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The Pulmonary Function Test in Patients of Eosinophilia

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Abstract

Eosinophilia is common in community and as well are lung diseases, so correlation of these ailments with eosinophilia is very essential for minimize the morbidity and mortality. We tried to find out the impact of these disease in our centre and tried to correlate with pulmonary function tests. Total of 100 patients were included in study and results are as mentioned below.

Keywords: eosinophilia, lung diseases, pulmonary function test

1. Introduction

The eosinophil is a polymorphonuclear leukocyte containing several eosinophil specific proteins in cytoplasmic granules. An eosinophil can serve as an end-stage effector cell but can also have specialized roles in the host defense mechanism. However, the eosinophil sometimes harms the host by releasing specific proteins that are potentially cytotoxic to tissues, resulting in pathologic processes¹. One of these proteins is the protein that forms Charcot-Leyden crystals. Eosinophilic lung diseases are a diverse group of disorders characterized by pulmonary opacities associated with tissue or peripheral eosinophilia. The diagnosis of eosinophilic lung disease can be made if any of the following findings is present: (a) pulmonary opacities with peripheral eosinophilia, (b) tissue eosinophilia confirmed at either open or transbronchial lung biopsy, or (c) increased eosinophils in bronchoalveolar lavage (BAL) fluid². A large variety of pulmonary diseases may be associated with occasional blood eosinophilia of a minor degree. These diseases include asthma; various pulmonary infections such as coccidioidomycosis, Pneumocystis jirovecii infection, and mycobacteria; some types of tumor, collagen vascular disorders; idiopathic pulmonary fibrosis; and Langerhans cell histiocytosis³⁻⁷. In this article, we tried to find out the demography and effect of eosinophilia on pulmonary function test.

2. Material and Method

The present study was conducted in department of medicine G.R. Medical College, Gwalior Madhya Pradesh. All the patients of eosinophilia were included in the study, who have absolute eosinophil count of more than 500/cumm. Total of 100 patients were included in the study. Relevant blood investigation including Haemoglobin, Total and Differential Leucocyte Counts, ESR and Absolute Eosinophil Count (AEC). All the patients of Eosinophilia were screened for eligibility. Informed consent was taken from the eligible patients and enrolled in the present study. The patients were interviewed and underwent thorough physical examination. A detailed history was elicited from all patients with emphasis on symptomatology and history of presenting & past illness; personal & family history; drug history of allergy and addiction history was taken. Patients with pulmonary tuberculosis, COPD, Chronic smokers, Ischemic heart disease were excluded from disease. And all patients were subjected for spirometry. The data of proforma and spirometry were analysed for correlation and significance.

3. Results

In present study patients of all age group were included and maximum number of patients were present in less than age of 50 years (85%). although the age group mostly affected was 21-30 years, about 1/3 patients (30%) were there. (table 1) Our study have 60% males and 40% of females in other words we can say that we have a ratio of 3:2 (table 2) The most common presentation of eosinophilia as appeared in our study are cough, breathlessness, fever and pain

in abdomen. pruritis and urticaria are other symptoms of eosinophilia.(table 3) patients presented in our study we categoerixed as per duration of symptoms, so 4 categories were created (table 4) and most patient were presented within 14 days of symptoms (46%). Number of patients who present to us after 60 days of symptoms were 19%. In our study patients with eosinophillia were divided into 3 classes, 500-750,751-1000 and >1001. And maximum patients were in class >1001 AEC (58%) and 28% patients were in group 751-1000. rest 14% were in group 500-750(table 5). All of 100 patients were subjected for spirometry and pulmonary function test was performed on all of them. 61 patients have normal test and 39% patients have abnormal PFT. Out of these 39 patients, 12 have obstructive type and rest 27 have restrictive type of abnormality.so most common abnormality present in our study is restrictive type.(table 6) In our study we found that number of patients with obstructive type of abnormality increase with the increase in AEC. While moderate obstructive type of abnormality was most common abnormality in group 2 and 3 patients.(table 7) 66.66% patients with restrictive pattern seen in ≥ 1001 eosinophil count (group 3).Most patients in group 3 have mild to moderate type of restrictive abnormality.(table 8) Obstructive pattern in most of the patients were presented within 60 days. (table 9) while Restrictive pattern in most of patients was presented after 60 days of duration. (table 10) Average duration for restrictive pattern was 44.48 days vs 20.4 days for obstructive pattern.(table 11) Correlation between Eosinophil count and FEV1/FVC could not be established. (table 12).

