



A CLINICAL STUDY TO ANALYSE THE NASAL AIRFLOW AND RESISTANCE IN CASES OF NASAL SINUS DISEASES HAVING NASAL OBSTRUCTION BEFORE ENDOSCOPIC SINUS SURGERY BY ACTIVE ANTERIOR RHINOMANOMETRY

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ABSTRACT

Background: The nasal cavities and paranasal sinuses are the first part of the airways, and normal nasal breathing requires a patent nasal airway. Nasal airway resistance accounts for more than 50% of total airway resistance. Complaint of a blocked nose is often a complex clinical problem involving mucosal, structural and even psychological factors. **Objective:** To analyse the nasal airflow and resistance in cases of nasal sinus diseases having nasal obstruction before endoscopic sinus surgery by active anterior rhinomanometry. **Methods:** The present prospective study was done in Department of ENT, Dr. BRAM Hospital & Pt. J.N.M. Medical College, Raipur (C.G.) from January 2009 to November 2010. The study was conducted on Patients suffering from Nasal Polyposis with or without chronic sinusitis. **Results:** Out of total 55 patients of Chronic rhinosinusitis and Polyposis 34(61.9%) cases were male and 21(38.1) cases were female. Nasal obstruction and discharge was most common presenting symptom in all cases followed by postnasal drip (40%), headache (38.2%), hyposmia (36.4%) and mouth breathing (30.9%). Most common finding in nasal endoscopy were, mass/polyp in nasal cavity (100%), blocked osteomeatal complex (100%) followed by discharge (92.7%) and synechiae (9%). Statistically significant improvement was seen in post operative mean values of right (442.0 cm³/sec) and left (399.0 cm³/sec) nasal airflow as compared to pre operative mean values of right (176.4 cm³/sec) and left (350.7 cm³/sec) nasal airflow of right antrochoanal polyp patients. **Conclusion:** The most common nasal polyp found was right antrochoanal polyp followed by ethmoidal polyp and least common left antrochoanal polyp. Duration of symptom ranged from 6 months to more than 2 years. Nasal obstruction and rhinorrhea are the commonest symptoms of presentation. Active Anterior Rhinomanometry is a sensitive but not a specific tool for detection of Nasal air way resistance.

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INTRODUCTION

Sinusitis and Polyposis is one of important cause for significant nasal obstruction. Sinusitis and Polyposis is 1 of the 10 most common diagnoses in primary care practice. The prevalence of Nasal Polyposis is considered to be around 4%.^[1] This prevalence has been shown to be as high as 40% in cadaveric studies.^[2] They predominantly affect adults and usually present in patients older than 20. They are uncommon in children under 10 and may be the presenting feature of cystic fibrosis. There is at least a 2:1 male to female preponderance. Up to a third of NP patients have asthma, whereas polyps are only found in 7% of asthmatics.^[3] Data on

(chronic) rhinosinusitis is limited and the disease entity is badly defined. Therefore, the available data is difficult to interpret and extrapolate. Nasal polyps and chronic rhinosinusitis are often taken together as one disease entity, because it seems impossible to clearly differentiate between them.^{[4][5][6]} Functional endoscopic sinus surgery (FESS) is at present the surgical method of choice for many clinicians treating chronic sinusitis and nasal polyposis. During the last 10 years, functional endoscopic Endonasal sinus surgery (FESS) has developed into one of the most commonly used surgical methods for the treatment of chronic or recurrent sinusitis and nasal Polyposis.^[7] Post operatively, patients have felt that patency of the nasal airway is improved, although all

