Effect of treatment onmaximal expiratory flow rates in tropical eosinophilia

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Ceylon Medical Journal, 1993, **38,** 78-80

Summary

Maximal expiratory flow rates such as peak expiratory flow rate (PEFR), rates at 25%, 50% and 75% of vital capacity (VE max 25%, VE max 50%, VE max 75%) and forced expiratory flow during the middle half of forced vital capacity (FEF 25-75%) were recorded in 23 patients with tropical eosinophilia (TE) before and after treatment. The mean values of all flow rates were significantly lower ($P < 0.001$) in untreated TE patients compared to predicted values. After three weeks' treatment with diethylcarbamazine, although there was a significant rise in the mean values of all expiratory flow rates ($P < 0.05$) except VE max 75% ($P > 0.2$), all flow rates continued to be significantly lower ($P < 0.01$) at one month than predicted values.

Introduction

Studies in patients with untreated tropical eosinophilia (TE) have revealed that the main pulmonary function abnormality is a reduction in single-breath transfer factor (TLCO) (1,2). Transfer factor had significant negative correlation with lung eosinophils, suggesting that the eosinophilic inflammation of the lower respiratory tract may be responsible for the lung injury. It is also known that there is incomplete reversal of this abnormality following a standard 3 week course of diethylcarbamazine (DEC) (5). Since TE patients present with asthma like symptoms (6), airway inflammation leading to airflow limitation in addition to lung parenchymal inflammation (7) is possible in untreated TE. We have reported reductions in maximal expiratory rates in untreated TE (8). However, how this would change with treatment is not known. The aim of the present study was, therfore, to assess response of maximal expiratory flow rates to a standard 3 week course of DEC.

Materials and methods

Twenty three patients fulfilling the diagnostic criteria of TE (6) were studied. The diagnosis was based on the criteria of residence in the filarial endemic area of Madras city, respiratory symptoms such as cough, dyspnoea and nocturnal wheezing, chest xray infiltrates, peripheral blood eosinophilia with absolute counts of > 2000 cells/cu mm, high serum titres of antifilarial IgG and a favourable response to DEC. All patients had symptoms for less than 6 months and none had received treatment with DEC in the past. Peak expiratory flow rate (PEFR), maximal expiratory flow rates at 25%, 50% and 75% of vital capacity (VE max 25%, VE max 50% and VE max 75%) and forced expiratory flow during the middle half of forced vital capacity (FEF 25-75%) were recorded using Transfer Test Model C (PK Morgan Ltd, Chatham, UK). This instrument was provided with a Data Dec computer and X –Y recorder for electronic memory and recording flow volume loops. The results were printed out after correction to body temperature and pressure saturated with water vapour (BTPS).

Maximal expiratory flow-volume loops were recorded by asking the subject to take the deepest breath possible, wrap his mouth tightly around a mouth piece, and on a given signal to blow out as completely and rapidly as possible, and finally to inhale fully as fast as possible taking care to keep his back against the chair-back all the time (9). At least three consistent flow-volume loops were obtained from each patient and the highest value obtained was used for calculation of PEFR. Values of FEF 25-75%, VE max 25%, VE max 50% and VE max 75% were derived from the single best test, and the best test was defined as the one with the highest value of FEV1 and FVC (10,11). The predicted values of maximal expiratory flow rates were obtained from regression equations established in our laboratory (12).

All patients were treated with DEC 6 mg/kg daily for 21 days. Maximal expiratory flow rates were repeated after one month in all patients.

Data are presented as mean+ SD. Statistical analysis was performed using two-tailed students paired t test. A P value less than 0.05 was considered as significant.

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(Accepted forpublication 14 March 1993).

