THE EFFECT OF THE AEROBIKA® OSCILLATING PEP (OPEP) DEVICE ON AIRWAY STRUCTURE, FUNCTION AND DRUG DEPOSITION IN PATIENTS WITH COPD

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OBJECTIVE

Sputum clearing devices, such like the Aerobika®, are designed to aid in the clearance of mucus by generating oscillatory positive expiratory pressure (OPEP) pulses in the airways. By clearing mucus, OPEP therapy has the potential to induce changes in drug deposition in the airways. In spite of the physiological rationale behind this approach, it remains hard to establish the clinical efficacy. Functional Respiratory Imaging (FRI) is able to assess these local effects of OPEP on lung structure and function.

The primary aim of this study was to investigate the possible effect of the Aerobika® device on the aerosol deposition pattern of concomitant inhalation medication using FRI.

METHODS

A single center, prospective study, was performed in sputum producing COPD patients. The subjects were instructed to use the Aerobika® device for 10 minutes, afterwards taking their standard of care medication and continue using the device twice daily for a total period of 15 ± 3 days. Paired inspiratory-expiratory HRCT scans were taken before and after the start of the treatment period. Afterwards, FRI was used to evaluate changes in the lung dynamics and deposition of concomitant medication.

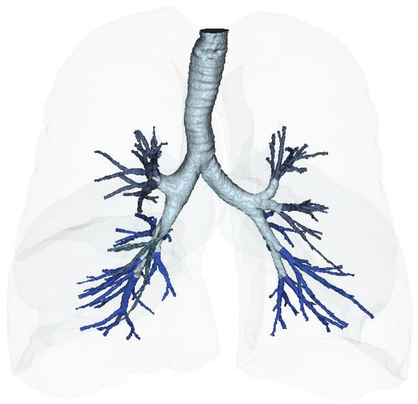

***Figure 1**: Visualization of lung dynamics of COPD patient.*

RESULTS

Ten subjects were investigated (7 male/3 female, mean age 67.3±9.6 years, mean FEV1 55±18.0 %predicted). A shift in internal airflow distribution between -7% and +5% was observed, significantly correlating to airway deposition of the concomitant medication (Figure 2).

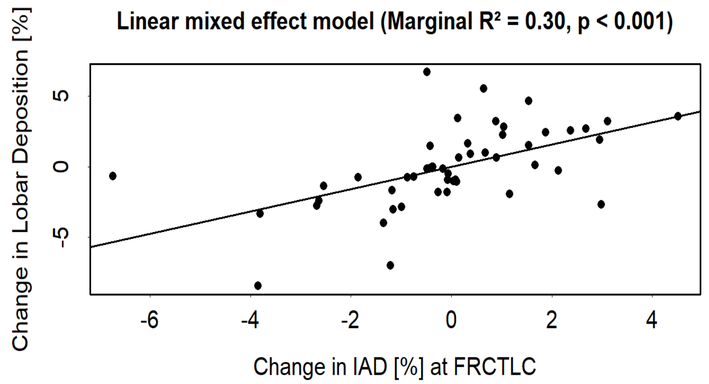

***Figure 2**: Correlation between change in internal airflow distribution and change in lobar deposition.*

Based on the correlation results between FRI and lung function parameters, it seems that FEV1 improves when the subject shows a distribution in ventilation to the lower lobes (IAD) after the therapy. Figure 3 illustrates such a responder.

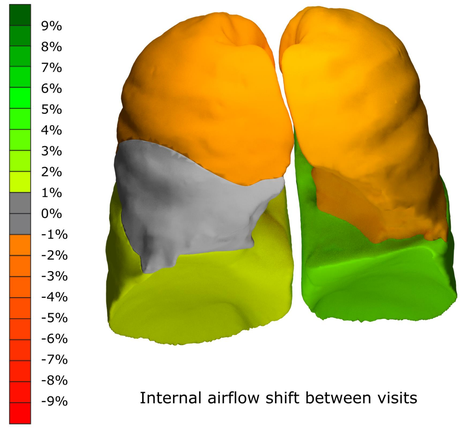

***Figure 3**: Visualization of the shift in internal airflow distribution.*

Further analysis revealed that changes in specific image-based airway resistance (p = 0.084) and specific image based airway volume (p = 0.048) indicate that the treatment seems to change regional lung structure and function on top of the standard of care. Shifting of mucus plugs between visits might explain these changes as visualized in figure 4.

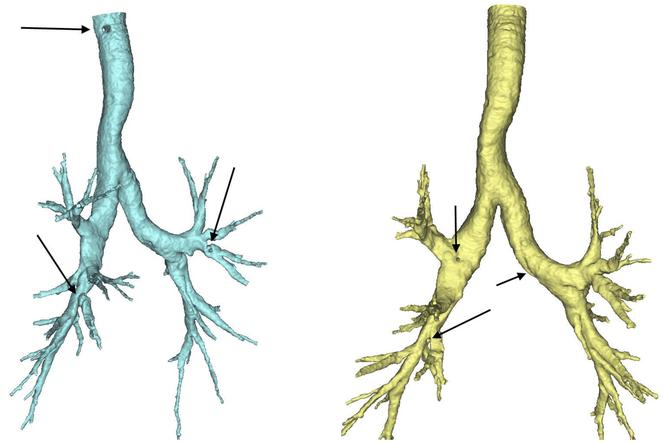

***Figure 4**: Airways with different positions of sputum (arrows) before and after treatment.*

CONCLUSIONS

These pilot study results provide evidence supporting the theory that this specific OPEP device enables airflow redistribution and influences drug deposition patterns. Further research is required to investigate the lower lobar ventilation relationship with FEV1. The resultant airflow redistribution following use of the device may well be a contributing factor to the previously reported[1,2] improved clinical outcomes and the specific nature of the redistribution might also be related to the level of clinical response observed.

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[1] Pulm Ther. 2017;(3):163

[2] COPD. 2016;13(1):66-74