

Original Research Article

Etiological profile and correlation of radiological and endoscopic modalities for evaluation of nasal obstruction: a hospital-based study

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ABSTRACT

Background: Nasal obstruction causes considerable disease burden on our society and is frequently under-treated and under-evaluated. Aim of the study was to establish etiological profile and evaluate correlation of radiological and endoscopic modalities for evaluation of nasal obstruction.

Methods: Ninety patients with nasal obstruction presenting to OPD of a tertiary hospital were evaluated with history/physical examination, rhinoscopy and radiological assessment by X-ray of para nasal sinuses (PNS), Computerized tomography of PNS (CT-PNS) and nasal endoscopy.

Results: Inflammatory polyps were most common cause (33%) of nasal obstruction in our population which was young in age (20-40 years), the obstruction being predominantly of short duration (<10 months). CT-PNS had significantly better performance than X-ray PNS in detection of nasal polyp and cyst. There was good agreement between CT-PNS and nasal endoscopy for most of the cases. Polyps and mucosal oedema had significantly higher detection rates by endoscopy while CT-PNS was better in assessment of DNS.

Conclusion: CT-PNS and Nasal endoscopy are superior for assessment of nasal obstruction and complement each other.

Keywords: CT-PNS, Nasal endoscopy, Nasal obstruction

INTRODUCTION

Nasal obstruction and chronic rhinosinusitis (CRS) have been estimated to cause significant disease burden on quality of Life in Indian scenario. A conservative estimate by National institute of allergy and infectious diseases (NIAID) places the disease burden at 134 million with considerable personal and economic impact.¹

Nasal Obstruction is an important component of CRS While previously CRS has been approached as symptom-based diagnosis. With advent of and rapid access to other treatment modalities like CT-PNS and nasal endoscopy more scientific management and improved diagnosis of CRS has been enabled.^{2,3} American academy of

otolaryngology head and neck surgery recommends a focused assessment of specific symptoms and liberal use of diagnostic modalities like nasal endoscopy and CT-PNS which complement both functional and anatomical assessment respectively for optimal management rather than just relying upon symptoms and X-ray PNS alone.³⁻⁸

While many studies have focused on etiopathogenesis and demographic profile of nasal obstruction, there is a paucity of Indian literature evaluating the diagnostic test performance of nasal endoscopy, X-ray and CT-PNS in anatomic subgroups of nasal obstruction.⁹

The aim of the study was to study the etiopathogenesis of various causes of nasal obstruction and study of

radiological and nasal endoscopic concordance and agreement in patients with nasal obstruction.

METHODS

This study consisted of 90 patients with complaint of nasal obstruction of various etiopathogenesis was carried out in the department of ENT and head neck surgery NSCB government Medical College, Jabalpur, Madhya Pradesh from 1 March 2016 to 31 August 2017.

Study design for this was hospital based cross sectional study.

All the patients who were admitted in ward of NSCB, MCH Jabalpur with complaint of nasal obstruction, excluding acute URTI / Paranasal sinus malignancy were included in this study.

All the patients with complaints of nasal obstructions were inquired in detail viz. Site of obstruction, onset, progression, degree, duration and associated symptoms a detailed rhinological examination was done. Anterior rhinoscopy examination before and after application of topical vasoconstrictor agent was carried out. Probe test was done wherever nasal mass is present. Posterior rhinoscopy was also done to screen posterior nasal space. Examination of ears, throat, regional and local lymph nodes were also carried out. Airway patency was tested by using cotton wool and cold spatula test. Blood examination and radiological examination investigations were also undertaken.

X-ray PNS water’s view was taken and was evaluated for the parameters like discharge and mucosal thickening.

In discharge parameter the presence of an air fluid level in maxillary sinus was taken as discharge present and if no air fluid level was present then it was considered as discharge absent.

