Cystic Fibrosis Research News

Title:
A Short extension to multiple breath washout provides additional signal of distal airway disease in people with CF: a pilot study

Lay title:
A Short extension to multiple breath washout provides additional indications of blocked and severely diseased airways in people with CF: a pilot study

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What was your research question?
Multiple breath washout (MBW) is a sensitive lung function technique, but is not without limitations. We looked to see if we could address one of these with a small change to the way the measurement is performed.

Why is this important?
MBW and the main measure it generates, the lung clearance index (LCI), are receiving considerable attention in both the research and clinical settings, particularly in cystic fibrosis (CF). Unlike the forced blow used in standard lung function tests, MBW just involves quiet breathing to assess how well the lungs are performing. However, LCI does not show airways or parts of the lung that are blocked. We term this feature of lung disease under/unventilated lung units (UVLU). UVLU is clinically important in CF as it has been shown to be the best predictor of lung disease progression.

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What did you do?

We explored several different breathing manoeuvres to open or access UVLU. Our chosen manoeuvre was a single slow maximal breath after the standard end of test for MBW; we termed this new measure LCI with Short extension (LCI_{ShX}). We compared 43 people with CF to 10 healthy controls. We also assessed the reliability of LCI_{ShX} during periods when people with CF were stable and how it changed with flare-up of lung infections (exacerbations). Finally, we attempted to control for (validate) our findings by assessing how well LCI_{ShX} matched lung imaging taken by high-resolution computed tomography (CT-scan).

What did you find?

We found bigger differences in UVLU between people with CF and the healthy controls when measuring with LCI_{ShX} compared to measuring with LCI. Within the CF group we found that the amount of UVLU was highly variable and could not be predicted from the LCI result. LCI_{ShX} showed little change during clinical stability but saw a larger change during periods of worsening disease and the follow-up period compared to LCI. Both LCI and LCI_{ShX} generated similar lung severity scores as the CT scans did, but only LCI_{ShX} was related to the extent of mucus plugging seen on CT.

What does this mean and reasons for caution?

LCI_{ShX} may be attractive for research and clinical use due to its reliability during clinical stability combined with its larger signal around periods of worsening disease. The fact that only LCI_{ShX} was able to identify the mucus plugging seen with the CT scan suggests that our goal of assessing UVLU with a breathing manoeuvre was successful. If we can routinely monitor and detect UVLU early, we may be better at preserving lung health.

Whilst our results are promising, they have been collected from a small number of people in each of the groups. The results are also mainly gathered from people with CF who have two copies of the F508del mutation.

What's next?

We will build on these promising early results, by collecting measures from more people in each of these subgroups, assessing the changes with triple-combination therapy and testing a broader range of CF genotypes. We will also compare LCI_{ShX} against other methods of measuring UVLU, including new types of lung imaging.

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