolaryngologists encounter this symptom almost on a daily basis. Nasal obstruction may be the chief complaint of many common disease processes, such as sinusitis, nasal polyp, septal deviation, adenoid hypertrophy, and nasal trauma[2]. The causes of nasal obstruction are as listed below[3]:

- *Nasal Septum Abnormalities:* Deviated nasal septum, septal hematoma, septal perforation.
- *Infective Rhinitis.*
- Acute rhinitis is often infective in origin, viral rhinitis, bacterial rhinitis, fungal rhinitis, allergic rhinitis, non-allergic rhinitis.
- *Foreign Bodies in the Nose.*

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- *Occlusion of the Nasal Valve.*
- *Adenoid hypertrophy* - most common cause of chronic nasal obstruction in young children.
- *Nasal polyposis.*
- *Turbinate hypertrophy.*
- *Rhinosinusitis.*
- *Neoplasm:* inverted papilloma, sarcoma, juvenile nasopharyngeal angiofibroma and squamous cell carcinoma.

Chronic nasal obstruction is one of the most common chronic diseases and affects nearly 50 million individuals every year around the world. The diagnoses of diseases associated with chronic nasal obstruction relies heavily on the clinical judgment. However the degree of accuracy in the diagnosis of many reported cases of the diseases with chronic nasal obstruction has exponentially increased owing to modern diagnostic methods like computed tomography of paranasal sinuses and diagnostic nasal endoscopy. Therefore during the past two decades, the concept of diseases associated with chronic nasal obstruction and its management has undergone tremendous changes. The patency of the ostia is the basis of the development of diseases associated with chronic nasal obstruction.CT-PNS has become the standard diagnostic tool in interpretation and evaluation of paranasal sinuses.[4] CT PNS scan for evaluation of the patients, for whom Functional Endoscopic Sinus Surgery (FESS) is planned, is an extremely useful investigating modality in confirming the clinical diagnosis of diseases of paranasal sinuses.[5] Advancements in radiological imaging technology which includes image acquisition, three-dimensional reconstruction, and CT-MRI fusion have assisted in more thorough preoperative planning, making it more safer for endoscopic surgical dissection.[6] Also with the increased use of nasal endoscopy for the interpretation, evaluation and surgical treatment of paranasal sinus diseases, special attention is now directed towards the analysis of the lateral nasal wall and paranasal sinus anatomy.Virtual CT endoscopy is a novel three-dimensional reconstruction technique which is equipped with strong magnification and the distortion of perspective. It results in true optical endoscopy with the view restricted to the target organ.[7]

The pioneer for these dramatic changes in the field of FESS was initiated by the hard work put in by Messerklinger. He reported that each sinus has a fixed pattern of mucociliary clearance where each sinus is primarily aimed to drain towards its natural ostium irrespective of whether or not there are accessory openings that may have been created into the sinuses.[8] This concept of opening the naturally draining ostium of the pathological sinus was popularized by Stammberger[9] and Kennedy.[10]

Computerized tomography and endoscopy have revolutionized the understanding and management of diseases associated with chronic nasal obstruction.

In this study we have correlated the CT PNS findings and diagnostic nasal endoscopy findings in patients presenting with chronic nasal obstruction.

2. Aims and Objectives

1. To study the correlation between endoscopic assessment and radiological evaluation in chronic nasal obstruction.
2. To study the diagnostic endoscopy findings in patients of chronic nasal obstruction.
3. To study the radiological profile in patients with chronic nasal obstruction.
4. To implement the knowledge of consistency in the findings in CT PNS and or X-ray soft tissue and in the endoscopic findings for better understanding the disease and hence diagnosis and further management of the patient.
5. To correlate the anatomical variants in radiological investigations and diagnostic nasal endoscopy.

3. Materials and Methods

Type of study: A Prospective, Observational Study.
Study settings: Department of Ear Nose Throat in a Medical College and Tertiary Health care Centre.
Study population: Patients with chronic nasal obstruction who came to the Department of ENT for treatment.
Sample Size: A total of 35 patients were selected during the study period.
Eligibility Criteria.
A) Inclusion criteria:
1. History of nasal obstruction > 3 months.
2. Age: Irrespective of age group.
3. All the patients with nasal obstruction that do not resolve in spite of medication.
B) Exclusion criteria:
1. Immunocompromised patients.