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previous studies have failed to objectively measure changes produced. Nasal obstruction is one of the main symptoms by patients with chronic sinonasal diseases. [8] Assessment of the outcome of patients after FESS has usually been based on subjective judgment made by either the surgeon or the patient. [9] Various objective methods have been applied to obtain nasal airway and resistance. The most common and accurate measurement methods used in modern rhinology are active anterior rhinomanometry. Rhinomanometry is accepted as Gold standard for measurement of nasal airflow and nasal resistance. By using anterior active rhinomanometry, decreased unilateral and total nasal resistance can be measured. Due to its simplicity and non-invasive nature this method had gained popularity. The successful use of rhinomanometry requires an experienced operator and significant subject co-operation in order to obtain reproducible and valid measurements. It cannot be performed in the presence of a septal perforation or complete nasal blockage. [10]

METHODOLOGY

Method: The present prospective study was done in Department of ENT, Dr. BRAM Hospital & Pt. J.N.M. Medical College, Raipur (C.G.) from January 2009 to November 2010. The study was conducted on Patients suffering from Nasal Polyposis with or without chronic sinusitis. Patients were selected on the basis of history, thorough clinical examination especially by nasal endoscopy as well as by radiological evaluation.

Patient Inclusion Criteria

Both male and female cases of nasal obstruction (unilateral or bilateral) due to nasal Polyposis with or without chronic sinusitis, having age 10 -70 years and which had undergone Functional endoscopic sinus surgery (FESS).

Patient Exclusion Criteria

- Nasal pathologies like septal perforation,
- adenoid hypertrophy,
- rhinomass,
- unilateral & bilateral completely blocked nasal cavity (other than nasal polyp)
- Non cooperative patients.
- Patients who had immune deficiency or suppression, granulomatous diseases and sino-nasal malignancies.

RESULTS

For this study 55 cases of nasal obstruction due to chronic Sinusitis and Polyposis selected on the basis of History, clinical examination, endoscopic and CT scan findings. Only these chronic pathological cases were selected so that we were able to demonstrate the change in nasal airflow and nasal resistance (NAR) in pre and post operative period.

The following observations were derived from present study.

Age and Gender Wise distribution

Patient's age ranged from 10-70 year. It was observed that out of total 55 patients of Chronic rhinosinusitis and Polyposis 34(61.9%) cases were Male and 21(38.1) cases were Female. Male to Female ratio was 1.6:1. Maximum number of cases 15(27.3%) were seen in third decade. Higher percentage of patient (76.36%) was seen in age group 10-40 years. Maximum number of male patient (29.4%) presented in third decade while female (33.3%) presented in second decade.

Table 1 Age and Gender Wise distribution

S.NO.	Age group (in years)	Male	Female	Total
1.	10-20	7 (20.5%)	7(33.3%)	14 (25.4%)
2.	21-30	10 (29.4%)	5(23.8%)	15 (27.3%)
3.	31-40	8 (23.5%)	5 (23.8%)	13 (23.6%)
4.	41-50	2 (5.8%)	3 (14.2%)	5 (9%)
5.	51-60	5 (16.6%)	1 (4.7%)	6 (10.9%)
6.	61-70	2 (5.8%)	0	2 (3.6%)
	TOTAL	34 (61.9%)	21(38.1%)	55

Symptoms with Duration

Duration of symptom ranged from 6 months to more than 2 years. Nasal obstruction and discharge was most common presenting symptom in all cases followed by postnasal drip (40%), headache (38.2%), hyposmia (36.4%) and mouth breathing (30.9%). Nasal obstruction was present on right (38.2%), left (27.3%) and both side (34.5%). 34.5% cases were presented in 6-12 month duration followed by 30.9% cases in 12-18 month duration. χ^2 (df 7)=48.05 showed a significant relation with nasal obstruction and discharge at .01 level.

