

Acoustic analysis of respiratory sounds during methacholine challenge in preschool children

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Abstract

Background: There are changes in inspiratory breath sound intensity in patients with airway obstruction. Airway narrowing may change sound spectral characteristics. Aim: To define the characteristics of lung sounds at standardized air flow during methacholine challenge and to compare acoustic changes with transcutaneous oxygen tension (PtcO₂) during induced airway narrowing. Patients and methods: Forty asthmatic children (20 male) aged 5.2±1 years and 40 normal children (18 male), aged 5.6 ± 1 years were studied. All patients were free of respiratory tract infections one month before the study. A methacholine challenge from 0.06 to 8 mg/ml was performed; the test was ended when a fall in PtcO₂ of >20% from baseline was observed or if the final concentration was reached. Subjects breathed through a pneumotachograph aiming at flows of 0.4 to 0.6 l/s. Respiratory sounds were recorded using contact sensors at the suprasternal notch and at the posterior right lower lobe. From average spectra, power at low (100-200 Hz=P₁) and high frequencies (400-2000 =P₂) was calculated. Frequencies below which 50% (F₅₀) and 99% (SEF₉₀) of the spectral power between 100 and 2000 Hz was contained, were also calculated. Results: In asthmatics, the methacholine concentration at which a 20% fall in PtcO₂ was observed, was lower than in normal children (p< 0.05). There was an increase in P₁ (p<0.01) and a reduction in P₂ (p<0.01) during inspiration, in subjects that experienced a 20% reduction in PtcO₂. Also, there was an increase in F₅₀ and SEF₉₉ during inspiration in lung sounds, but not over the trachea. Conclusions: Lung sounds analysis can be useful for the assessment of airway reactivity in asthmatic children