Table 1. Effect of treatment on maximal expiratory flow rates (l/s) in patients with TE (mean + SD)

Variable	*Predicted value*	*Patients with TE at diagnosis (n = 23)*	*Patients TE at one month (n = 23)*
PEFR	6.8±0.7	5.3±1.6	5.8±1.6**
VE max 25%	5.5±0.6	4.1±1.4	4.8±1.2**
VE max 50%	3.8±0.4	2.7±0.9	3.1±1.1**
VE max 75%	1.9±0.3	1.2±0.9	1.4±0.8*
FEF 25-75%	3.9±0.5	2.3±0.9	3.2±0.9**

* No significant change with treatment

** Significant improvement after treatment but still significantly less than predicted values.

Results

All patients were males and eleven of them were smokers. The mean (±SD) age was 22.5 ± 5.3 years (range 15–40 years), height 163.3 ± 6.6 cm and weight 47.4 ±8.3 kg. Since there were no differences in mean values of expiratory flow rates in smokers and non-smokers, this factor was not considered separately.

The maximal expiratory flow rates (l/s) before and after treatment are shown in Table 1. At diagnosis, the mean PEFR (5.3 ± 1.6), VE max 25% (4.1±1.4), VE max 50% (2.7 ± 0.9), VE max 75% (1.2 ± 0.9) and FEF 25-75% (2.8 ± 0.9) were significantly lower than the predicted values ($P < 0.05$). Following treatment, at one month, the mean PEFR (5.8 ± 1.6), VE max 25% (4.8±1.2),VE max 50% (3.1±1.1) and FEF 25-75% (3.2 ± 0.9) showed a significant rise compared to pre-treatment values, but VE max 75% (1.4 ± 0.8) did not show a significant change. However, all flow rates at one month continued to be significantly lower than the predicted values (Figure 1).

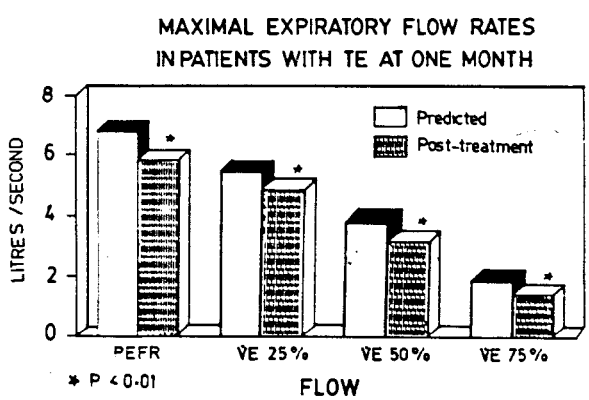

Figure 1

Discussion

Previous pulmonary function studies in patients with untreated TE have shown that the main physiological abnormality is a reduced diffusing capacity and mild to moderate restrictive and obstructive ventilatory defects (1,2,5,6). They also showed that there was incomplete reversal of these changes one month after treatment (2,5). The significant negative correlation between eosinophil count in bronchoalveolar lavage fluid and single-breath transfer factor suggests the possibility that eosinophilic infiltration can cause injury to lung parenchyma (3,4). The clinical manifestations of nocturnal wheezing and rhonchi (6,13) along with mild obstructive ventilatory defect (5,6) suggest that there is airway inflammation in addition to lung parenchymal inflammation (7).

It is possible that bronchial inflammation leads to airway obstruction resulting in reduced expiratory flow rates in untreated TE. This is further corroborated by the airway hyperreactivity seen in TE patients (14). It has been suggested that eosinophilic inflammation can induce bronchial hyperresponsiveness in bronchial asthma (15). Thus, it appears that eosinophilic inflammation of the bronchial tree may also be an important factor in TE along with lung parenchymal inflammation (7). Symptoms disappeared in most patients with DEC for 3 weeks (5), and this was associated with significant improvement in expiratory flow rates. However, the expiratory flow rates at one month were significantly lower than the predicted values. This finding together with the earlier observation of incomplete reversal of other physiological abnormalities after treatment in TE (5) suggests that inflammation does not resolve completely with the three week treatment schedule. A mild chronic inflammation that persists (16) may be responsible for the significantly reduced expiratory flow rates at one month. Studies

are therefore, required to evaluate other treatment modalities including long term DEC or corticosteroids.

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