Changes of breathing pattern and mouth occlusion pressure in patients with airway obstruction after bronchodilator inhalation
M. Franczak, L. Radwan, Z. Maszczyk, A. Kazimierczyk, J. Kusi, J. Kowalski. Unit of Function Laboratory, Department of Thoracic and Lung Diseases, Warsaw, Poland, Department of Lung Diseases, Institute of Thoracic and Lung Diseases, Warsaw, Poland.

It is known that neuromuscular drive is increased in patients with airway obstruction. The aim of the study was to estimate an influence of beta-agonist on breathing pattern and mouth occlusion pressure (P0.1) in patients with reversible and nonreversible airway obstruction. Ventilatory function tests, pattern of breathing, mouth occlusion pressure were measured in 23 patients (15 with bronchial asthma, 8 with COPD), age 48.4 ± 16.7. Their mean FEV1 was 1.6 ± 0.7 l, mean Row 0.79 ± 0.36 kPa/l. Control group consisted of 20 healthy subjects, aged 38.2 ± 8.6 years. Pattern of breathing in patients was changed in comparison to control group - the tidal volume and minute ventilation were increased (0.81 ± 0.19 vs 0.67 ± 0.16 l and 13.3 ± 3.7 vs 9.9 ± 1.9 l), and inspiratory flow (VVT1) was higher, inspiratory and total time were shortened but these differences did not reach statistical significance. Also mouth occlusion pressure and inspiratory impedance were significantly increased (P0.1 3.6 ± 1.6 vs 1.6 ± 0.5 cmH2O and P0.1/VVT1 0.6 ± 2.3 vs 3.8 ± 1.0 cmH2O/l/s).

In all patients these measurements were repeated 20 minutes after beta-agonist inhalation (0.2 mg fenoterol). Patients were divided in two groups according to reaction to the drug. Gr.A consisted of 15 pts. (mostly with bronchial asthma), who responded to bronchodilator (increase in FEV1 > 15%) and revealed significant decrease of P0.1 (0.48 ± 1.2 vs 2.6 ± 1.2 cmH2O) and P0.1/VVT1 (6.6 ± 2.4 vs 4.2 ± 1.1 cmH2O/l/s). Gr.B consisted of 8 pts (mostly with COPD) who did not respond to bronchodilator (ΔFEV1 ≤ 15%) and did not present changes in P0.1 and P0.1/VVT1.

The reduction of neuromuscular drive and inspiratory impedance in responsive patients (Gr.A) is a consequence of diminishing of nonelastic respiratory load and seems to be an additional advantage for the patient.

Conclusion: In this study we have shown that obtained perception of dyspnoea during a histamine provocation test in asthmatic patients by three different methods to assess the comparability of these techniques.

Methods: In 154 asthmatic patients a histamine provocation test was obtained. The FEV1 was measured after each inhalation of histamine, and the subjects were asked to rate their symptoms of dyspnoea on a Visual Analogue Scale (VAS). VAS score was dichotomized as follows. Any increase in VAS score was coded as good perception; no change in VAS score was coded as no perception. For further analyses, correlations and slopes were used to analyze the relationship between VAS score and the reduction in FEV1. The results of these three different methods were compared.

Results: Dyspnoea as indicated by the VAS scale increased as the FEV1 decreased in 150 subjects (97.4%). The correlation and slope between increase in VAS score and decrease in FEV1 could be analyzed respectively in 137 and 122 subjects. The group mean correlation was 0.83 ± 0.30 SD. The group mean slope of perception of dyspnoea/percentage fall in FEV1 was 1.11 ± 0.75 SD. After dichotomy between good and bad perceivers, we obtained different proportions for each method (Table 1). Although the relation between the individual slopes and correlation was significant (p < 0.01), the correlation between the methods was not very convincing (r = 0.41).

Table 1: Percentages of good and bad perceivers for each method.

<table>
<thead>
<tr>
<th>Method</th>
<th>Good perception</th>
<th>No good perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope</td>
<td>71.3%</td>
<td>28.7%</td>
</tr>
<tr>
<td>Correlation</td>
<td>10.9%</td>
<td>89.1%</td>
</tr>
<tr>
<td>Any increase in VAS score</td>
<td>97.4%</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

Conclusion: In this study we have shown that obtained perception of dyspnoea during a histamine provocation test by three different methods leads to different results. Therefore, the qualification "good perceiver" depends on the kind of measurement.

Pulmonary gas transfer and exercise

Factors underlying the relationship of transfer factor (Tl, CO) to alveolar volume (VA)
J.E. Cotes, D.J. Chinn, J.W. Reed. Dept. Physiological Sciences, Medical School, Newcastle upon Tyne, UK

Background and Aims: in normal subjects Tl, CO is described more accurately by a pressure (St) and VA than by age and St alone (Chinn et al, Eur Respir J 1996; 9: 1269-1277). Tl, CO reflects the diffusing capacity of the alveolar capillary membrane (Dm) and volume of blood in alveolar capillaries (Vc); hence our question: Is the contribution of VA to Tl, CO mediated via an effect on Dm or Vc, or both variably.