In mucosal thickening parameter it was evaluated by considering the opacification of sinus when compared with that of the orbit. Opacification denser than that of orbit was considered as presence of mucosal thickening. Further the extent of thickening was judged by the percentage of total maxillary sinus volume which was opacified: Type a- <50% thickening, Type b->50% thickening but \geq 100%, Type c-100% opacification and Type d- bony remodelling or destruction irrespective of amount of opacification.

Cyst/antral polyp- isolated domed opacity was classified as an antral polyp or cyst within the sinus polyp/nasal mass-completely opacified sinus with evidence of opacification in nasal cavity was classified as nasal mass or polyp arising in middle meatus.

Contrast enhanced CT scan was done. 1-3 mm cuts were obtained both in coronal and axial plane.

Endoscopic evaluation was done in three passes and, in all the three passes various structures were examined and any abnormality found was noted.

First pass: Inferior meatus, floor of nose, post-nasal space, Eustachian tube orifice, mucus channel, septum, nasolacrimal duct opening and previous antrostomy.

Second pass: Lateral wall of nose including agger nasi, polyps, accessory ostia and uncinat process, Middle meatus including hiatus semilunaris, bulla ethmoidalis, natural OS and ground lamella and Middle turbinate deformity.

Third pass: Superior turbinate/meatus, sphenoethmoidal recess and sphenoidal/ostium. Diagnosis was made on the basis of Etiopathogenesis, Endoscopic and Radiological findings, and accordingly appropriate treatment was given.

Chi-Square test and test of proportion adjusted for continuity correction were used for analysis of categorical variable and test of association. Performance of diagnostic test was evaluated by ROC curve and Kappa to evaluate agreement between diagnostic test. Software R (version 3.4.4) was used to carry out the statistical analysis.

RESULTS

Demographic profile most nasal obstruction was in age group 20-40 years. (47/90-52.22%). There were fewer younger (32/90-35.56%) and older (11/90-12.22%) patients, which is shown in Table 1.

Table 1: Age-wise distribution of observed nasal obstruction.

Age group (year)	Nasal obstruction observe (%)
< 20	35.56
20-40	52.22
> 40	12.22

Male preponderance was significantly higher in the population (55/90-61 vs 35/90-38.8%, 95% CI 6.7-37%, p=0.004), which is shown in Figure 1.

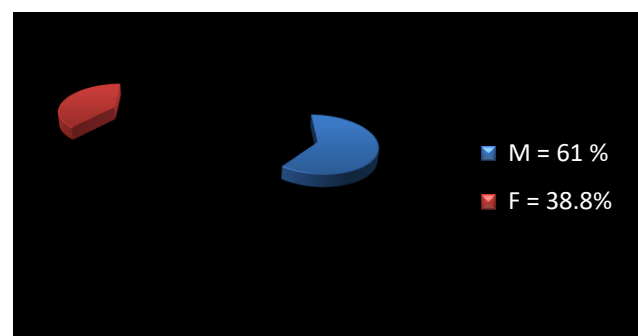


Figure 1: Gender-wise distribution.

In etiopathogenesis, most common cause of nasal obstruction in <20 years was inflammatory polyp (53%), in 20-40 subgroup (deviated nasal septum-21%) while allergic rhinitis predominated in older patients greater than 40 years of age (18%).

The percentage of partial obstruction (58/90-64.44%) in the population was significantly higher than complete obstruction (32/90-35.56%), 95% CI (13.7%-43.9%, p=0.0001) because of higher incidences of DNS, CRS and polyps.

Maxillary ostia were most common site of obstruction (36%) due to increased prevalence of nasal polyp in younger population.

The distribution according to duration, Etiology, Severity and site is illustrated shown in Figure 2.

