

Cystic Fibrosis Research News

Title:

Comparison of facemask and mouthpiece interfaces for Multiple Breath Washout measurements

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What was your research question?

What is the impact of switching between a facemask and mouthpiece when multiple breath washout (MBW) is performed among young children (aged 2-6 years) and how does this affect their ability to perform the test, the stability of their breathing (i.e. how relaxed they are) and the results obtained (e.g. Lung Clearance Index, LCI)?

Why is this important?

MBW is a very useful test to detect the first signs of altered lung function in children with CF. There are two choices for the interface used to connect the young child to MBW equipment: (1) facemask with putty to help seal and/or reduce additional dead space of the facemask or (2) mouthpiece and nose clip assembly. A key benefit of using the facemask is that it is less distracting for the child, whilst the benefit of using the mouthpiece is that it is also used by older children when assessing lung function, so there is a continuity and consistency in MBW results over time. Recommending which should be used requires better understanding of the pros and cons of each and the effects the choice has on the results obtained. These two interface choices have never been directly compared before.

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What did you do?

We first compared the different interfaces in adults. This allowed us to explore why differences might occur e.g. Does breathing exclusively through the nose (possible with a facemask but not a mouthpiece) make a difference? We also performed MBW experiments with preschool children using both interfaces and, performed two measures of test quality: how relaxed were they during testing (more relaxed = more stable breathing pattern); and do multiple MBW tests with different interfaces generate similar results between replicates?

What did you find?

In adults, use of a facemask led to an increased LCI (indicating more uneven ventilation distribution), which appeared to be due, at least in part, by nasal breathing during the test. In preschool children (defined as ages 2-6 years), there was no overall difference in LCI suggesting that nasal breathing is not significant during the test in this age group. However, a facemask led to better success of testing, and more stable relaxed breathing during the test, such that results were more repeatable across the test visit. This beneficial effect was most marked in children less than 4 years of age.

What does this mean and reasons for caution?

These results suggest that it is better to use a facemask in preschool children, especially those less than 4 years of age. The best time to switch between the interfaces (from facemask to mouthpiece) appears to be at age 6 as this was the age when success rates with a mouthpiece were >80%. Important to note, the children in this study only had the opportunity to practice with the mouthpiece immediately before testing which may have effected MBW accuracy, and approaches such as mouthpiece training for extended period prior to testing were not evaluated.

What's next?

The results highlight benefits of facemask use in young children, and recommend an age to switch to a mouthpiece. Future studies need to explore ways to improve the success rate for mouthpiece testing and guide the optimal training approach so that effects at the time of transition can be minimised.

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