

Cystic Fibrosis Research News

Title:

Comparison of Lung Clearance Index Determined by Washout of N₂ and SF₆ in Infants and Preschool Children with Cystic Fibrosis

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What was your research question?

We wanted to know if the results of a special lung function test, the multiple breath washout (MBW), to determine the lung clearance index (LCI) are comparable if two different gases, nitrogen (N₂) or sulphur hexafluoride (SF₆), were used in infants and preschool children.

Why is this important?

CF lung disease has the biggest influence on illness and death in people with CF and starts early after birth. LCI describes the number of lung turnovers necessary to clear a tracer gas from the lungs and high values correspond to poor ventilation homogeneity. The LCI is able to detect CF lung disease from the first months of life. So far, SF₆ has been used as the MBW tracer gas in infants and N₂ as the MBW tracer gas in older children and adults. As SF₆ is a greenhouse gas and not available in all countries, use of N₂ in infants and preschoolers would be helpful. Up to now, a direct comparison of these two gases has not been undertaken in infants and young children with CF.

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What did you do?

We investigated LCI in 51 infants and preschoolers with CF (n=31) or without lung disease (n=20) aged 0 to 5 years with the MBW using N₂ and SF₆ successively. Children with CF underwent a chest MRI scan afterwards as part of their annual check-up. The chest MRI also ensured that any abnormal MBW results are true. We compared the main MBW outcome factor LCI, as well as further factors derived from N₂- or SF₆-MBW. In addition, we compared whether N₂- and SF₆-LCI were in accordance with MRI findings.

What did you find?

Findings included that both N₂- and SF₆-LCI discriminate infants and preschoolers with CF from those without lung disease; however, in both groups of children N₂-LCI values were much higher than SF₆-LCI values. More infants and pre-schoolers with CF had an abnormal N₂- than SF₆-LCI. The N₂-LCI value showed a better agreement with chest MRI findings than the SF₆-LCI value. The difference between N₂- and SF₆-LCI in our study was largely explained by a higher overall expired volume (CEV) in N₂-MBW than SF₆-MBW.

What does this mean and reasons for caution?

N₂- and SF₆-LCI are not interchangeable. Our data indicate that N₂-LCI might be more sensitive to detect early CF lung disease than SF₆-LCI. The higher N₂-CEV could be attributed to N₂ that is released from the lung tissue, which is enhanced in lung regions that are worse ventilated like in CF lung disease. It will be interesting to see more data over a longer period of time on this comparison to finally decide which tracer gas is more sensitive. However, N₂-MBW necessitates inhalation of pure oxygen and there are reports that this could lead to alterations of the breathing pattern, especially in young infants.

What's next?

It will be interesting to identify the youngest age where N₂-MBW is feasible without putting infants at risk.

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