Table 1: Age wise distribution

Age (yrs)	No. of cases	% of cases
<20	19	19 %
21-30	30	30%
31-40	21	21%
41-50	15	15%
51-60	7	7%
≥ 61	8	8 %

Table 2: Sex wise distribution

Sex	No. of cases	% of cases
Male	60	60 %
Female	40	40 %

Table 3: Distribution of cases according to clinical presentation

Clinical Presentation	No. of cases	% of cases
Cough	42	42 %
Breathlessness	39	39 %
Pain abdomen	27	27 %
Fever	37	37 %
Pruritis/Urticaria	11	11 %
OTHER	21	21 %

Table 4: Distribution of Cases According To Duration of Symptoms

Duration Of Symptoms (Days)	No. of cases	% of cases
0 – 14 DAYS	46	46%
15 – 29 DAYS	18	18%
30 – 59 DAYS	17	17%
> 60 DAYS	19	19%

Table 5: Distribution of Patients According to the Level of Eosinophil

Acute eosinophil count	No. of Patients	% OF PATIENTS
500 – 750	14	14%
751 – 1000	28	28%
> 1001	58	58%

Table 6: Distribution of cases according to severity of pulmonary function test

Patterns of Abnormality	No. of Patients				Total No. Patients
	Mild	Moderate	Severe	V Severe	
Obstructive	0	7	4	1	12
Restrictive	15	9	1	2	27

Table 7: Correlaton of Level of Eosinophila with Obstructive Pattern and Severity (N=12)

Level Of Eosinophilia	Obstructive Pattern				Total No.Of Patients And %
	Mild	Moderate	Severe	V Severe	
500-750(Gr 1)	0	1	2	0	3(25%)
751-1000(2)	0	3	1	0	4(33.3%)
$\geq 1001(3)$	0	3	1	1	5(41.6%)

Table 8: Correlaton of Level of Eosinophila with Restrictive Pattern and Severity (N=27)

Level of Eosinophila	Restrictive Pattern				Total No. of Patients And %
	Mild	Moderate	Severe	V Severe	
500-750	4	0	0	0	4(14.8%)
751-1000	3	2	0	0	5(18.55%)
≥ 1001	8	7	1	2	18(66.66%)

Table 9: Correlaton of Duration of Symptoms with Obstructive Pattern and Severity (n=12)

Duration of Symptoms	Normal	Obstructive Pattern				Total	Total No. of Patients And %
		Mild	Moderate	Severe	V. Severe		
0-14 Days	46	0	3	2	0	5	10.80%
15-29 Days	18	0	3	0	1	4	5.5%
30-59 Days	17	0	1	1	1	2	11.76%
> 60 Days	19	0	0	0	1	1	5.26%

Table 10: Correlaton of Duration of Symptoms with Restrictive Pattern and Severity (n=27)

Duration of Symptoms	Normal	Restrictive Pattern				Total	Total No. of Patients And %
		Mild	Moderate	Severe	V. Severe		
0-14 Days	46	2	2	0	0	4	8.69%
15-29 Days	18	3	0	0	0	3	16.66%
30-59 Days	17	2	5	1	1	9	52.94%
> 60 Days	19	8	2	0	1	11	57.85%

Table 11: Pattern of Abnormality with Average Duration of Symptoms

Pattern of Abnormality	Average Duration of Symptoms (Days)
Obstructive Pattern	20.4 Days
Restrictive Pattern	44.48 Days

Table 12: Restrictive Pattern Correlation between Eosinophil Count and Fev1/Fvc

Eosinophil Count	Mean Eosinophil Count	Fev1/Fvc Avg \pm Sd
500-750	619.42	0.78 \pm 0.12
751-1000	880.17	0.80 \pm 0.10
> 1001	1267.46	0.79 \pm 0.10

p value = 0.836 (not significant)

4. Discussion

The present study was carried out to see the pulmonary function test in patients of eosinophilia. Total 100 patients were taken in the study in which the absolute eosinophil count was above 500/cumm. The present study was conducted in the Department of Medicine GRMC Gwalior during the period of March 2012 to Nov. 2013. The diagnosis of eosinophilia was made on the basis of clinical symptoms and absolute eosinophil count in the peripheral blood film.

In our study patients having a mean age 35.04 years. Similar pattern of age distribution had been reported in the studies of M.S. Nesarajah et. al⁸. in which the ages ranged from 13 to 63 years with the mean of 34.6 years.

There was a male preponderance in the study with the ratio of 3:2. In our study out of 60 male patients 24 showing change in pulmonary function test and 15 females out of 40 showing abnormal pulmonary function test. The same male preponderance was also found in the previous study done by M.S. Nesarajah⁸, in his study out 25 patients 18 were males and 5 females.

