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Original Research Paper

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PRE & POST OPERATIVE ASSESSMENT OF NASAL AIRFLOW BY ACTIVE ANTERIOR RHINOMANOMETRY IN OBSTRUCTIVE NASAL PATHOLOGIES

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ABSTRACT Nasal obstruction is a common symptom seen across various nasal pathologies, the objective way of measuring nasal obstruction is active rhinomanometry. To measure the difference in the nasal airflow of cases of nasal pathology with nasal obstruction, a prospective study was undertaken to compare the pre and post-operative rhinomanometry findings in cases presenting with nasal obstruction.

KEYWORDS : Nasal obstruction, Rhinomanometry, Nasal resistance, Nasal airflow, Septoplasty

INTRODUCTION

One of the most commonly used objective method of assessing nasal airway is the simultaneous recording of the trans nasal pressure and air flow and with the help of these two parameters, the nasal resistance. Rhinomanometry, as defined, is the graphic record of the quantitative measurement of nasal flow and pressure(1,2 & 3).

MATERIAL AND METHODS

The present study was conducted during the period January 2019 to January 2022 in Dept. of ENT, Raipur Institute of Medical Sciences, Raipur (CG). Total 146 cases have been studied. Detailed breakdown as under Table 1

Table 1: Demographic details

Ser	Group 1	Group 2	Group 3
Description	Nasal Obstruction	Asympt. Children	Asympt. Young Adults
Age Grp	16 – 50+	06 – 10	16 – 25
n	84	31	31
Male (%)	58 (69.04%)	18 (58.06%)	19 (61.29%)
Female (%)	26 (30.95%)	13 (41.93%)	12 (38.7%)

The volunteers for this study were divided into groups as described above based on the presenting complaints. Subjects with previous history of nasal surgery were excluded, they were further subjected to ENT examination and active anterior rhinomanometry wherein the pressure vs volume curves were plotted, nasal airflow calculated for both nostrils along with calculation of Nasal Airflow Resistance (NAR) at 150 pascals. 53 subjects of Group 1 underwent surgery and post- operative active anterior rhinomanometry at 01 month post op.The findings were tabulated and the Z score and p values were used for statistical analysis using SPSS software.

RESULTS

Age wise distribution of Group 1 is tabulated in table 2. Mean age calculated for group 1 for male 27.24 yr and female 20.26 yr.

Table 2: Age wise distribution of cases of nasal obstruction

Group	Age Group	No of Cases & Percentage
Adolescents & young adults	14 - 34 yrs	59 (70.23%)
Middle age	36 – 50 yrs	12 (14.28%)
Paediatric age	10 – 13 yrs	10 (11.90%)
Elderly age	50 & above	3 (3.56%)

Presenting complaints for Group 1 were nasal obstruction in all 84 cases and other associated complaints have been listed in table 3. The diagnoses for Group 1 is tabulated in table 4

Table 3: Percentage distribution of symptoms in Group 1

Ser	Presenting Complaints	Total no & Percentage
1.	Nasal Obstruction	84 (100%)
2.	Nasal Discharge	34 (40.47%)
3.	Headache	25 (29.76%)
4.	Nasal Phonation	16 (19.04%)
5.	Anosmia	21 (25%)
6.	Snoring	18 (21.42%)
7.	Epistaxis	10 (11.91%)

Table 4: Disease wise distribution of Group 1

Ser	Disease	No of Cases (no & %)
1.	Rhinosporidiosis	33 (39.29%)
2.	Deviated Nasal Septum	17 (20.25%)
3.	Deviated Nasal Septum & Rhinitis	14 (16.66%)
4.	Sinonasal Polyp	12 (14.28%)
5.	Deviated Nasal Septum & Chronic otitis media	4 (4.76%)
6.	DNS & Sinusitis	1 (1.19%)
7.	Rhinitis medicamentosa	1 (1.19%)
8.	Hypertrophied Inferior Turbinate	1 (1.19%)
9.	Pansinusitis	1 (1.19)

The mean NAR calculated for Group 1 both in terms of age groups and gender is tabulated in Table 5, there was no statistically significant difference in NAR between males & females.

Table 5: Age wise NAR for group1

Ser	Age Group	Mean NAR pa/cm3/sec	Mean NAR Male	Mean NAR Female
1	Paediatric (10 – 13 yrs)	0.71	0.38 (0.14 – 2.94)	0.46 (0.11 – 2.94)
2	Adolescent & young adults (14 – 34 yrs)	0.39		
3	Middle age (35 – 50 yrs)	0.26		
4	Elderly (50 yrs above)	0.38		

The mean age & NAR of Group 2 is tabulated in table 6, no significant difference was seen in the NAR between males &

females

Table 6: Mean age and of group 2

Gender	Mean age	No of cases	Mean NAR
Male	8.06	18	0.24 (0.16 – 0.63)
Female	8.17	13	0.22 (0.15 – 0.38)
Total	8.11	31	0.23 (0.15 – 0.63)

The mean age and NAR of Group 3 is tabulated in table 7, no statistically significant difference was seen in NAR between males & females.