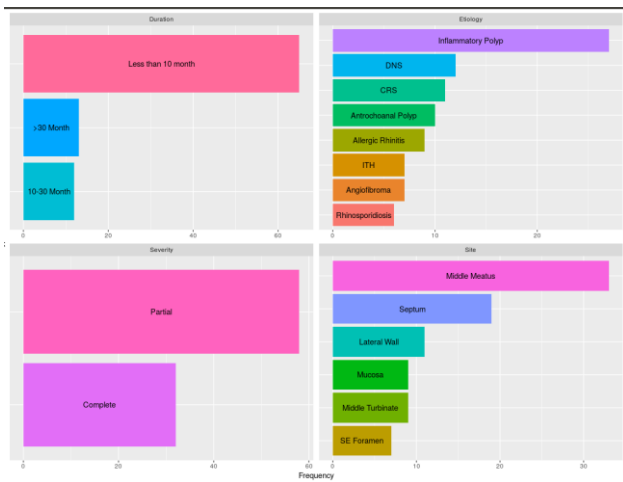


Figure 2: Distribution of etiologies/site and duration of nasal obstruction in the population.

Most patients in the population had significantly higher left sided nasal obstruction (58/90-62.3%) vs right sided (32/90-37.7%) 95% CI (9.1-39.7%, p=0.00175).

Most patients 65/90 (72.2%) had significantly shorter (<10 months) duration compared to 10-30 (12/90-13.3%) and >30 months (13-90, 14.4%) (chi square-91.9, df=2, p<0.0001).

Absolute eosinophil count and etiology-dependent variance-Angiofibroma (6/9-85.71%), Allergic rhinitis (3/9-33.33%) had significantly higher percentage of cases with AEC elevation as compared to rhinosporidiosis (1/7-14.3%) and Inflammatory polyp (2/24-8.5%). Due to significant heterogeneity, the chi-square statistic is 12.8202. The p value is 0.045982. The result is significant at p<0.05.

X-ray PNS VS CT- radiological parameters, X-ray PNS had poor sensitivity in diagnosis of antral cyst and nasal polyp and milder mucosal thickening (till type B) while it

had similar test performance in diagnosis of nasal discharge or higher grade of mucosal thickening.

For cyst sensitivity, specificity X-ray compared to CT-PNS as gold standard was 62% (95% CI 24-99%) and 91% (90-99%) respectively. Area under curve (AUC) 0.794.

ROC curve demonstrating comparative test performance of X-ray PNS with CT-PNS as gold standard is shown in Figure 3.

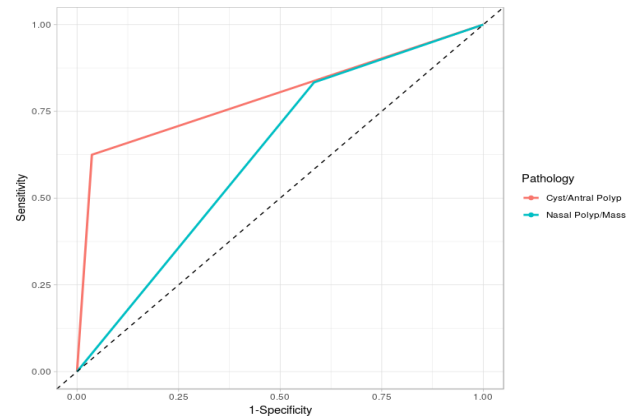


Figure 3: ROC curve comparing perform X-ray PNS with CT-PNS in diagnosis of nasal polyp and antral cyst.

For diagnosis of nasal polyp sensitivity, specificity value of X-ray compared to CT-PNS as gold standard was 17% (95% CI 6-35%) and 91% (45-71%) respectively, AUC 0.625.

The prevalence of mucosal thickening as detected by CT-PNS was 71.4% respectively with relative counts/percentages in mucosal thickening grades- A, B, C, D being 26 (28.6%), 9 (9.8%), 17 (19%) and 12 (14.3%) respectively.

In CT-PNS vs nasal endoscopy, CT-PNS was non-significantly better than nasal endoscopy for detection of hypertrophied inferior turbinate (63/90-70% vs 52/90-57.7%, 95% CI-2.7%-27%, p=0.12) and significantly higher for DNS (74/90-82% vs 61/90-67.7%, 95% CI 0.8%-28%, p=0.003).

