

# Correlation between the upper and lower respiratory tract in childhood

D. Černelč, Ljubljana, Yugoslavia

## SUMMARY

*Nasal and bronchial resistance can be measured by bodyplethysmography. This is a practical method of measurement of resistance due to upper and lower respiratory tract obstruction. It is a comfortable method for children too. A close correlation was found between the nasal and bronchial resistance during the allergen inhalation test. The calculated correlation coefficient between the  $R_n$  and  $R_{aw}$  was statistically significant.*

## INTRODUCTION

Measuring of the nasal airway resistance was first introduced by Butler (1960). The results of plethysmographic measurements were described by Nolte et al. (1972). This method evolved from the pulmonary physiology. Recently, it has been used in measuring nasal airway resistance.

Our experiences showed that children with pathologic changes of the upper respiratory tract (shadowing of paranasal sinuses, deviation of nasal septum, atopic rhinitis) had significantly higher pathologic lung ventilation tests than children with normal upper respiratory tract (Černelč et al., 1971).

The aim of our study was to determine the correlation of bronchial and nasal airway resistance before and after the inhalation of physiologic saline (control test) and inhalation of the extract of allergen *Dermathophagoides pteronyssinus* and *farinae* (Černelč et al., 1976).

The investigation aimed at a better evaluation of the effect of allergens on the nasal and bronchial mucosa by measuring nasal and bronchial airway resistance using bodyplethysmography.

## MATERIAL AND METHOD

Practically all of the 29 asthmatic children aged 7-15 years underwent a routine allergologic investigation with cutaneous (prick) tests and provocation tests with inhalative allergen extracts (Černelč et al., 1974). All patients were in the symptom-free period and were not administered any symptomatic drugs during the previous 24 hours. The inhalation tests were performed with Heyer inhalator with dispersion of drops of 5-10  $\mu$  for nasal provocation tests and with dispersion of

drops up to 0,5  $\mu$  for bronchial provocation tests.

Tests were carried out with the subject resting and comfortably seated. The inhalation tests were preceded by the explanation of the procedure and a number of preliminary measurements. The children were allowed to watch the procedure and were next encouraged to do the same. The allergen extract of *Dermatophagoides pteronyssinus* and *farinae* for bronchial provocation tests was used in concentration of  $10^{-8}$  and  $10^{-6}$  and for nasal provocation tests in concentration of  $10^{-5}$  to  $10^{-3}$ . In all cases the provocation test was concluded by letting the patient inhale Salbutamol aerosol and decongestive nasal drops. Only mild clinical signs, i.e. dyspnea, rhonchi, sneezing etc., were observed to result from the inhalation or nasal tests.

Bronchial resistance was measured by bodyplethysmography of Gould-Godart type 8264 (Hofmann et al., 1977).

For the calculation of nasal resistance the method by Nolte (1968, 1972) was used.

### Statistical evaluation

In testing for significance the t-test was used. This paper reports the obtained difference statistically significant at the 0,5 per cent level or better ( $P < 0.05$ ).

The relationship between the bronchial and nasal resistance values before and after the control and inhalation tests (provocation tests) have been determined by regression calculation. The correlation between all values of nasal and bronchial resistance is graphically represented.

## RESULTS

Statistical analysis showed the resistance (nasal and bronchial) values after the inhalation tests of allergen extracts to be significantly higher than those before the

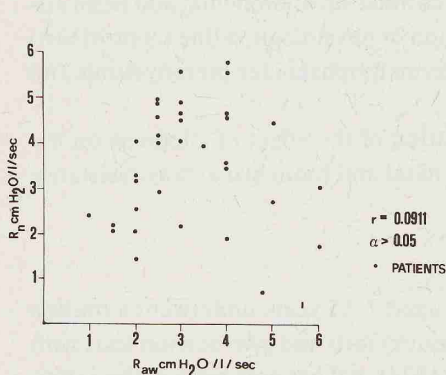


Figure 1. Correlation between nasal airway resistance ( $R_n$ ) and bronchial resistance ( $R_{aw}$ ) during control tests with physiologic saline.