Table 7: Mean age and of group 3

Gender	Mean age	No of cases	Mean NAR
Male	20	19	0.196
Female	18.82	12	0.184
Total	19.41	31	0.190

The 53 subjects of Group 1 underwent surgery and their pre & post operative NAR has been tabulated in table 8. There is statistically highly significant difference between the pre and post operative NAR with Z score of 3.51 and p value of <0.01

Table :8 pre & post Op NAR of group 1

n=53	Range NAR		Mean NAR		Total NAR
	Rt.	Lt.	Rt.	Lt.	
Pre Op	0.223-8.82	0.226-8.82	1.57	1.50	0.51
Post Op	0.21-1.44	0.25-1.92	0.49	0.49	0.25

The maximally obstructed nasal cavity had the maximum improvement in NAR as compared to the minimally obstructed nasal cavity post surgical intervention. The results are tabulated in table 9 showing statistically highly significant improvement post surgery. It should also be seen that even removal of obstruction in nasal cavities seems to marginally improve the airflow in the unaffected nasal cavity also.

Table 9 : NAR in maximally vs minimally obstructed nasal cavities

Status	Maximum obstruction	Minimum Obstruction
Pre Op NAR	2.31	0.76
Post Op NAR	0.53	0.47
p value	<0.001	<0.05

DISCUSSION

The Results obtained by this study shows that maximum cases reporting with nasal obstruction are in the adolescent and young adults group, Similar conclusions are drawn by reseachers elsewhere (3, 4 & 5). Nasal obstruction in paediatric age group is lesser in incidence but more in severity and this if left untreated may also lead to ear pathologies (6, 7). The main symptoms which were associated with nasal obstruction were rhinorrhoea, headache and anosmia which are also closely correlated with various studies on similar topics (8(Hsu & Suh, 2018)). The only difference is the larger incidence of epistaxis which is attributed to the endemic prevalence of rhinosporidiosis which predisposes subjects for development of nasal obstruction with epistaxis, which usually means higher likelihood of neoplastic or malignant etiology in pediatric and geriatric population9, young males with similar presentation of nasal obstruction and epistaxis must also be evaluated for Juvenile Nasopharyngeal Angiofibroma which may resemble rhinosporidiosis mass both historically and sometimes on examination too(10, 11).

Primarily, the major fraction of subjects were diagnosed as Rhinosporidiosis which is endemic in this region, which is followed by deviated nasal septum and rhinosinusitis with polyps. The study successfully demonstrated no difference between the male and female subjects of NAR which shows that the disease process equally affects all irrespective of gender and that the gender has apparently no role in deciding the severity of the symptoms measured objectively by rhinomanometry. The study also demonstrated that children have significantly higher nasal airway resistance as compared to adults and therefore maximum benefit can be accorded to such pediatric subjects by early diagnosis and prompt treatment(12, 13).

Uncorrected nasal obstruction in children is fraught with development of negative middle ear pressure and subsequent aftermath(14).The NAR of subjects with obstruction (Group 1) showed statistically highly significant difference showing that the surgery has a huge role to play in decreasing the nasal resistance, we also saw that the surgery is also able to improve the nasal airflow and decrease the NAR in apparently unobstructed nostril also, this may be due to decreased incidence of alar collapse of the unobstructed or less obstructed nostril as the pressure gradient across such airway will lead to its collapse due to the venturi effect.

Operating and subsequent removal of obstruction effectively decreased the overall nasal resistance and therefore the pressure gradient. This leads to lesser collapse and more patent nasal airway.

CONCLUSION

Active anterior Rhinomanometry is a fast, effective, comfortable, relatively simple diagnostic method for objective measurement of nasal air flow and evaluation of patient's capability of breathing through the nose. Measurement of Nasal air way resistance is a useful investigation in assessing with obstructive nasal pathology for corrective surgery. It should be noted that Active anterior rhinomanometry is a sensitive but not a specific tool for detection of nasal air way resistance.

Patient compliance was good with Active anterior rhinomanometry even children showed well co-operation after proper counseling and demonstration which may be useful as a screening tool for children.Active anterior rhinomanometry cannot be used to measure Nasal air way resistance in totally obstructed nose and cases like septal perforation, velopharyngeal insufficiency, palatal perforation which have not been surgically corrected.Children have significant higher Nasal air way resistance than young adults, So prompt and complete evaluation of nasal obstruction in children is a very important concept that should never be overlooked.On the whole, there was a good correlation between clinical grading of nasal obstruction and the measured nasal resistance.

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