Table 2 Symptoms with Duration (N=55)

SN	duration (month)	nasal obstruction			discharge	post nasal drip	headache	mouth breathing	hyposmia
		right	left	both					
1.	0-6	3	0	3	4	9	15	14	14
2.	6-12	5	7	7	20	7	3	3	4
3.	12-18	6	4	6	16	3	1	0	1
4.	18-24	3	2	2	4	2	0	0	0
5.	>24	4	2	1	11	1	2	0	1
	TOTAL	21 (38.2%)	15 (27.3%)	19 (34.5%)	55 (100%)	22 (40%)	21 (38.2)	17 (30.9%)	20 (36.4%)

Nasal endoscopic findings and provisional diagnosis of patients

Preoperative nasal endoscopy was done in all cases. Most common finding was mass/polyp in nasal cavity (100%), blocked osteomeatal complex (100%) followed by discharge (92.7%) and synechia (9%).

Table 3 Nasal endoscopic findings and provisional diagnosis of patients

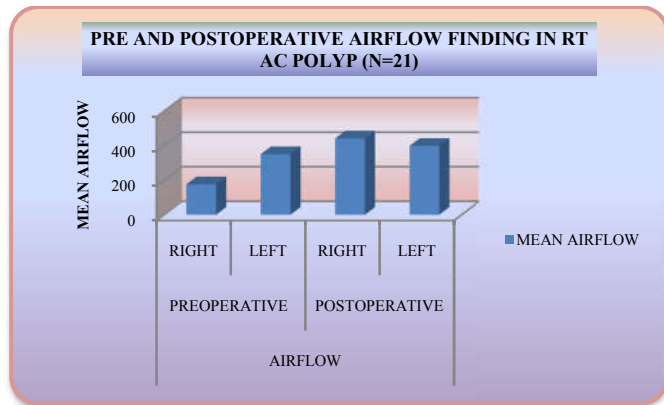
SN	Nasal endoscopic findings	M	F	total (n=55)	%
1.	right	11	10	21	38.2
	left	12	4	16	27.3
	bilateral	11	7	18	34.5
2.	present	31	20	51	92.7
	absent	3	1	4	7.3
3.	patent	0	0	0	0
	blocked	34	21	55	100
4.	present	3	2	5	9.1
	absent	31	19	50	90.9

Table 4 Comparison of pre and postoperative right and left nasal airflow in right antrochoanal polyp patients (n=21)

Airflow	Pre Operative		Post Operative		't'	Sig.
	Mean	S.D.	Mean	S.D.		
Right	176.47	114.23	442.04	72.61	7.26	p<.01
Left	350.76	92.20	399.09	82.27	1.99	p<.06

Statistically significant improvement was seen in post operative mean values of right (442.0 cm³/sec) and left (399.0 cm³/sec) nasal airflow as compared to pre operative mean values of right (176.4 cm³/sec) and left (350.7 cm³/sec) nasal airflow of right antrochoanal polyp patients. The reported t value for right nasal airflow (7.26) was statistically significant

at .01 levels and left nasal airflow (1.99) was in closer proximity at .06 significant levels.

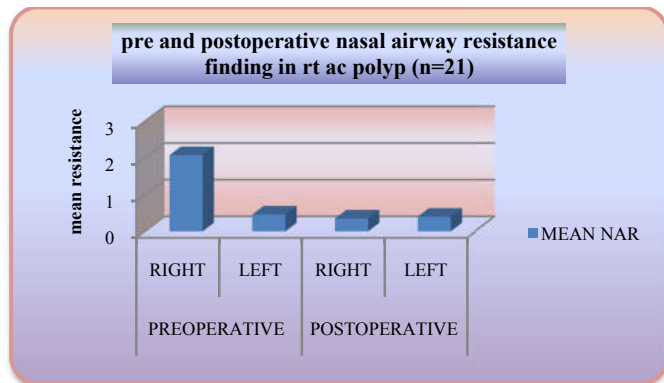


Graph 1 Comparison of pre and postoperative right and left nasal airflow in right antrochoanal polyp patients (n=21)

Table 5 comparisons of pre and postoperative right & left nasal airway resistance (NAR) in right antrochoanal polyp patients