2. Patients not willing to participate.

4. Methodology

The present study was conducted in the Department of Ear, Nose and Throat in a Medical College.A total of 35 patients were included after they satisfied the eligibility criteria.Written informed consent was obtained from all the study participants. Detailed history and examination was done and findings were recorded in a predesigned proforma. Then relevant investigations and surgical intervention as indicated was performed on the patients.

4.1 Collection of Data

1. An informed consent was taken from all the patients.
2. A detailed history and clinical examination were done.
3. A routine haemogram and urine examination were done for all the patients.
4. All the patients having symptoms for more than 12 weeks and in the active stage of the disease were treated with a course of suitable antibiotic, systemic antihistamines and local decongestants. They were also treated for medical conditions like diabetes mellitus, hypertension, and nasal allergy.
5. Each patient underwent a computed tomography of Para nasal sinuses and diagnostic nasal endoscopy.

Patients underwent all the necessary investigation prior to being included in the study.

5. Observation and Results

Most of the patients were in the age group between 21-40 yrs., the least being >60 yrs. (Table 1). In the study out of 35 patients, 20% were upto 20 years age, 54.3% were within 21 to 40 years age group and 11.4% were above 60 years old.

Males were more common than females (Table 2).Out of 35 chronic nasal obstruction patients 34.3% were females and 65.7% were males.

On Nasal Endoscopy of Floor, there was presence of polyps in 20% on the right side and in 14.3% in the left side, secretions were present in 11.5% on both the sides, 5.7% had concretions on the right while 2.9% on the left side of the floor. Nasal septum was deviated in 82.9% patients on visualization from the right and in 80.1% in the left side, while 2.9% had congestion and 17.2%

Table 1. Age group distribution of patients with chronic nasal obstruction

Age group(years)	Frequency	Percent
upto 20	7	20.0
21 to 40	19	54.3
41 to 60	5	14.3
>60	4	11.4
Total	**35**	**100.0**

Table 2. Sex distribution of patients with chronic nasal obstruction

Sex	Frequency	Percent
Female	12	34.3
Male	23	65.7
Total	35	100.0

Table 3. Floor, Septum, inferior meatus, inferior turbinate and adenoids findings on diagnostic nasal endoscopy in chronic nasal obstruction

		Right		Left	
		Frequency	Percent	Frequency	Percent
Floor	Polyp	7	20.0	5	14.3
	Secretions	4	11.5	4	11.5
	Concretions	2	5.7	1	2.9
Septum	Deviated	29	82.9	28	80.1
	Congestion	1	2.9	1	2.9
	Spur	6	17.2	6	17.2
Inferior Meatus	Hypertrophy	0	0	1	2.9
	Concretions	1	2.9	0	0.0
	Secretions	3	8.6	2	5.7
Inferior turbinate	Hypertrophy	17	48.6	25	71.5
	Congestion	2	5.8	1	2.9
	Concretions + Edematous	1	2.9	0	0.0
Adenoids	Enlarged	1	2.9	1	2.9

had spurs on both the sides. Inferior meatus endoscopy revealed hypertrophy in 2.9% patients on the left side and concretions on the right side in 2.9% of the patients. Secretions were found on the right side in 8.6% of the patients and 5.7% had it on the left side. Inferior turbinate was hypertrophied in the right side among 48.6% of the patients while 71.5% had it on the left side. Congestion was seen on the right side among 5.8% of the patients along with concretions and edematous inferior turbinate, while 2.9% patients had only the congestion on the left side. Adenoids were enlarged in 2.9% patients on both sides as shown below in Table 3.

CT scan finding showed septal deviation in 80% patients, spur in 22.9% and SS type deviation in 8.6% patients. Inferior turbinate hypertrophy was in 65.7% patients by CT findings. In middle turbinate CT finding showed Concha bullosa in 22.9%patients, cobblestone was not seen, paradoxical curve was noted in 8.6% patients, edematous turbinate was in 20%, hypertrophy was in 14.3% and polyp in 14.3% patients. Accessory maxillary ostium was present in 54.3% patients. Agar Nasi cells were noted in all patients. Bulla ethmoidalis was opacified in 51.4% patients, while 11.4% had mucosal thickening. Uncinate process was free in 2.9% patients, attached to lamina papyracea in 74.3% and skull base attachment of uncinate process was seen in 17.1% patients (Table 4).

