

The Impact of different Valved Holding Chambers (VHCs) on Lung Drug Delivery: Using Functional Respiratory Imaging (FRI) and an Asthma Patient

Suggett J¹, Lanclus M², and Sadafi H³

¹Trudell Medical International, London, Canada ²FLUIDDA Inc, New York, USA ³FLUIDDA n.v, Kontich, Belgium

RATIONALE

VHCs, often also called spacers, are commonly used to counter the metered dose inhaler (MDI) use error of failure to coordinate inhalation with actuation as well as to reduce the impact of oropharyngeal deposition when MDIs are used alone.

This FRI based study assessed a few different VHCs, comparing their impact on modelled lung delivery, in addition to when the MDI was used alone.

METHODS

3D geometries of airways and lobes were extracted from a CT scan of a 21 year old male moderate Asthma patient.

Drug delivery and airway deposition of MDI delivered albuterol was modelled using FRI with and without three VHCs: **AeroChamber Plus* Flow-Vu*** (AC+FV), OptiChamber Diamond[†] (OD), and Compact Space Chamber[†] (CSC).

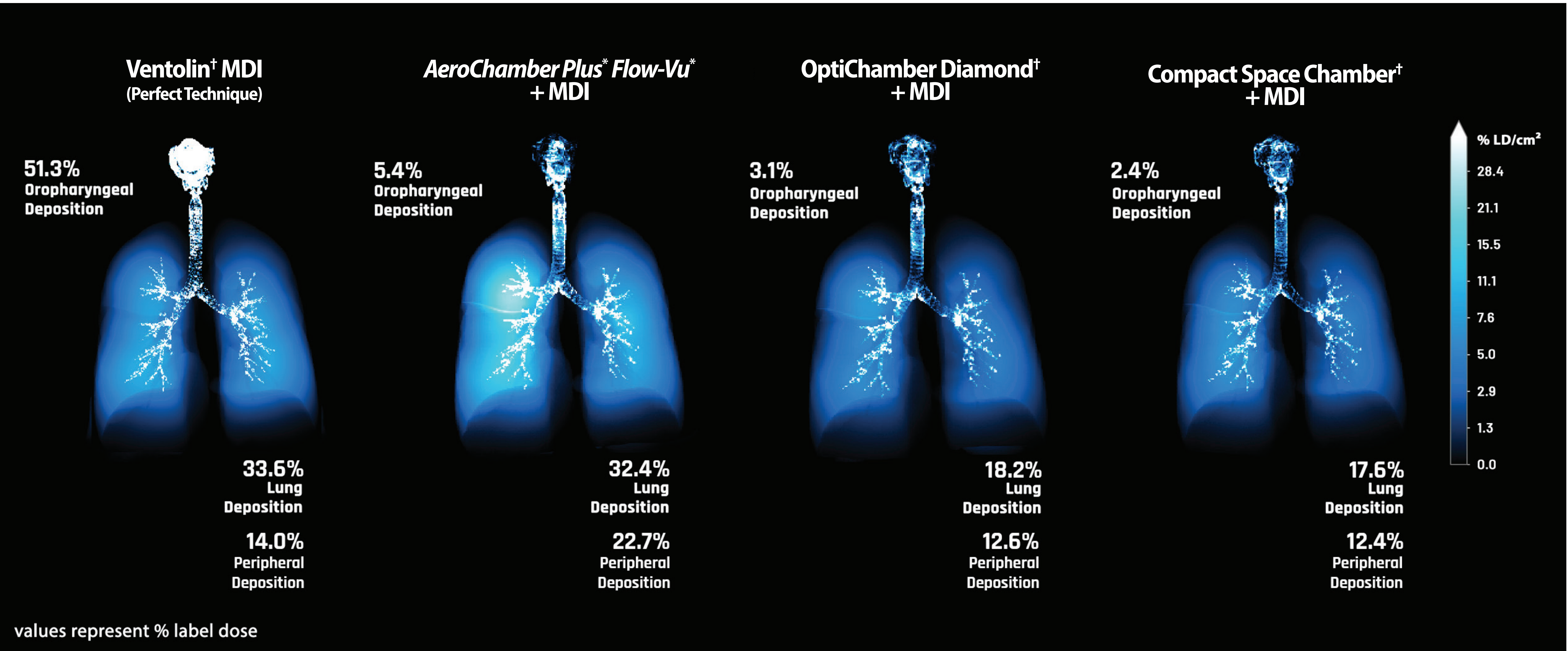
For the MDI alone, the ‘perfect’, but unlikely coordination of a 0 second delay was simulated. For the MDI/VHC systems, a more typical 2 second delay was evaluated.



RESULTS

The deposition profile results are shown in the table below (% of label dose).

Deposition Zone	MDI alone (no delay)	AC+FV/MDI (2.0s delay)	OD/MDI (2.0s delay)	CSC/MDI (2.0s delay)
Extrathoracic	51.3	3.1	2.4	2.4
Intrathoracic	33.6	32.4	18.2	17.6
Central Lung	19.5	9.6	5.5	5.2
Peripheral Lung	14.0	22.7	12.6	12.4



CONCLUSIONS

The FRI deposition profiles highlighted significant differences between the VHCs on test, with intrathoracic (available to the lungs) delivery for the **AeroChamber Plus* Flow-Vu*** VHC system being almost double that of the other two VHC systems and being similar to the MDI alone with perfect (unlikely) coordination.

Interestingly, the peripheral lung deposition was appreciably higher using the **AeroChamber Plus* Flow-Vu*** than the MDI alone. Extrathoracic (linked to oropharyngeal) deposition was much lower for all VHCs than for the MDI alone.

These results highlight that the use of an appropriate VHC should be considered for general practice in MDI asthmatic patients and that VHCs should not be considered interchangeable.