Methods: Measurements of Dm and Vc by the single breath CO method for 46 asymptomatic men (33 smokers and 13 non-smokers) from a previous study (Cotes et al. Br J Industr Med 1985; 40: 13-21) were re-analysed. The mean age was 41.7 (range 20-72) yr. To avoid co-linearity with St, VA was expressed as VA/St². Dm and Vc were analysed in the reciprocal forms in which they were derived.

Results: Tl, CO was related to VA. St², and smoking (p < 0.05); age contributed in the absence of VA. St². Dm was not related to VA. St². St was significant in the absence of VA. FC was related to St but not to VA. St².

Conclusions: VA contributes to both subject variation in Tl, CO by affecting Dm. This result resembles that within subjects measured at different levels of VA (Hamer NJ, Clin Sci 1963; 24: 275-279).

Consequences of carbon monoxide from tobacco smoke on hemoglobin

We studied 132 consecutive subjects (77% males), age 60.4 ± 12.7 yr (22-85 yr) sent to our lab for blood gas analysis and with PaO2 higher than 65 mmHg. They answered a questionnaire asking for age, number of cigarettes smoked per day the last fifteen days, number of hours per day they stayed in a room were other people were smoking, their occupations and if they had gas or fuel heating systems at home. 3 ml blood samples were anaerobically drawn from the radial artery. Blood samples were tested twice with an Instrument Laboratories (Lexington, MA) IL 482 co-oxymeter. Patients were divided in non-smokers (n = 46), passive smokers (> two hour in a room were somebody was smoking) (n = 29), smokers < 10 (n = 12), smokers > 10 < 20 (n = 21), smokers > 20 < 40 (n = 25) and smokers > 40 (n = 9).

Conclusion: It is very important to have more and continual informations about changes in blood gases or brain perfusion during conventional ventilation. The evaluation of pneumotachographs could help to detect uncontrolled hyperventilation, especially in neonates with SIPPV. Uncontrolled hyperventilation generated by the fluid in the hoses could increase the risk for both hyperoxygenation of the brain and barotrauma.

Pulmonary gas transfer and exercise

Factors underlying the relationship of transfer factor (Tl, CO) to alveolar volume (VA)
J.E. Cotes, D.J. Chinn, J.W. Reed. Dept. Physiological Sciences, Medical School, Newcastle upon Tyne, UK

Background and Aims: in normal subjects Tl, CO is described more accurately by a pressure (St) and VA than by age and St alone (Chinn et al, Eur Respir J 1996; 9: 1269-1277). Tl, CO reflects the diffusing capacity of the alveolar capillary membrane (Dm) and volume of blood in alveolar capillaries (Vc); hence our question: Is the contribution of VA to Tl, CO mediated via an effect on Dm or Vc, or both variably.

Methods: Measurements of Dm and Vc by the single breath CO method for 46 asymptomatic men (33 smokers and 13 non-smokers) from a previous study (Cotes et al. Br J Industr Med 1985; 40: 13-21) were re-analysed. The mean age was 41.7 (range 20-72) yr. To avoid co-linearity with St, VA was expressed as VA/St². Dm and Vc were analysed in the reciprocal forms in which they were derived.

Results: Tl, CO was related to VA. St², and smoking (p < 0.05); age contributed in the absence of VA. St². Dm was not related to VA. St². St was significant in the absence of VA. FC was related to St but not to VA. St².

Conclusions: VA contributes to both subject variation in Tl, CO by affecting Dm. This result resembles that within subjects measured at different levels of VA (Hamer NJ, Clin Sci 1963; 24: 275-279).

Consequences of carbon monoxide from tobacco smoke on hemoglobin

We studied 132 consecutive subjects (77% males), age 60.4 ± 12.7 yr (22-85 yr) sent to our lab for blood gas analysis and with PaO2 higher than 65 mmHg. They answered a questionnaire asking for age, number of cigarettes smoked per day the last fifteen days, number of hours per day they stayed in a room were other people were smoking, their occupations and if they had gas or fuel heating systems at home. 3 ml blood samples were anaerobically drawn from the radial artery. Blood samples were tested twice with an Instrument Laboratories (Lexington, MA) IL 482 co-oxymeter. Patients were divided in non-smokers (n = 46), passive smokers (> two hour in a room were somebody was smoking) (n = 29), smokers < 10 (n = 12), smokers > 10 < 20 (n = 21), smokers > 20 < 40 (n = 25) and smokers > 40 (n = 9).

Conclusion: It is very important to have more and continual informations about changes in blood gases or brain perfusion during conventional ventilation. The evaluation of pneumotachographs could help to detect uncontrolled hyperventilation, especially in neonates with SIPPV. Uncontrolled hyperventilation generated by the fluid in the hoses could increase the risk for both hyperoxygenation of the brain and barotrauma.