6. Discussion

A variety of benign and malignant conditions involve the nose and paranasal sinuses and these lesions are encountered in clinical practice regularly. Even though the presenting features, diagnostic nasal endoscopy and CT PNS helps to draw a provisional diagnosis but for a definitive diagnosis, histopathological examination remains the gold standard. CT is one of the standard diagnostic tool in the evaluation of paranasal sinuses. When it is combined with diagnostic nasal endoscopy, it provides most of the objective findings required for

Table 4. Pathological findings on CT in chronic nasal obstruction

CT scan		Frequency	Percent
Septum	Deviation	28	80.0
	Spur	9	22.9
	Congestion	0	0
	SS deviation	3	8.6
Inferior Turbinate	Hypertrophy	23	65.7
Medial Turbinate	Concha Bullosa	8	22.9
	Cobblestone Appearance	0	0
	Paradoxical Curve	3	8.6
	Edematous	7	20.0
	Hypertrophy	5	14.3
	Polyp	5	14.3
Accessory Maxillary Ostium	Present	19	54.3
Agar Nasi Cell	Present	35	100
Bulla Ethmoidalis	Opacified	18	51.4
	Mucosal Thickening	4	11.4
Uncinate Process	Free	1	2.9
	Lamina Papyracea	26	74.3
	Skull Base	6	17.1

diagnosing CRS.[11,12] Despite the enormous use of CT, its true accuracy in diagnosing CRS is less clear.[13]

6.1 Age Distribution(Table 1)

In the present study age of patients varies between 9 and 66 years, of which most of the participants are between the age group of 21 - 40 years.

In the study conducted by Sheetal et al., (2011)[4] among 45 patients, majority of them were in the age group of 20 - 40 years. On comparison, the mean age group in the present study was 33.6 years, which is almost equal.

6.2 Sex Distribution (Table 2)

Table 2 shows that of the total 35 patients in this study, 23 (65.7%) were males and 12 (34.3%) were females.

Similarly, in a study conducted by Sheetal et al, (2011)[4], there were 62% males and 38% females, demonstrating a male predominance.

6.3 Comparative Study of CT and Diagnostic Nasal Endoscopy on Pathological Conditions (Table 3 and 4)

In the present study, nasal endoscopy done on patients with chronic nasal obstruction showed septum deviation in 82.9%, spur in 17.1% patients, congestion of septum in 2.9% and S shaped septum deviation in 8.6% patients. Inferior turbinate was hypertrophied in 71.4% patients as seen on endoscopy. Middle turbinate had concha bullosa in 22.9% patients, cobblestone appearance in 20% patients, paradoxical curve in 2.9% and edematous turbinate in

31.4% patients. Middle turbinate was hypertrophied in 8.6% while polyps were noted in 8.6% patients at the middle turbinate. Accessory maxillary ostiums were visualized in 31.4% patients. Bulla ethmoidalis was normal in 40% patients. Medial meatus had polyp in 17.1% while concha bullosa was present in 2.9% patients. In the study 25.7% had polyp and 5.7% had mass. CT scan finding showed septal deviation in 80% patients, spur in 22.9% and SS type deviation in 8.6% patients. Inferior turbinate hypertrophy was found in 65.7% patients by CT findings. In middle turbinate CT finding had Concha bullosa in 22.9% patients, cobblestone was not seen, paradoxical curve was noted in 8.6% patients, edematous turbinate was in 20%, hypertrophy was in 14.3% and polyp in 14.3% patients. Accessory maxillary ostium was present in 54.3% patients. Agar Nasi cells were noted in all patients. Bulla ethmoidalis was opacified in 51.4% patients, while 11.4% had mucosal thickening. Uncinate process was free in 2.9% patients, attached to lamina papyracea in 74.3% and skull base attachment of uncinate process was seen in 17.1% patients.

In the study conducted by Zojaji, *et al.*,[5] out of 51 patients, middle turbinate hypertrophy was seen in 8(15.6%) cases on diagnostic nasal endoscopy and 7(13.7%) cases in CT scan. On comparison both the studies had almost similar number of cases seen with middle turbinate hypertrophy.

In the study done by Naghibi, *et al.,* hypertrophy of the inferior turbinate was the most obvious finding in the CT scan (70.6%) as well as in endoscopic evaluation (68.6%). On comparison with the present study, both showed that diagnostic nasal endoscopy as well as CT scan can detect hypertrophied inferior turbinate in almost equal percentageof cases.

Jiannetto and Pratt study reported that operative findings were more consistent with the surgeon's CT scan evaluation than with the radiologist's CT report. Hence, surgeons read -CT scans form an important and more reliable assessment tool for patients undergoing surgery[14].

