

Effect of Chronic Nasal Obstruction on Pulmonary Function

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ABSTRACT

Introduction: Upper and lower respiratory diseases are closely related which has been well documented in literature. Even though a relationship between upper and lower airway disease has been described, altered pulmonary function in patients with upper airway diseases is still not fully understood. The present study was conducted to assess the effect of chronic nasal obstruction on pulmonary function and to compare the pulmonary function in same patients after surgical relief of nasal obstruction.

Material and methods: The present study was carried out in the Department of ENT and Head and Neck Surgery and Department of Respiratory Medicine, Rohilkhand Medical College and Hospital, Bareilly between November 2017 to October 2018. 56 patients with chronic nasal obstruction due to either deviated nasal septum or chronic rhinosinusitis with or without nasal polyp underwent pulmonary function testing pre and post-operatively at 6 weeks and results were compared.

Results: The most common age group affected was less than thirty years accounting for more than 50%. Mean age of total sample size was 24.2 ± 6.98 years. Thirty three (58.9%) patients were males while 23(41.07%) patients were females. Out of 56 subjects, 34(60.71%) patients underwent septoplasty, while 22(39.28%) patients underwent functional endoscopic sinus surgery. Clinically and statistically significant improvement in FEV₁ and FVC was observed irrespective of age, gender or duration of obstruction.

Conclusion: Patients with bilateral nasal obstruction had worse pulmonary function initially and more significant improvement after surgery, suggesting an association of bilateral obstruction with bad prognosis.

Keywords: Chronic Nasal Obstruction, Pulmonary Function

INTRODUCTION

Narrowing of the nasal cavity due to anatomical or physiological reasons leads to insufficient airflow through the nose and reduces the breathing capacity. Chronic nasal obstruction can occur due to septal deformity, turbinate hypertrophy, nasal polyps, foreign body or rarely neoplasms either benign or malignant. Other causes include inflammatory pathologies, such as chronic rhinosinusitis which is a persistent inflammatory response of mucous membranes of nasal cavity and paranasal sinuses caused by a disturbance of ventilation and drainage of the nasal cavity and paranasal sinuses.¹

Upper and lower respiratory diseases are closely related which has been well documented in literature. Even though a relationship between upper and lower airway disease has been described, altered pulmonary function in patients

with upper airway diseases is still not fully understood. The alteration of normal physiology of nose affect pulmonary function significantly thus relationship between upper and lower airways cannot be neglected.

Spirometry is the measure of air moving in and out of lungs during various respiratory manoeuvres. Various parameters obtained from Spirometry give important information about pulmonary function and also how well the gaseous exchange is occurring. Parameters used for this study include Forced Vital Capacity (FVC), Forced Expiratory Volume in 1 second (FEV₁) and FEV₁/FVC.²

The present study has been carried out to assess the improvement in Pulmonary Function after the correction of the cause of Nasal Obstruction.

The present study was conducted to assess the effect of chronic nasal obstruction on pulmonary function and to compare the pulmonary function in same patients after surgical relief of nasal obstruction.

MATERIAL AND METHODS

This study was carried out from November 2017 to October 2018 in the Department of Otorhinolaryngology and Head & Neck surgery and Respiratory Medicine, Rohilkhand Medical College and Hospital, Bareilly, a tertiary care teaching hospital in western Uttar Pradesh.

All patients of chronic nasal obstruction due to either septal deviation or chronic rhinosinusitis attending the Otorhinolaryngology and Head & Neck Surgery department of Rohilkhand Medical College & Hospital, Bareilly in the stipulated period fulfilling the inclusion criteria were enrolled for the study.

Patients with Chronic nasal obstruction due to either septal deviation or chronic rhinosinusitis between 18 and 50

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years of age, willing for surgery and follow up were included in the study.

Patients not relieved of nasal obstruction after surgery and with previous history of nasal surgery were excluded from the study.

A thorough ENT examination with appropriate investigations was done as required. A detailed nasal examination including diagnostic nasal endoscopy and CT scan was also done if indicated. Patients with chronic nasal obstruction due to either septal deviation or chronic rhinosinusitis were diagnosed after thorough evaluation. All the cases underwent spirometry pre-operatively. Pre-operative spirometry was done one day prior to the surgery.

As per the pathology, appropriate surgery was performed either Septoplasty or Functional Endoscopic Sinus Surgery (FESS) under local or general anaesthesia conventionally. Post-operative spirometry was done after 6 weeks of surgery and the results were compared.

The method and purpose of spirometry was explained to the patient. It was ensured that the patient exhaled for at least 6 seconds during the PFT. The procedure was repeated until 3 readings of which at least 2 of the FVC and FEV₁ components were reproducible. Following parameters were assessed.

1. FVC
2. FEV₁
3. FEV₁/FVC

The values of PFT were considered to indicate significant obstruction when FEV₁ was <80% and FEV₁/FVC was <0.8 of the predicted value for a patient's age, weight and height.

STATISTICAL ANALYSIS

The post-operative data was collected, tabulated and statistically analysed using SPSS version 22 and paired t test.

RESULTS

The study consisted of 56 patients with chronic nasal obstructions due to either septal deviation or chronic rhinosinusitis with or without polyposis who fulfilled

the inclusion criteria and had undergone septoplasty and functional endoscopic sinus surgery respectively.