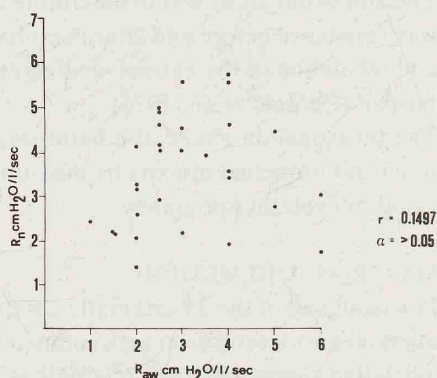


Figure 2. Correlation between nasal airway resistance ( $R_n$ ) and bronchial resistance ( $R_{aw}$ ) before allergen inhalation tests.

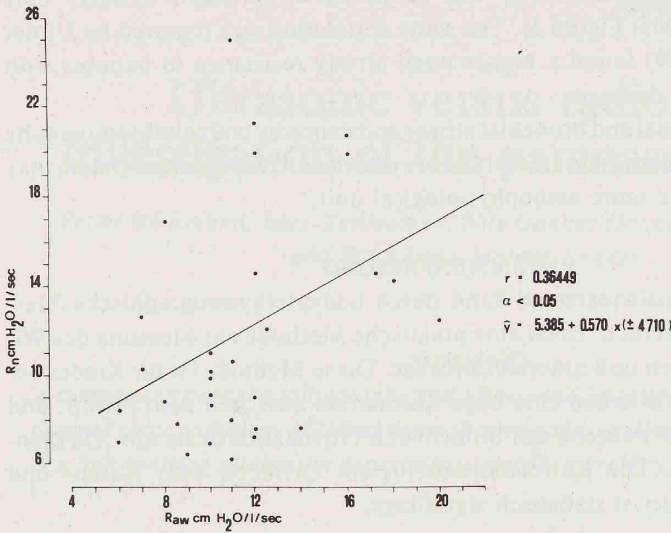


Figure 3. Correlation between nasal airway resistance ( $R_n$ ) and bronchial resistance ( $R_{aw}$ ) during allergen inhalation tests.

provocation tests and after the control tests. The correlation coefficient has been calculated for nasal and bronchial airway resistance values prior to provocation tests (Figure 1), after the control tests (Figure 2) and during allergen inhalative test (Figure 3).

The t-test for significance of these differences evidenced the nasal and bronchial airway resistance values to be significantly higher after the allergen inhalation test only.

## DISCUSSION

Bodyplethysmographic measurements of bronchial airway resistance and the nasal resistance measurements by Gould-Godar bodyplethysmograph type 8264, apparatus in both, children and adults (Hofmann et al., 1977) showed a high dispersion of results.

The nasal resistance is higher than the bronchial one (Nolte, 1972; Speitzer, 1964). In accordance with Nolte's observation in healthy adults and in our asthmatic children during the symptom-free period there was no close correlation between the nasal and bronchial airway resistance. In patients after the inhalation of physiologic saline (control tests), the values of nasal and bronchial airway resistance were practically the same as before the control test (Figure 1). The calculated correlation coefficient was not statistically significant ( $r = 0.0911$ ,  $P > 0.05$ ). Correlation between nasal airway resistance ( $R_n$ ) and bronchial resistance ( $R_{aw}$ ) before allergen test is not statistically significant ( $r = 0.1497$ ,  $P > 0.05$ ) (Figure 2). Significant correlation was found between the nasal and bronchial airway resist-



ance in asthmatic patients after the inhalation of allergen extracts only ( $r = 0.36449$ ,  $P < 0.005$ ) Figure 3). The same correlation was reported by Ulmer (1972). Cohen (1969) found a higher nasal airway resistance in patients with chronic obstructive diseases.

The evaluation of nasal and bronchial airway resistance by bodyplethysmography confirmed the well-known fact that the airway from nose to bronchial system may be considered as the same pathophysiological unit.

#### ZUSAMMENFASSUNG

Nasen- und Bronchialwiderstand kann durch bodyplethysmographische Messungen dargestellt werden. Es ist eine praktische Methode zur Messung des Widerstandes der oberen und unteren Luftwege. Diese Methode ist für Kinder besonders geëignet. Wir haben eine enge Korrelation zwischen dem Nasen- und Bronchialwiderstand während des bronchialen Provokationstests mit Allergenextrakten gefunden. Die Korrelationskoeffizient zwischen dem Nasen- und Bronchialwiderstande ist statistisch signifikant.

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Prof. Dr.sc. Dr. D. Černelč  
Otolaryngological Department  
Clinical Centre  
61 000 Ljubljana  
Zaloška 2  
Yugoslavia