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Title: Comparison of changes in the expiratory capnogram waveform and regional ventilation distribution measured by synchrotron imaging during acute bronchoconstriction in brown Norway rat

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Body: RATIONALE: Although the increase in the phase III slope of the volumetric expiratory capnogram (S3v) is attributed to ventilation heterogeneity in patients, the relation between S3v and direct measurements of ventilation distribution has not been studied. METHODS: Rats divided into 2 groups: ovalbumin-sensitized (OVA) and exposed to air or to NO₂, 10 ppm, 6h/d, 5d/wk for 4 weeks underwent K-edge subtraction synchrotron imaging, to measure regional ventilation (sV*), the area of well-ventilation regions (VAA) and ventilation heterogeneity (CV of sV*) at baseline and during intravenous infusion of methacholine (MCH, 15 µg/kg/min (γ)). S3v was computed using a rapid CO₂ analyzer. RESULTS: S3v and CV of sV* increased during MCH infusion and the 2 parameters were correlated (R=0.78, p<0.001).

m±SD	Air-OVA (n=4)		NO2-OVA (n=4)	
	Baseline	MCH15γ	Baseline	MCH15γ
CV of sV* (%)	15.3 ± 5.2	42.6 ± 25.0*	18.2 ± 8.0	49.3 ± 42.4*
VAA (% Total Lung Area)	93.8 ± 2.5	66.7 ± 22.1*	90.8 ± 7.7	72.3 ± 25.1*
S3v (mmHg/ml)	2.45 ± 0.07	3.32 ± 0.46	2.49 ± 0.15	4.33 ± 0.44*#

*: p<0.05 vs. baseline, within a group; #: p<0.05 vs. Air-OVA, within a condition, by ANOVA.

CONCLUSIONS: This is the first comparison of S3v with direct measurements of ventilation heterogeneity confirming the contribution of this parameter to the increase in S3v during bronchoconstriction.