NO DEAD SPACE IN THE MICRO BVM EXT TUBE

SUMMARY:

Laboratory tests have confirmed that the dead space in the **Micro BVM EXT tube** is only 4.5ml (equivalent to 1/3 of a tablespoon), while the ISO standard-ISO 10651-4:2002 allow up to 65ml. Therefore, there is no issue of dead space in the product.

INTRODUCTION:

Dead space is defined as "the volume of a breath that does not participate in gas exchange. It is ventilation without perfusion. Physiologic or total dead space is the sum of anatomic dead space and alveolar dead space"[1].

The issue of dead space is also applicable to the **Micro BVM EXT tube**. The **Micro BVM EXT tube** is an extension tube that ranges between 23 – 75 cm (9-30"). To avoid dead space, the **Micro BVM EXT tube** was designed with a T connection that prevents air from flowing back into the tube. As a result, all of the air blown into the tube enters the patient's lungs and cannot re-enter the tube.

ABOUT THE MICRO BVM EXT TUBE

The Micro BVM EXT tube is the latest innovation of Micro BVM[2]. Unique in the emergency medicine market, the **Micro BVM EXT tube** offers practitioners a new way to ventilate patients.

The product can expand from 23-75 cm (9-30"), and as a result, the ventilation can be carried out at a slight distance from the patient. This allows for safer and easier transfer of a manually ventilated patient in and out of a hospital setting.

For example, if a patient is on a stretcher, the caregiver can ventilate the patient while walking alongside the stretcher. This treatment flexibility can be applied to endless scenarios such as ventilating a patient while going down a narrow staircase, ventilating a patient trapped in a car after a car accident and ventilating a patient in an ambulance while sitting securely in the ambulance chair.

The latter example also shows how the **Micro BVM EXT tube** increases the safety of the practitioner since s/he is not in danger of being tossed around by the movement of the ambulance. Furthermore, in situations where the patient has multiple injuries, the practitioner can perform the ventilation from a slight distance and make room for other paramedics to treat the patient.

Figure 1: The Micro BVM EXT Tube

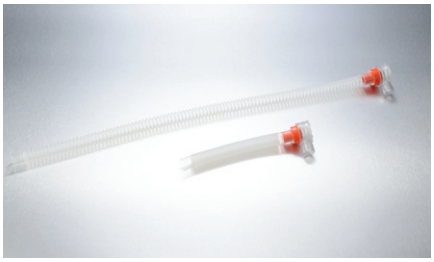


Figure 2: The Micro BVM can expand from 23 - 75 cm (9-30")

1 https://www.openanesthesia.org/aba_respiratory_function_-_dead_space/
2 https://www.microbvm.com/products/micro-bvm-ext/

The Micro BVM EXT tube also secures the airway and reduces the risk of unwanted extubation. While unwanted extubation can occur in any setting, the risk is greater in the prehospital setting since the patient is transferred and moved more frequently. Studies have suggested that endotracheal tube (ETT) dislodgement occurs in 3.0% of patients[3]. **The Micro BVM EXT tube** addresses this important complication and once an ETT or LMA has been inserted and set, the Micro BVM EXT tube protects it from unwanted extubation. The EXT is very light weight and agile. As a result, it adjusts itself to the movement of the patient and doesn't place pressure on the ETT or LMA.

Figure 3: Patient transfer using the Micro BVM EXT tube

Figure 4: Using the Micro BVM EXT tube to ventilate a patient while going down stairs

Figure 5: Ventilating a patient while sitting securely in the ambulance chair

Using the **Micro BVM EXT tube**, the ETT is secured with an elongated tube which ensures that even if the provider's hands move, the EET is secure and the ventilation is uninterrupted. Additionally, the T connector is very lightweight and doesn't pull on the ETT.

The **Micro BVM EXT tube** can be used with any BVM on the market. Its connections are universal and compatible with all standard patient valve ports, such as viral filters, ET tubes and PEEP valves.

DEAD SPACE IN THE MICRO BVM EXT TUBE

1. Calculation of Dead Space:

To eliminate all concerns regarding dead space in the **Micro BVM EXT tube**, the dead space issue was investigated in a laboratory specializing in ventilation. The calculations revealed that dead space for the **Micro BVM EXT** is only 4.5ml (1/3 of a tablespoon) while the ISO standard-ISO 10651-4:2002 allows up to 65ml.

