Long-Term Variability in Oscillatory Impedance in Stable Obstructive Airways Diseases

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Rationale: The forced oscillation technique (FOT) may be used for monitoring in obstructive airways diseases in the clinic, such as obliterative bronchiolitis in bone marrow transplant (BMT) recipients, asthma and COPD. It requires tidal breathing during which the flows generated by oscillatory pressure waves superimposed at the mouth are used to derive respiratory system resistance (Rrs) and reactance (Xrs). Knowing the between visit variability in stable disease would aid clinical interpretation of Rrs and Xrs. We hypothesised that the within- and between-visit variability is increased in obstructive airways disease but differs between diseases. Methods: 16 BMT recipients without airflow obstruction, 20 COPD and 25 asthmatic subjects underwent FOT measurements during their regular clinic visits at the Respiratory Department of Royal North Shore Hospital. All subjects were clinically stable during the visits. 12 healthy controls also underwent repeated FOT measurements. Within-session variability was calculated as the standard deviation (SD) and coefficient of variation (CoV) of 3 repeated measurements of each session and between-visit variability was expressed as the SD of the mean measurements over 3 separate visits, several months apart. Results: Mean FEV1/FVC ratios for BMT, asthma and COPD groups were 0.78±0.07, 0.64±0.12 and 0.44±0.16, respectively. The within- and between-visit SD of Rrs and Xrs were increased in BMT recipients compared to healthy controls ($p=0.03$ for both) and were greatest in patients with COPD and asthma. Differences in CoV were similar to that for SD. In the entire group, within-session variability of Rrs and Xrs was related to the between-visit variability ($r_s=0.58$, $p<0.0001$, $r_s=0.77$, $p<0.0001$,respectively) and worse FEV1/FVC correlated with increased within- and between-visit SD of Xrs ($r_s=-0.38$, $p=0.002$, $r_s=-0.46$, $p=0.0002$, respectively). Conclusion: In clinically stable subjects, within- and between-session variability is increased in BMT recipients with normal spirometry, but is less than in asthma and COPD, where variability was similar despite worse airflow obstruction in COPD subjects. This suggests that variability of Rrs and Xrs may be used as a marker of disease progression or activity in the clinic.

	Healthy	BMT	Asthma	COPD
Within-session SD Rrs	0.12 (0.08-0.2)	0.19 (0.10-0.4)	0.26 (0.18-0.37)	0.24 (0.17-0.40)
Within-session SD Xrs	0.05 (0.03-0.07)	0.11 (0.04-0.15)	0.24 (0.13-0.6)	0.34 (0.17-0.68)
Between-visit SD Rrs	0.14 (0.10-0.23)	0.26 (0.17-0.39)	0.51 (0.28-0.86)	0.62 (0.44-0.86)
Between-visit SD Xrs	0.09 (0.05-0.13)	0.16 (0.10-0.26)	0.49 (0.24-0.87)	0.74 (0.39-1.1)

** Expressed as median (interquartile range) (cm H_2O/L/s)*

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