Nasal Airway Resistance	Pre Operative		Post Operative		‘t’	Sig.
	Mean	S.D.	Mean	S.D.		
Right	2.05	2.86	0.34	0.05	2.71	p<.01
Left	0.45	0.13	0.39	0.11	1.94	p<.06
Total	0.30	.09	0.17	0.02	5.60	p<.01

Statistically significant reduction in nasal airway resistance was noted when the post operative mean values of right (0.34 Pa/cm³/sec), left (0.39 Pa/cm³/sec) as well as total (0.17 Pa/cm³/sec) nasal airway resistance was compared with pre operative mean values of the right (2.05 Pa/cm³/sec), left (0.45 Pa/cm³/sec) and total (0.30 Pa/cm³/sec) nasal airway resistance of same population in right antrochoanal polyp patients. The t-value of left NAR (1.94 Pa/cm³/sec) was significant at .06 significant level. Right (2.71 Pa/cm³/sec) and total (5.6 Pa/cm³/sec) NAR were significant at .01 significant levels.



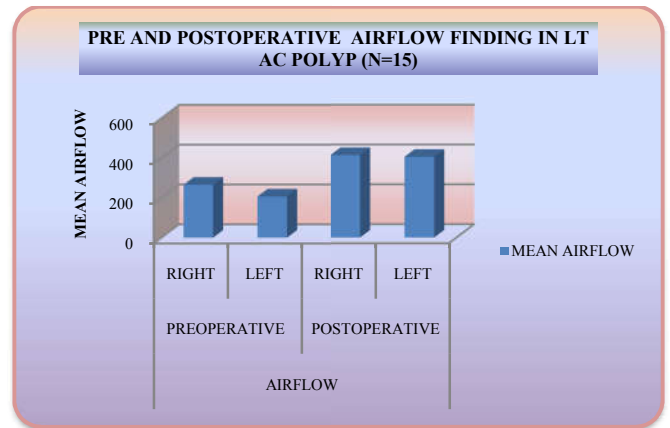
Graph 2 Comparisons of pre and postoperative right & left nasal airway resistance (nar) in right antrochoanal polyp patients.

Table 6 Comparisons of preoperative and postoperative right and left nasal airflow in left antrochoanal polyp patients

Airflow	pre operative		post operative		‘t’	sig.
	mean	SD	mean	SD		
right	265.66	113.51	414.33	112.54	3.99	p<.01
left	206.73	149.02	405.66	117.11	5.19	p<.01

Statistically significant improvement in post operative mean values of right (414.3 cm³/sec) and left (405.6 cm³/sec) air flow as compared to pre operative mean values of right (265.6 cm³/sec) and left (206.7 cm³/sec) air flow of left antrochoanal

polyp patients. The reported ‘t’ value for right and left air flow i.e. 3.99 and 5.19 respectively was statistically significant at .01 level.

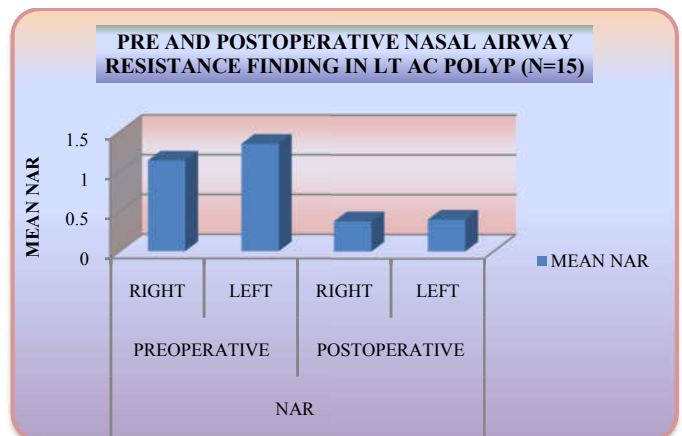


Graph 3 Comparisons of preoperative and postoperative right and left nasal airflow in left antrochoanal polyp patients