Middle turbinate variations were non-significantly better appreciated by CT-PNS when compared to nasal endoscopy by 10%. (45.5% vs 35.5%, p=0.22).

Polyps and mucosal oedema were appreciated better in nasal endoscopy when compared to CT PNS (36/90-40% vs 20/90 22.2% by 17.8%, p=0.015).

Accessory ostium was only appreciated in nasal endoscopy. The relevant numbers and amount of agreement as depicted by Kappa are presented in Table 1.

Table 2: Comparative agreement between radiological assessment and nasal endoscopy.

Parameters	Nasal endoscopy	CT scan	Kappa	Strength of agreement
Bulla ethmoidalis	20	18	0.933	V. Good
Variations in MT	32	41	0.795	Good
Nasal polyp	36	20	0.600	Moderate
Accessory MO	43	0	0.000	Poor
Hypertrophied inferior turbinate	52	63	0.739	Good
DNS	61	74	0.625	Good

DISCUSSION

This study adds to Indian literature in evaluating the demographic and etiological characteristics of nasal obstruction in a tertiary ENT center as well as elaborates on test performance of X-ray PNS compared to CT-PNS and nasal endoscopy in cases presenting with nasal discharge.

Found that inflammatory polyps were main cause of nasal obstruction in young age, while DNS was more common in 20-40 years and allergic rhinitis in older (>40 year) population. Site of obstruction was predominantly left sided with majority of them having short duration of presentation. Partial Obstruction was more common in our population. DNS is a common cause of nasal obstruction similar findings were seen in study by Arya et al who found DNS prevalence to be 29% in 20-40-year age group.²

The patient age group was similar to the demographic profile of Arya (81%), Sood (20-40 years median age) and Sinha et al (17-48 years median age) indicating young population has significant nasal allergy and inflammation which contributes to obstruction.²⁻⁴ Angiofibroma and allergic rhinitis had significantly higher AEC than other causes of nasal obstruction.¹ In this study CT-PNS significantly out-performed X-ray PNS for detection of antral cyst and nasal polyp. X-ray PNS had poor sensitivity 62% for antral cyst, while significantly worse sensitivity (17%) for nasal polyp, while its specificity was optimal indicating it has a limited use as a screening tool and it will miss a significant number of cases if used as investigation of first choice in evaluation of nasal obstruction.

It is similar to study by Gupta et al and Jolazi et al who showed poor X-ray sensitivity of as low as 30% in diagnosis of nasal polyp.^{11,12}

The haziness/opacity prevalence in our study on X-ray PNS is 55% and similar to 57% prevalence in study by Saxena et al.⁹

On the other hand, nasal endoscopy complemented CT-PNS with their respective strength. While CT-PNS diagnosed fifteen percent of higher number deviated septum. Nasal endoscopy helped in determining functional significance of deflection and spur.^{9,10}

As expected according to previous literature CT-PNS was significantly superior in visualization of variations of middle turbinate, hypertrophy of inferior turbinate while nasal endoscopy performed significantly better in diagnosis of accessory maxillary ostia and polyps.¹¹⁻¹⁴ In study by Zolaji et al prevalence of hypertrophied turbinate is 71% and it is detected more frequently by CT-PNS similar to this study.¹¹ CT-PNS helped in better delineation regions beyond the access of nasal endoscope.¹³

This is similar to findings in study by Jeminiani et al where CT-PNS performed significantly better endoscopy negative /CT positive cohort (20%) in navigating areas not covered by endoscopy. Thus, CT-PNS correlation was significantly better with nasal endoscopy than X-ray.

CONCLUSION

CT-PNS and nasal endoscopy complement each other in diagnosis and management of nasal obstruction in this population and perform significantly better than X-ray PNS in its management.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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