**Introduction**

Multiple breath inert gas washout (MBW) is a technique for quantifying ventilation heterogeneity (VH), the uneven distribution of ventilation, through analysis of the efficiency and pattern with which an inert tracer gas is washed out of the lungs during tidal breathing. Lung clearance index (LCI) is the most commonly reported MBW parameter, and may be elevated by (i) unequal convective ventilation between large lung units, or (ii) increased respiratory dead space. We aimed to derive novel parameters (LCIvent and LCIds) that would distinguish between these two mechanisms.

We hypothesised that:
1) The novel parameters LCIvent and LCIds are repeatable.
2) LCIvent and LCIds effectively distinguish between healthy control subjects and patients with asthma or cystic fibrosis (CF), and between sub-phenotypes of asthma and CF.

**Methods**

MBW data from seventy-four patients with asthma, forty adults with cystic fibrosis and sixty-six healthy control subjects were analysed. MBW was performed using the method described by Horsley et al (Thorax 2008; 63(2): 135-40). MBW data was fitted to a two-compartment model consisting of two theoretical lung units ventilated in parallel. This was represented mathematically by the weighted sum of two exponential decay curves, as shown in Figure 1. From the parameters of this model we calculated:

i. LCIvent – The proportional increase in LCI over and above its ideal value, taking into account specific ventilation inequality but not increased respiratory dead space.

ii. LCIds – The proportional increase in LCI over and above its ideal value, taking into account increased respiratory dead space but assuming no specific ventilation inequality.

**Results**

Table 1 shows the repeatability of MBW parameters in each of the three groups. LCIvent and LCIds were highly repeatable in disease groups and moderately repeatable in healthy controls. Demographic characteristics and MBW results of the three groups are shown in Table 2. Figure 2 shows LCI, LCIvent and LCIds across the groups.

**Conclusion**

The novel parameters LCIvent and LCIds are repeatable and may provide further granularity in assessing the mechanisms of ventilation heterogeneity in airway diseases such as CF.