A CORRELATION BETWEEN VARIOUS SPLROMETRIC VARIABLES AND PERIPHERAL LEUCOCYTE COUNT

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Abstract

An inverse correlation between peripheral leucocyte count and various spirometric variables, i.e. vital capacity (V.C.), forced vital capacity (FVC), forced expiratory volume in one second (FEV1), forced expiratory ratio (FEV1%), forced mid-expiratory flow rate (FEF 25% — 75% or MMFR), maximum expiratory flow rate (FEF.2—1 .2m1 or MEFR), was found among 60 smokers of various age groups when compared with matched controls. Results suggest that peripheral leucocyte count can be used as another determinant of lung function besides various spirometric variables used in routine assessment of lung function (JPMA 38 132, 1988).

INTRODUCTION

Peripheral leucocyte count and the pulmonary function in smokers have been studied for many years. It has been reported by Sparrow[1] and co-workers that the peripheral as well as lung leucocyte count tend to be higher in cigarette smokers which could reflect a probable increase in the elastinolytic burden on the lung. Cigarette smoking has also been shown to produce changes in various spirometric variables including FEV[2], MMFR[3], MEFR[4] and FVC[5]. In the present study, changes in various spirometric variables and the leucocyte count in smokers have been investigated In order to explore possible correlation between the spirometric variables and leucocyte count and to assess whether peripheral leucocyte count can be used as another determinant of lung function.

PATIENTS AND METHODS

Sixty males with a smoking history of at least one year were selected from the general population. Smokers practising vigorous exercises, and those who were unusually exposed to various dusts, fumes, or having gross abnormalities of vertebral column, thoracic cage, or suffering from neuromuscular diseases, acute febrile illness, disabling cardiac disease and gross anaemia were excluded. Control subjects included 40 healthy subjects who had never smoked. Control subjects as well as smokers had differential leucocyte count within normal range and body mass index below 30. The subjects were divided into 4 age groups with the age range of 21 to 30, 31 to 40, 41 to 50 and 51 to 60 years. Expiratoiy spirometry was performed on an S-model vitalograph spirometer at Pakistan Medical Research Council Laboratory, Karachi. Six seconds Vitalogram charts and disposable safety mouth pieces were used for recording forced expiratory spirogram. Total leucocyte count were estimated by ERMA blood cell counter P,C—604 at the main Clinical Laboratory of Jinnah Postgraduate Medical Centre, Karachi.

RESULTS

The values of all the spirometric variables were lower in smokers as compared to the control subjects,

and the difference was statistically significant for all the variables in the age range of 31-40 years with the exception of MEFR (Table I).

Table 1. Comparative variations in Spirometric variables and peripheral Leucocyte Count with Age in the control Subjects and the Smokers.

Values are expressed as mean ±s. e. m.

Group No.	Age range	Subjects	VC (liter)	FVC (liters)	FEV_1 (liters)	FEV_1 %	MMFR (L/Sec) or (FEF_{25-75})	MEFR (L/Sec) or ($FEF_{02-1.2ml}$)	peripheral leucocyte count (mm^3)
1	2	3	4	5	6	7	8	9	10
			3.84	3.95	3.54	87.76	4.87	12.76	6415.38
		control (13)	±0.16	±0.17	±0.15	±1.83	±0.62	±1.75	±212.69
1	21 – 30		3.64	3.71	3.17	84.48	4.48	10.45	8034.78
		smokers (23)	±0.10	±0.13	±0.10	±1.55	±0.79	±1.37	±154.97
			3.78	3.96	3.31	84.38	3.90	8.85	6484.61
		control (13)	±0.15	±0.17	±0.15	±1.69	±0.40	±1.33	±239.88
2	31 – 40		3.03*	3.11*	2.32*	75.35*	2.99*	6.23	9171.40*
		smokers (14)	±0.09	±0.09	±0.14	±2.43	±0.45	±1.45	±189.69
			2.92	3.19	2.52	79.30	2.55	5.72	7557.14
		control (7)	±0.16	±0.18	±0.13	±0.16	±0.19	±0.32	±221.30
3	41 – 50		2.67	2.86	2.23	77.50	1.89*	4.86	9073.30*
		smokers (15)	±0.13	±0.12	±0.09	±1.49	±0.16	±0.59	±132.90
			2.43	2.63	2.00	75.20	1.93	2.85	8028.57
		control (7)	±0.19	±0.18	±0.17	±1.99	±0.27	±0.36	±197.26
4	51 – 60		1.88*	2.09*	1.60	75.00	1.45	2.52	8512.50
		smokers (8)	±0.62	±0.15	±0.11	±3.23	±0.30	±0.60	±419.37