5. Clinical presentation

Cough was the main presenting symptom which include 42% of total patients while breathlessness made up 39%, followed by 37% of fever. In the previous studies by J. Durieu et. al.⁹ respiratory symptoms which were a constant finding with cough and dyspnea. Other symptoms includes pain in abdomen (27%), pruritis (11%) and other non specific symptoms (21%)

6. Duration of symptoms

The patients presented with the above mention presenting complains with different duration, most of the patients presented within 14 days of duration which made a 50% of total number of patients. The other group of duration was 15-29 days in which the patients were presented were 15% and rest of the patients presented with complains of more than 1 month duration which made 35% of total patients.

7. Level of eosinophilia

Diagnosis of eosinophilia was established by absolute eosinophil count in the peripheral blood smear of more than 500/cumm. We divided the patients in 3 groups on the basis of eosinophil count as 1st from 500-750/cumm, 2nd group from 751 to 1000cell/cumm and the third one of > 1001 eosinophils/cumm.

8. Duration of patients based on pulmonary function test

In our study, out of 100 patients 61 had normal lung functions and 39 had abnormal lung functions. Study done by the Andrea K. Boggild et.al¹⁰ had 12 patients of tropical eosinophilia were taken of which 11 patients had abnormal pulmonary function test.

9. Pattern of pulmonary function abnormality

In this study 39 had abnormal PFT in which 12 patients had obstructive pattern of pulmonary function abnormality and 27 had restrictive pattern. This showed the restrictive pattern predominates in the patients of eosinophilia. In the previous studies by S. C. Poh et al¹¹ restrictive pattern had been found in all patients about 30% showing airway obstruction as well. Study done by A study on blood eosinophil level and ventilatory pulmonary function of the workers exposed to storage grain dust¹² 4.76 % obstructive and 9.52 % restrictive pattern of abnormality seen in higher blood eosinophil level. the Andrea K. Boggild, et.al.¹⁰ showed that one of the tropical

eosinophilia presented with restrictive pattern of abnormality with superimposed airway obstruction.

10. Correlation of Pft Abnormality Pattern with Eosinophil Count

In our study the total no. of patients of obstructive abnormality were 12 out of which 7 patients had eosinophil count between 500-1000/cumm. and 5 were > 1001/cumm. The group of restrictive pattern of abnormality total patients were 27 out of which 8 belonged to eosinophil count of 500-1000 and rest 17 out of 27 patients belonged to AEC of > 1001. This suggests that initially in the eosinophilic patients obstructive pattern seen, as the number of eosinophil increases to higher level restrictive pattern predominates.

11. Correlation of Pft Abnormality Pattern with Duration of Symptoms

In the study total number of obstructive patterns were 12 out of which 9 showed duration of symptoms < 30 days and rest 3 patients showing duration of symptoms >30 days. The most of the patients who have restrictive pattern of abnormality having duration of symptoms of more than 30 days, 20 out of 27 patients presented with the symptoms > 30 days. In nutshell, the eosinophilic patients initially obstructive pattern is seen as the duration of symptoms increases, restrictive pattern dominates. In early stages, during acute eosinophilic infiltration the lesions are in the main peribronchial and perivascular consisted of dense accumulation of eosinophil with increase vascularity of lesion. There is also perivascular cuffing with edema of wall. This favours the early obstructive abnormality in eosinophilia patients. In later stage during which eosinophil lesion occurs with histiocyte and lymphocytic infiltration. Interstitial fibrosis occurs initially with peribronchial fibrosis. Initially severity of damage of basal lamina and amount of fibrosis is less as the duration of symptoms increases, the destructed lung tissue replaced by fibrosis. As the fibrosis progresses, dense fibrotic band connects the bronchioles and vessels.¹³ Study done by Udawadia 1967¹⁴ he observed a restrictive pattern of lung function in all his patients and only about 1/5th of the patients showed obstructive pattern, 90% of patients had symptoms of more than 3 month duration. Azad khan et al 1970¹⁵ studied that there is no obstructive ventilator defect and that the pulmonary lesion is a restrictive one.

12. Conclusion

Patients of eosinophilia commonly presented with symptoms of cough and breathlessness with the average duration symptoms of 42 days and 31 days respectively. Obstructive pattern of pulmonary function abnormality initially seen in patients of eosinophilia as the eosinophil count and duration of symptoms increases, restrictive pattern predominates. The correlation of FEV1/FVE with the increasing number of eosinophil count could not be established.

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