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Title: Can non-invasive measurements of respiratory phase angle offer a surrogate of disease severity in COPD? 2- Tidal breathing data

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Body: Introduction: During respiration, the thorax and abdomen change in volume. Increased resistance changes the phasing of these movements. Structured Light Plethysmography (SLP) is a non-invasive method of assessing the movement of thorax and abdominal wall. The movement of a projected grid of light records compartment volume change, from which a Konno-Mead loop (KM), phase angle (Phi) and entropy can be derived. Aims: To interrogate Phi during Tidal breathing (TB) between COPD and controls. Methods: TB data were collected from 10 COPD patients in exacerbation (av Age 71.8, (47-92) (No PFT), and 10 controls (Av Age 55, Av FEV1% 95 (95-105). 17 parameters were derived including Overall Phase (OPhi), principle angle (PA), KM spread, IT and ET. KM loop principal angle and spread was derived from Principal Component Analysis. For all parameters except OPhi, the mean, median and entropy (ApEn*) were calculated. The Mann Whitney and Brown-Forsythe tests were applied for significance. Results: Mean Phi, Median Phi, ApEn, KM Spread, Mean Angle Change, Mean IT, Median IT, ApEn IT, and ApEn ET were statistically significant. For controls KM Spread, the ApEn Phi was low, suggesting regular TB. Entropy of IT and ET, was high in COPD.

Table 1 - Results

	Brown Forsyth (two tailed)		Mann-Whitney U
Statistic	0.025	0.05	p
Overall Phase			0.607
Mean Phase-w	*	*	0.071

ApEn Phase-w		*	0.031
Mean Phase-b		*	0.571
Median Phase-b		*	0.395
ApEn Phase-b			0.918
KM Spread		*	0.680
Principle Angle			0.164
Mean Angle change		*	0.354
Mean IT			0.023
Median IT			0.020
ApEn IT		*	0.002
ApEn ET			0.005

Conclusion: SLP enables a non-invasive and objective assessment of the chaotic tidal breathing patterns in COPD.