Table 7 Comparisons of pre and postoperative right and left nasal airway resistance (NAR) in left antrochoanal polyp patients

Nasal Airway Resistance	Pre Operative		Post Operative		‘t’	Sig.
	Mean	S.D.	Mean	S.D.		
Right	1.13	2.14	0.37	0.10	1.37	p>.05
Left	1.34	1.32	0.40	0.10	2.79	p<.05
Total	0.37	0.18	0.18	0.05	4.03	p<.01

Significant reduction in left (0.40 Pa/cm³/sec) and total (0.18 Pa/cm³/sec) nasal airway resistance of left antrochoanal polyp patients when the post operative mean values of left (1.34 Pa/cm³/sec) as well as total (0.37 Pa/cm³/sec) nasal airway resistance was compared with pre operative mean values of the same. Left at 0.05 and total at 0.01 levels.



Graph 4 Comparisons of pre and postoperative right and left nasal airway resistance (NAR) in left antrochoanal polyp patients

DISCUSSION

In the general population, the prevalence of Nasal Polyposis was considered to be around 4%. Nasal polyposis predominantly affect adults and usually present in patients older than 20 as found by *Hedman et al.* in their study. [11] Nasal polyps usually presents between the ages of 30 and 60 years. There was a strong male predominance with 2:1 male to female ratio. [12] *Balwant et al.* in their study demonstrated that most common clinical presentation was nasal obstruction (94%), followed by rhinorrhea (44%), mouth breathing and

epistaxis in (33%), and postnasal drip in 28% of cases. Least commonly headache 11% was noted. [13] According to Basak et al. Antrochoanal polyps (ACPs) constitute approximately 4-6% of all nasal polyps in the general population, which is high i.e. 33% in children and ACPs occur more commonly in children and young adults, but it may manifest at any age. In a previous study, approximately 70% of patients were between 30 and 70 yr old. ACPs are more common in males than females. [14] In our study we found significant improvement in Nasal airflow was noted and the results were consistent with previous study. Minimal variations in the results may be due to type of Rhinomanometry used (Anterior Rhinomanometry, Posterior Rhinomanometry, or Acoustic Rhinomanometry), use of decongestant or due to technical error. Bourolias et al. [15] in their study selected 64 patients with deviated nasal septum which were undergone surgery. Active Anterior Rhinomanometry was done and nasal airflow and resistance recorded. Preoperative right NAR was 1.73 Pa/cm³/s, Left NAR was 1.50 Pa/cm³/s, and Total NAR was 3.22 Pa/cm³/s. Postoperative right NAR was 0.54 Pa/cm³/s, Left NAR was 0.49 Pa/cm³/s, and Total NAR was 1.03 Pa/cm³/s. Cook et al. [16] in their study 31 patients who had chronic sinusitis (with bilateral disease) and were scheduled to have functional endoscopic sinus surgery (FESS). They were obtained Preoperative total mean NAR 1.26 Pa/cm³/s and postoperative 0.55 Pa/cm³/s. Clarke et al. [16] in their study had taken 60 patients of nasal sinus diseases. Objective measurement was done by posterior Rhinomanometry and subjective by Visual analogues scale. They came to conclusion that the bigger the difference of NAR between nasal passages, patient subjectively indicated as more obstructed.

CONCLUSION

The most common nasal polyp found was right antrochoanal polyp followed by ethmoidal polyp and least common left antrochoanal polyp. Duration of symptom ranged from 6 months to more than 2 years. Nasal obstruction and rhinorrhea are the commonest symptoms of presentation. Active Anterior Rhinomanometry is a sensitive but not a specific tool for detection of Nasal air way resistance. Measurement of Nasal air way resistance is a useful investigation in assessing obstructive nasal pathology for corrective surgery. A good assessment of problem, proper investigation and sufficient endoscopic sinus surgery is the key for successful management.

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