Kaplan concluded in his study that when CT scan findings are combined with a directed and thoughtful history, endoscopy can yield more accurate information regarding anatomic variants and severity of the disease[15].

6.4 Diagnosis

In the present study, diagnosis among patients with chronic nasal obstruction was, DNS with sinusitis in 48.6% only DNS in 5.7% and, polyp in 25.7% of the patients. 2.9% patients either had fungal sinusitis, angiofibroma, inverted papilloma, mucormycosis, olfactory neuroblastoma or rosaidorfman which have been confirmed with a histopathological study conducted on the specimen sent for HPE. In the study conducted by Zojaji, *et al.*,[5] on 51 patients, most (33, 64.7%) were diagnosed with chronic rhinosinusitis. The remaining 18(35.2%) patients were diagnosed as having allergic rhinitis along with chronic rhinosinusitis. On comparison with our study it shows, more variation in disease conditions which can be attributed to less exclusion criteria in the present study. The incidence of causes of nasal obstruction diseases cases is same.

7. Summary

In the present study 35 patients were taken with many variations in their Sino nasal pathology. Most of the cases were in the age group of 21-40 years and showed male predominance, due to more exposure rate and better follow up rates of the male patients compared to females. Headache is one of the main symptoms. On endoscopy most of the patients had septal deviation on either the right, left or S shaped, as seen in majority of them who presented with chronic nasal obstruction. CT scan is a better diagnostic method for deviated nasal septum than diagnostic nasal endoscopy. Different attachments of uncinate process is better visualized by CT scan. Aggernasi cells can be seen both on CT and diagnostic nasal endoscopy but can be well studied by CT scan. Therefore CT PNS scan is a better investigative modality for viewing aggernasi cells. Whereas other anatomical variants like Haller cells and Onodi cells can only be appreciated on CT scan. Therefore for evaluating Haller cells and Onodi cells, nasal endoscopy has no diagnostic value at all. Visualization of middle meatal secretions is better interpreted in diagnostic nasal endoscopy than by CT scan thereby which is why diagnostic nasal endoscopy has to be done in all cases of sinonasal pathology. Variants of Middle turbinate like concha bullosa and paradoxical could both be seen in CT scan and diagnostic nasal endoscopy. Both modalities are equally useful in identifying these variants in almost all the cases. Hypertrophy of the middle turbinate and inferior turbinate both can be evaluated and analyzed by CT scan as well

as on diagnostic nasal endoscopy, however diagnostic nasal endoscopy has a better diagnostic value than CT scan because direct visualization of the mucosal changes can be done. Diagnostic nasal endoscopy helps in better interpretation of the disease process and the condition of the sinonasal pathology at any given point of time. Sinus opacification due to pent up secretions was better seen with CT scan as also to know the extent of the disease and planning for better management of the disease in advance to avoid intraoperative hazards. Polyps and nasal mass are pathological conditions of the nasal cavity and paranasal sinus that can be visualized both on CT scan as well as diagnostic nasal endoscopy; however diagnostic nasal endoscopy gives a better insight of the pathology of polyp or mass, its origin and gross anatomy, its mucosal condition and biopsy under local anaesthesia to confirm the diagnosis. The extent and spread of the pathology CT scan supervenes diagnostic nasal endoscopy and gives a better understanding of the pathology.

8. Conclusion

- From the present study done on 35 patients it is concluded that sino nasal pathology has a higher preponderance in male patients as compared to females.
- Most commonly seen in the age group of 20 to 40 years which present with sinonasal pathology.
- CT scan has got a better advantage compared to diagnostic nasal endoscopy in interpretation of the anatomical variants and also to know the condition of para nasal sinus, and to the extent of disease in sinuses.
- From the present study we conclude that diagnostic nasal endoscopy is a better diagnostic modality compared to CT scan when conditions like nasal mucosa, middle meatal secretions, and polyps are concerned.
- CT scan provides findings almost similar to the preoperative findings of FESS and helps in management and provides “road map” to the surgeons when indicated.
- Histopathological diagnosis is a must for definitive diagnosis.
- In all patients with sino nasal disease both CT scan and diagnostic nasal endoscopy should be done, to know the exact pathology and to plan for further management.
- Both CT scan and diagnostic nasal endoscopy are complimentary to each other.

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How to cite this article: Shelke SS and Kulkarni SV. Study of Correlation between Endoscopic Assessment and Radiological Evaluation in Chronic Nasal Obstruction. MVP J. Med. Sci. 2020; 7(1): 90-97.