DISEASE PROGRESSION IN IPF ASSESSED USING PULMONARY FUNCTION TESTS AND FUNCTIONAL RESPIRATORY IMAGING (FRI) – A PILOT STUDY

JWM De Backer¹, WGM Vos¹, L Nuyttens¹, GC Smaldone², SD Skaria², R Condos³

¹FluidDA nv, Belgium  ²Stony Brook University School of Medicine - NY/US  ³New York University - New York, NY/US

In the FRI workflow, CT images are converted into 3D patient specific quantifiable endpoints. FRI yields the following parameters:

- Internal airflow lobar distribution (IALD)
- Airway resistance (iRaw)
- Lung volume (iVlung)
- Lobe volume (iVlobe)
- Airway volume (iVaw)

Previously it was shown that:

- FRI is 3-8 times more sensitive than the classic pulmonary function tests (PFT) to evaluate treatment¹²
- FRI is optimal to understand the exact mode of action of a treatment in early clinical research³
- Changes in FRI parameters correlate with changes in lung function and changes in patient feeling⁴

Hypothesis
Disease progression is correlated with a reduced lobar volume, an enlarged airway volume and a reduced airway impedance.

Methods
In this trial we studied 5 IPF patients for 6 months to assess the changes in airway structure and function. At the baseline and 6 month visit FVC, DLCO and helium based lung volumes were measured. In addition, HRCT-based functional respiratory imaging (FRI) was performed in all patients. FRI provides information regarding lobar volumes, regional airway volumes and impedance.

Results
In terms of FVC, 1pt declined (-6%), 1pt improved (+6%) and 3pts remained stable (-1%,0%,1%). The pt that declined in FVC also experienced: DLCO -21%, FRC -12.67%, TLC -7.47%. iVaw stayed constant. However when iVaw are corrected for lung volume (siVaw = iVaw/iLobe), then siVaw increased by 23.99%.

Conclusion
The study suggests that disease progression is associated with a reduction in regional lung volume, an increase in regional airway volume and a reduction in regional impedance. Further studies need to confirm these initial observations.