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PREDICTIVE VALUE OF ABSOLUTE EOSINOPHIL COUNT FOR BRONCHODILATOR REVERSIBILITY IN COPD

Pulmonary Medicine

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ABSTRACT

Background: COPD patients have high prevalence of elevated absolute eosinophil count. Significant number of COPD patients may also have bronchodilator reversibility. This study assessed the predictive value of absolute eosinophil count for bronchodilator reversibility in COPD.
Objective: To find out the predictive value of absolute eosinophil count for bronchodilator reversibility in COPD
Materials and method: Cross sectional observational study in 120 patients with spirometry confirmed COPD after absolute eosinophil count estimation. The predictive value of absolute eosinophil count for bronchodilator reversibility in COPD is assessed
Result: Positive and negative predictive value for peripheral blood eosinophilia in COPD for bronchodilator reversibility was found to be 60% (95% CI =40 - 77.14) and 36% (95% CI=25.3 - 48.29) respectively
Conclusion: Flow reversibility in COPD patients is associated with the degree of peripheral blood eosinophilia.

KEYWORDS

COPD Bronchodilator Reversibility Absolute Eosinophil Count

INTRODUCTION:

COPD patients have high prevalence of elevated absolute eosinophil count. Significant number of COPD patients may also have bronchodilator reversibility. We do not know the predictive value of absolute eosinophil count for bronchodilator reversibility in COPD.

Chronic obstructive pulmonary disease (COPD) is characterised by the presence of bronchial obstruction and chronic airway inflammation. Eosinophilic COPD appears to be a distinct patient subgroup[1,2]. Eosinophilic inflammation has been observed in the airways of some COPD patients[3-7]. Moreover, the severity of airfow obstruction in such patients was found to correlated with the degree of eosinophilia[4 - 6]. Elevated absolute eosinophil counts in COPD patients were significantly greater in the reversible COPD group than in the non-reversible COPD group. Absolute eosinophil count correlated significantly with the increase in FEV_1 (%) in the reversible COPD patients Reversibility to a $\beta_2$agonist also closely correlated with the absolute eosinophil count. COPD patients with non-reversible airway obstruction showed higher degree of neutrophil activation. However, it has been shown that up to 30%of patients with stable COPD undergo an increase in FEV_1 of more than15% from baseline after inhalation of a short-acting β_2-agonist after single test, and up to 70% of patients during serial testing[8]

METHODS:

Cross sectional observational study conducted in 120 patients with COPD who visited the OPD of pulmonary medicine, medical college ,Thrissur who had the inclusion criteria as COPD subjects aged 40 – 75 years with a smoking history of 10 pack-years with post-bronchodilator forced expiratory volume in 1 second (FEV_1) and forced vital capacity (FVC) ratio <0.7. Patients with asthma, malignancy, exacerbation COPD, ischemic heart disease, uncontrolled hypertension, heart failure were excluded.

After careful history and physical examination; COPD was confirmed by pulmonary function tests. Post bronchodilator FEV_1 was taken to confirm COPD. Baseline blood samples were obtained .Absolute eosinophil count were measured during automated full blood count analysis.

RESULTS

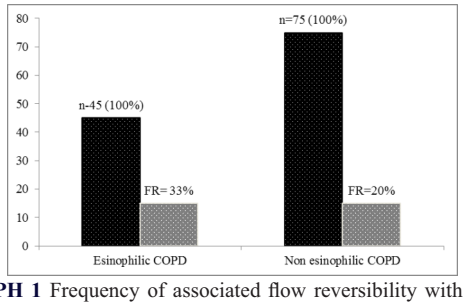
Basic characteristics of the subjects

120 subjects with COPD were studied which included 45 eosinophilic COPD (42 males and 3 females) and 75 non eosinophilic COPD (60 males & 15 females) (p value= 0.786).Mean age was 65 (range 56-70) in eosinophilic COPD group and 64.36 (range 48-80) in non eosinophilic COPD group (p value= 0.786).Smoking history was there in 93.34% of eosinophilic and 80% of non eosinophilic COPD patients.(p value 0.253).BMI in eosinophilic COPD group was 22.1 kg/m^2 and in non eosinophilic COPD 19.8 kg/m^2.In non eosinophilic COPD mean reversibility in FEV_1 was 15.06% with absolute value of 123 ml. Associated mean FVC change was 15.4% and absolute value of 258.8 ml. In eosinophilic COPD group mean reversibility in FEV_1 was 19.5% and 141.3 ml .Mean FVC reversibility was 22.1 % and 297.3 ml.

