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Title: Frequency dependence of capnography in anesthetized rabbits

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Body: Objective, non-invasive lung function measurements are needed to improve the diagnostic of asthma in uncooperative young children. The shape of capnogram may be informative to the presence of bronchial obstruction, but the potential of aspirative capnography may be limited in young children because of the comparatively high rate of breathing (RB). The objective was to characterize the flattening of the capnogram induced by acute airway obstruction at different RB, with reference to respiratory mechanics. Material and method. Eight anesthetized paralyzed rabbits were artificially ventilated at 30, 60 and 80 breaths.min⁻¹. Measurements of expired CO₂ and of respiratory resistance (Rrs) and reactance (Xrs) at 8Hz using the forced oscillation technique were taken at baseline and after methacholine aerosol. The capnogram was characterised by the slope of the transition line from dead- to alveolar space (alfa), the slope of the alveolar plateau (beta), Q, the angle between alfa and beta, DI, the maximum value of the first time derivative, DII, the minimal value of the second time derivative. Results. Methacholine induced significant decrease in alfa, DI and Xrs, increase in DII and Rrs at all RB (p<0.001), significant increase in beta and Q at 30 (p<0.001), but not 60 or 80 breaths.min⁻¹. At 30 breaths.min⁻¹, beta or Q were found to correlate best with Xrs (p<0.0001) and to a lesser extent with Rrs (p=0.001). Alfa, DI and DII correlated with Xrs at 80 breaths.min⁻¹ (p<0.045). Conclusion. Alfa, DI and DII appear the most robust capnogram shape-indices in a range of breathing frequency relevant to young children respiratory disease.