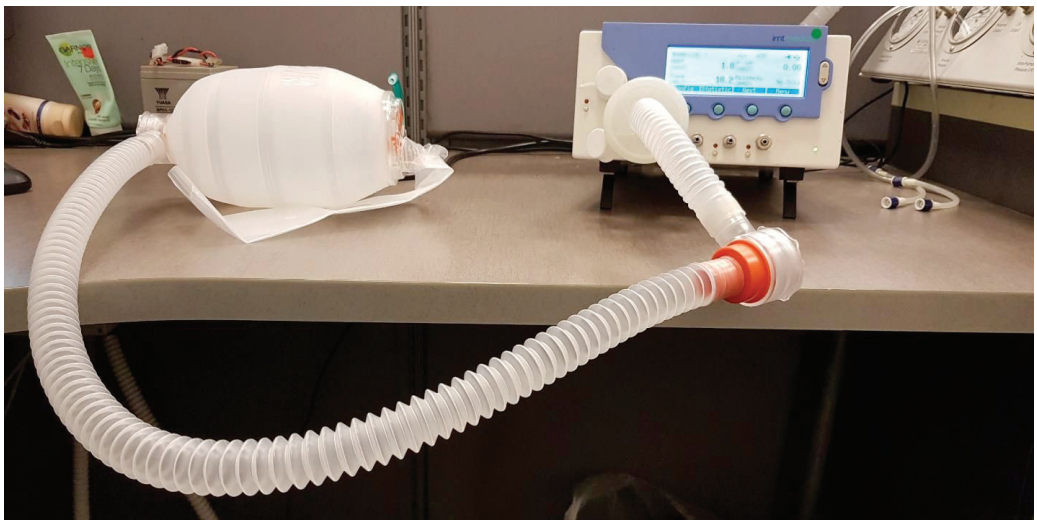


Figure 6: The Micro BVM EXTS Tube being tested in a laboratory

3 https://www.ncbi.nlm.nih.gov/pubmed/19947864

FlowAnalyser Analysis

Figure 7: Testing for dead space in the Micro BVM EXT tube

The T-Connector

Figure 8: T-Valve

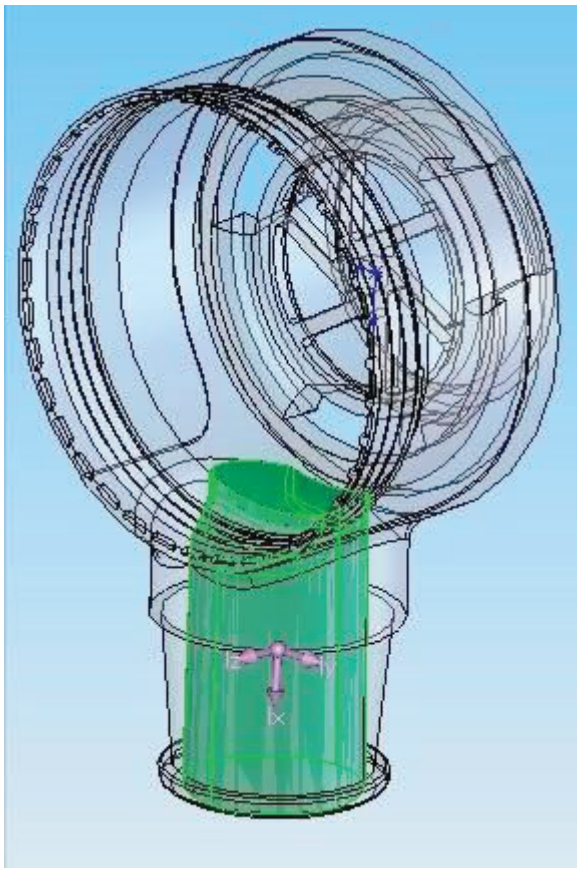


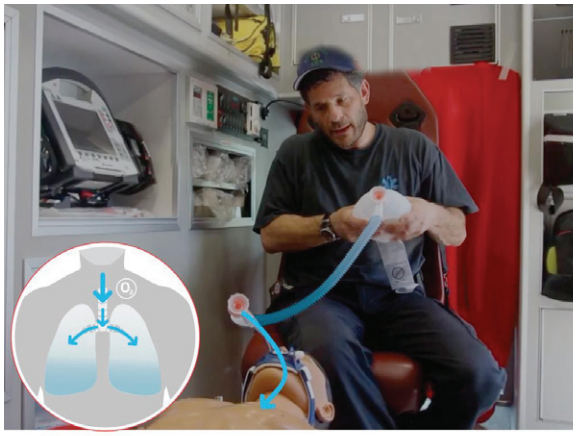
Figure 9: 3D illustration of the T-Valve.

2. How dead space is prevented:

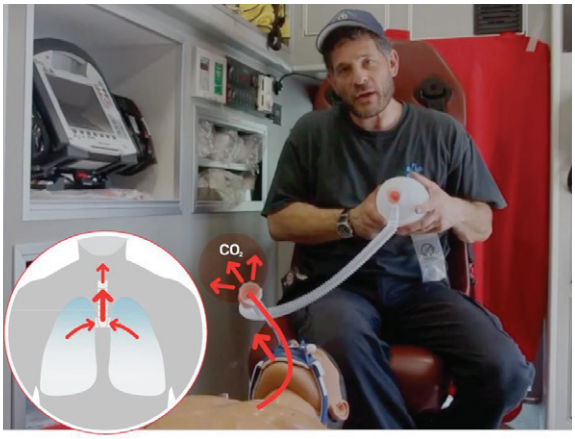
Ventilation procedure:

A: The BVM is in an inflated position

B: The BVM is squeezed and oxygen (blue line) enters The **Micro BVM EXT tube**



C: Oxygen penetrates the patient's lungs.



D: CO_2 is exhaled (red line) and released into the air. The T valve prevents the CO_2 from entering The **Micro BVM EXT tube**.

Figure 10: The T valve connected to the PEEP and Viral filter

The T connector prevents the air from flowing back into The **Micro BVM EXT tube** and eliminates the risk of dead space.

CONCLUSION:

The Micro BVM Ext tube is a novel accessory in airway management. It was designed in such a way that its T valve eliminates the flow of oxygen back into the tube. As a result, there is no dead space. Laboratory tests further confirm this claim.