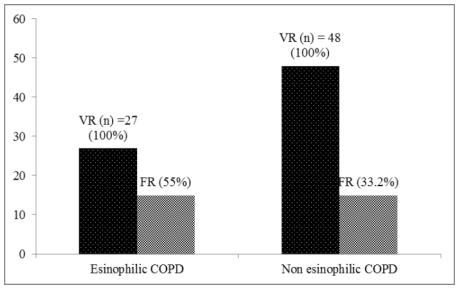
Among 75 patients without peripheral blood eosinophilia 48 (64%) had volume reversibility and 27 subjects (36%) had no reversibility. Among 48 with volume reversibility 15 (31.2%) had associated flow reversibility which amounts to 20% of total patients in non eosinophilic group. Out of 45 patients in eosinophilic group 27 subjects (60%) had volume reversibility. 15 subjects among the volume reversible group showed associated flow reversibility (55%of total volume reversible group).Out of total patients in eosinophilic COPD 33% had flow reversibility which was higher than the non eosinophilic COPD where only 20% had flow reversibility.

TABLE .1: Predictive value of peripheral blood eosinophilia for bronchodilator reversibility in COPD

	Measure	95% CI
Sensitivity	36%	17.9 - 57.41
Specificity	60%	32.2 - 83.66
Positive predictive value	60%	40.0 - 77.14
Negative predictive value	36%	25.3 - 48.29
Accuracy	45%	29.26 - 61.51
Positive likelihood ratio	0.9	0.40 - 2.02
Negative likelihood ratio	1.07	0.64 - 1.77
Pre test odds	1.77	1.15 - 2.74
Post test odds	1.5	0.71 - 3.15



GRAPH 1 Frequency of associated flow reversibility with volume reversibility among eosinophilic COPD and non eosinophilic COPD



GRAPH.2. Percentage of flow reversibility associated with volume reversibility among eosinophilic COPD and non eosinophilic COPD

DISCUSSION

Present study was designed to evaluate whether airway reversibility in COPD patients is amounted with absolute eosinophil count and to find out the predictive value of absolute eosinophil count for bronchodilator reversibility in COPD.

Studies found that more than one-third of patients with stable COPD had partial reversible airway obstruction .Present study shows reversibility in COPD is mostly volume reversibility which was slightly more in non eosinophilic COPD than eosinophilic COPD. Comparing volume reversibility with flow reversibility in eosinophilic and non eosinophilic COPD both had more volume reversibility than flow reversibility; but flow reversibility associated with this volume reversibility was more in eosinophilic COPD.

Flow reversibility was more in eosinophilic COPD group. Studies support the 'Dutch Hypothesis'[9], arguing that allergic sensitisation could be a factor in COPD group with β_2 agonist reversibility, but does not appear to apply to a non-reversible form of COPD. Thus, COPD patients with β_2 agonist reversibility and ongoing eosinophilic inflammation may represent an intermediate group of patients, between asthma and non-reversible COPD, which may have implication for the choice of therapy and in this group of patients, the eosinophil count significantly correlated to the percentage improvement of FEV_1 (flow reversibility) induced by salbutamol. This finding is in agreement with those of Dahlen and colleagues, who found a significant relationship between the change in eosinophil markers and the improvement in lung function in non-smokers or short-term smokers following the emergency treatment of obstructive pulmonary disease[10]. Earlier, Chanez and colleagues[11] have reported that the percentage of reversibility to an oral corticosteroid test correlates with the number of eosinophils in the airways of COPD patients. Together, these findings suggest that eosinophils may be involved in bronchial smooth muscle contractility in COPD. The percentage of active neutrophils was greater in the non-reversible COPD group compared with the control group. This finding supports the current theory that neutrophils may be involved in forms of more emphysematic COPD without reversibility[12,13]. Yet regarding COPD, little advance has been made since the 'Dutch hypothesis' was first proposed. Some prospective studies have shown that a decline in lung function is related to atopy only among current smokers or in the presence of eosinophilia[14,15]. However,other studies have failed to identify any significant relation between lung function response and atopy[16,17]

Present study aimed to find out the predictive value of peripheral blood eosinophilia for bronchodilator reversibility. Positive and negative predictive value for peripheral blood eosinophilia in COPD for bronchodilator reversibility was found to be 60% (95% confidence interval =40 – 77.14) and 36%(95% confidence=25.3 – 48.29) respectively.

Conclusion

Present study shows reversibility was slightly more in non eosinophilic COPD than eosinophilic COPD. Comparing volume reversibility with flow reversibility in eosinophilic and non eosinophilic COPD both had more volume reversibility; but flow reversibility associated with this volume reversibility was more in eosinophilic COPD

CONFLICTS OF INTEREST: nil

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