Poster Session Abstracts

Conclusions: In conclusion, these preliminary imaging findings suggest that the proposed T1-MRI image analysis methodology can be used to classify pixels as either normal or abnormal as indicators for progressive lung disease. This T1-MRI lung characterization methodology builds upon earlier T1-MRI studies and provides a sensitive, quantitative outcome measure that can be used in clinical trials of new CFTR modulator therapies.
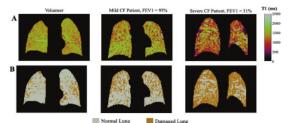

Figure: A) Representative coronal, lung T1-MRI maps from a healthy volunteer and two CF patients with mild and severe lung disease. **B)** Classification maps identifying regions of lung damage (T1 value below threshold, in orange) from normal lung (T1 values above threshold, in white).

651

INITIATION OF TRIPLE COMBINATION CFTR MODULATOR THERAPY IN PATIENTS WITH ADVANCED CYSTIC FIBROSIS LUNG DISEASE

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Objectives: Elexacaftor/tezacaftor/ivacaftor (ETI) was approved in the US in October 2019 for individuals with CF and at least one copy of the F508del-CFTR mutation. Excluded from clinical trials, there is limited experience with this therapy for those with FEV_1< 40% predicted (pp). We describe the early clinical response to ETI among patients with advanced lung disease in a single-center cohort.

Methods: We included data from patients started on ETI both before and after commercial availability. Eligibility included CF patients with at least one F508del-CFTR gene mutation and FEV_1 < 40% predicted 6 months prior to initiating ETI.

Results: 47 patients with data currently available for analysis were included. The mean age of patients was 32.4 years, and the mean FEV_1 was 29% predicted (F508del-CFTR homozygous (n=26) 28.6% of predicted and F508del-CFTR heterozygous (n=21) 30.4%). For 47 patients with data while on ETI, the mean $ppFEV_1$ improved to 38.1% (absolute change of 9% and relative change of 33.7%) for those F508del-CFTR homozygous and 40% (absolute change of 10.4% and relative change of 29.8%) for those F508del-CFTR heterozygous. Weight improved on average 5.0 kg across both groups. Only 5 patients had sweat chloride data available at time of analysis, with an average sweat chloride decrease of 64 mmol/L. While some patients experienced recurrent side effects and ETI was briefly held for at least 4 patients, none permanently discontinued ETI due to intolerance or side effects while one patient died from unrelated causes (complications from a motor vehicle accident). Adverse reactions reported in clinic included respiratory symptoms (59%), gastrointestinal symptoms (22%), rash (3.7%) and identification of previously unrecognized drug-drug interactions (DDIs).

Conclusion: In patients with severe lung disease and at least one copy of F508del-CFTR gene mutation, ETI was well tolerated with improved pulmonary and nutritional outcomes. While close monitoring of symptoms and identification of potential DDIs are necessary, our early experience suggests a significant benefit with ETI amongst those with advanced CF lung disease.

652

QUALITY OF HOME SPIROMETRY IN PATIENTS WITH CYSTIC FIBROSIS

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Introduction: The benefits of periodic lung function testing to support clinical decision making in CF are well known. Whilst laboratory spirometry is associated with high quality data, hand-held spirometry has advantages in that it can be taught and performed efficiently in a range of settings allowing for regular testing and trends to be identified. Home-based spirometry is an alternative to supervised spirometry but is unproven as a method of remote lung health monitoring.

Methods: The NuvoAir platform consists of a smartphone application, Bluetooth spirometer and clinician portal that allows patient data to be shared with their healthcare team. The app's built-in coaching system provides feedback to patients on the quality of spirometry (2017 ATS Technical Statement). Adults with CF were trained to perform spirometry with NuvoAir in the hospital by a member of the CF multi-disciplinary team. Upon discharge, patients were asked to perform home spirometry every two weeks. Geolocation data were used to identify patients' first spirometry session in the hospital ("supervised") and sessions at home ("unsupervised"). All sessions were included in the analysis regardless of quality and repetition. We chose to use hospital-supervised spirometry with NuvoAir as the control, rather than gold standard in-laboratory spirometry, to provide a more realistic comparator for assessing the quality of "field-based" spirometry. Data were analyzed anonymously, and all patients provided informed consent for their data to be used. These analyses used only data from patients who performed their first unsupervised spirometry within 30 days of their supervised.

Results: Data were available from 37 patients (mean±SD age 31.7±10.6 years; 29.7% male; FEV_1 51.8±15.0), who performed 783 unsupervised sessions (21.2 sessions per patient, 2.4 weeks between sessions) over 355.4±213.4 days.

Supervised-spirometry quality gradings (Table) and results were similar to the first unsupervised-spirometry sessions (mean±SD FEV_1 1.7±0.5 vs 1.8±0.7L [p=0.5]; FVC 2.8±0.8 vs 2.9±0.9L [p=0.3]). There was a higher proportion of Grade A sessions for all unsupervised (26.8%) than supervised or first unsupervised (5.4%) spirometry sessions (Table), suggesting a coaching effect from app feedback. Quality was acceptable (Grades A to C: At least 2 maneuvers, <200 mL FEV_1 and FVC variation) in 59.4% of supervised, 56.7% of first unsupervised and 72.5% of all unsupervised sessions.

Conclusion: Spirometry quality was found to be equivalent in the unsupervised home setting using the NuvoAir system, suggesting that remote spirometry has a place in the long-term monitoring of lung function in CF. In addition, adherence to a bimonthly spirometry regime was high.

Session grade	Supervised sessions, %	First unsupervised session (within 30 days of supervised), %	All unsupervised sessions, %
A	5.4	5.4	26.8
B	45.9	40.5	40.0
C	8.1	10.8	5.7
D	2.7	8.1	4.0
E	27.0	27.0	16.2
F	10.8	8.1	7.3