34(60.71%) patients underwent septoplasty. 22(39.28%) patients underwent FESS. Pre-operative and post-operative pulmonary function tests were done at 6 weeks after surgery.

The most common age group affected was less than thirty years accounting for more than 50%, with a mean age of 24.2 ± 6.98 years.

A statistically significant improvement in FEV₁ and FVC was found in age groups below 20 years, 21 to 30 years and above 40 years but not in age group 31 to 40 years, which showed only clinical improvement. (Table 1)

Though maximum gain in pulmonary function was observed in patients below 20 years of age, the difference in the pulmonary functions between different age groups which was calculated using paired t test was found not to be statistically significant.

The mean duration of nasal obstruction was 3.8 ± 3.13 years. Majority patients 25(44.64%) had less than 2 years of nasal obstruction followed by 16(28.57%) patients who had nasal obstruction between 2-4 years. (Table 2)

In patients with duration of obstruction less than 4 years a statistically significant improvement in value of FEV₁% and FVC% was observed. (Table 3)

Patients with bilateral nasal obstruction had worse pulmonary function pre-operatively and relative gain was more in this group. In both set of patients with unilateral and bilateral nasal obstruction, the postoperative values of FEV₁% (p<0.004) and FVC% (p<0.001) were higher than preoperative values and these results were found to be statistically significant except for FEV₁/FVC also the difference in pulmonary functions between both the groups for FVC, FEV₁ and FEV₁/FVC were, found to be more for bilateral nasal obstruction calculated using paired t test. (Table 4)

There was a significant improvement in the postoperative values of FEV₁%(p<0.001) and FVC%(p<0.001) but not for FEV₁/FVC%. (Table 5)

| | <20 | | | 21-30 | | | 31-40 | | | >40 | | |
|-----------------------|--------|-------|-------|--------|--------|-------|--------|-------|--------|--------|-------|-------|
| | Pre | Post | P | Pre | Post | P | Pre | Post | P | Pre | Post | P |
| FEV ₁ | 71.75 | 83.58 | 0.001 | 77.19 | 84.94 | 0.001 | 79.71 | 85.29 | 0.0159 | 75.59 | 83.56 | 0.001 |
| FVC | 69.17 | 84.25 | 0.001 | 70.94 | 79.80 | 0.001 | 74.01 | 81.70 | 0.0138 | 70.09 | 80.04 | 0.005 |
| FEV ₁ /FVC | 105.33 | 97.50 | 0.098 | 109.69 | 100.75 | 0.092 | 109.71 | 99.71 | 0.0207 | 108.21 | 99.63 | 0.007 |

Table-1: Age distribution in relation to pulmonary function

| Duration of obstruction | Number of patients | Percentage |
|-------------------------|--------------------|------------|
| 0-2YRS | 25 | 44.64% |
| 2-4YRS | 16 | 28.57% |
| 4-6YRS | 7 | 12.5% |
| 6-8YRS | 2 | 3.57% |
| 8-10YRS | 4 | 7.14% |
| >10YRS | 2 | 3.57% |

Table-2: Duration of nasal obstruction

in the postoperative values of FEV₁%(p<0.001) and FVC%(p<0.001) but not for FEV₁/FVC%, compared to preoperative values. The result is in accordance with the studies done by Tuzuner et. al³, Karaman et. al⁵, Bulcun et. al⁷, and Kurkcuoglu et. al⁸ all of whom also found that post-operative FEV₁ and FVC were significantly higher than preoperative values after septoplasty in their respective studies. Karuthedath et. al⁴ and Elmonem et al.⁹ studied the effect of FESS on pulmonary functions in patients of CRS and found marked improvement in post-operative Pulmonary functions. Sonkhya N et al.¹⁰ in a study compared improvement of FEV₁ in patients undergoing FESS for chronic rhinosinusitis with polyposis and asthma (25 cases) and patients who refused surgery and were kept on medical management in the control group. They observed that FEV₁ improved in the study group while it was same or decreased in the control group. This is in accordance with the findings of our study, where we have also found a significant improvement in FEV₁ and FVC post-operatively. Thereby concluding that, relief of nasal obstruction has a positive effect on pulmonary function. The improvement in pulmonary function signified a decrease in bronchial hyper-responsiveness as compared to the preoperative condition.

Thus comparing our study with others it was found that changes in the upper airways adversely affects the lower airways as well. Also that surgical correction of chronic nasal obstruction not only improves the quality of life but also prevents permanent changes that may occur in the lower airways as a consequence of chronic nasal obstruction.

CONCLUSION

Chronic nasal obstruction has been attributed to cause changes in the respiratory mechanisms. Altered pulmonary function leads to dysfunction of the respiratory system and thus affecting the functions of other related systems. Surgical correction of chronic nasal obstruction leads to a favourable outcome in pulmonary function which was corroborated clinically and statistically. On comparing unilateral versus bilateral nasal obstruction it was found that patients with bilateral nasal obstruction had worse pulmonary function and more improvement after surgery. Age or duration of nasal obstruction didn't seem to play statistically significant role in improvement of pulmonary functions after surgery.

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