Number of observal one is given parenthesis below the subjects

*$P < 0.05$ as compared to control in the same age group.

Higher values of peripheral leucocyte count were observed in smokers in all age groups, as compared to the control subjects; the difference was significant in age groups 1, 2 and 3.

Table II. Variations in Spirometric variables with peripheral Leucocyte count in the Smokers.

Values are expressed as mean ± s.e.m.

Group No.	Peripheral leucocyte count (mm^3)	VC (litres)	FVC (litres)	FEV_1 (litres)	FEV_1%	MMFR (L/sec) $FEF_{25-75\%}$	MEFR (L/sec) (FEF.2–1.2 ml)
1	5000 – 5900	–	–	–	–	–	–
2	6000 – 6900 (2)	4.07 ±0.13	4.17 ±0.19	3.64 ±0.25	86.75 ±3.25	5.86 ±0.69	14.14 ±4.54
3	7000 – 7900 (12)	3.27* ±0.27	3.44 ±0.29	2.82* ±0.27	82.83 ±2.91	4.67 ±1.53	12.00 ±2.19
4	8000 – 8900 (24)	3.19 ±0.12	3.33 ±0.12	2.83 ±0.10	82.30 ±1.49	3.11 ±0.26	6.73** ±0.99
5	9000 – 9900 (20)	2.67*** ±0.13	2.81*** ±0.12	2.10*** ±0.09	75.18*** ±1.63	2.24*** ±0.31	3.94*** ±0.24
6	10000–10900 (2)	2.20 ±0.96	2.22 ±0.58	1.45 ±0.30	66.25**** ±3.75	0.78**** ±0.20	1.32**** ±0.72

Number of observations is given in parenthesis below the leucocyte
*P <0.05 as compared to peripheral leucocyte count group 1
**P <0.05 as compared to peripheral leucocyte count group 2
***P <0.05 as compared to peripheral leucocyte count group 3
****P <0.05 as compared to peripheral leucocyte count group 4

Table II shows the variation in the spiro-metric variables with increasing peripheral leucocyte count in the smokers. All the spirometric variables appeared to decrease with the increasing peripheral leucocyte count. Table III shows correlation co-efficient for various spirometric counts in 60 smokers. An inverse correlation was observed between peripheral leucocyte count and all the spirometric variables studied.

DISCUSSION

The present work which is concerned with the study of the effect of smoking on leucocyte count and spirometric variables in our population, confirms the finding of previous studies[6-8] that cigarette smoking leads to elevation of leucocyte count and reduction of spirometric variables. In the present study leucocyte count in smokers was higher than in the non-smokers (Table I). The mechanism of increase is unknown. One postulate is that nicotine induces the release of catacholamines that can raise the leucocyte count, the other being irritant effect of smoke on the respiratory tree with resultant inflammation. Lung function studies, i.e., vital capacity, forced vital capacity, forced expiratory volume in one second, forced expiratory ratio, forced mid expiratory flow rate and peak flow rate all showed reduction in these spirometric variables compared to agematched non-smoking controls. The values of spirometric variables show a decline as the leucocyte count increases, which is suggestive of pulmonary damage induced by elevated leucocyte count. This is further supported by the values of correlation coefficient calculated to relate spirometric variables with leucocyte count in smokers. All the spirometric variables are inversely correlated with the peripheral leucocyte count. Since our data shows relationship between leucocyte count and the spirometric variables in smokers, we are of the view that leucocyte count can be used as another determinant of lung function.

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