BEWARE THE AIRWAY FILTER: DEADSPACE EFFECT IN CHILDREN UNDER TWO YEARS

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INTRODUCTION: Airway filters are increasingly used in breathing circuits to prevent bacterial and viral contamination. However, as the volume of the dead space is often similar in adults and children, the impact in children, with smaller tidal volumes, can be very significant.¹ This study measured the increase in minute ventilation required to maintain normal ETCO_2 levels following insertion of a pediatric airway filter in children less than 2 years of age.

METHODS: Following institutional ethical approval, 20 healthy children under 2 years of age requiring endotracheal intubation were recruited for the study. A two-treatment crossover design was used. After induction of anesthesia and endotracheal intubation, ventilation was adjusted to produce a tidal volume of 15ml/kg and respiratory rate adjusted to achieve an ETCO_2 of 35mmHg, sampled at the endotracheal connector. Following a 10-minute period of stabilization the airway filter (Brathwaites Oliver Medical 'Aquesure Anesthesia Bacterial/Viral Filter with Gas Sampling Port' 22ml volume) was introduced into the circuit. The respiratory rate (RR) was adjusted to return to an ETCO_2 of 35mmHg. The increase in minute ventilation (normalised for weight) as well as the ETCO_2 difference (sampled at the endotracheal connector and from the airway filter) were compared.

RESULTS: Two children were withdrawn after consent following clinical concerns, leaving 18 children, median 5.5(2-24) months and 7.4 (5-15) kg, to complete the protocol. A mean increase in ventilation of 228(56)% was required to maintain a normal ETCO_2 . Airway pressure increased by 7.9(4.6) mmHg and RR by 19.8(8.7)%. The mean difference in ETCO_2 was 3.6(1.6) mmHg compared to 0.3(0.8) mmHg using an inline sampling curvet. The inspired CO_2 difference was 5.9(3.9) mmHg.

DISCUSSION: Amplified deadspace due to airway filters result in a significant increase in the ventilation needed to maintain a normal ETCO_2 in children under two years of age with normal lungs. This increase would certainly be undesirable in patients with reduced lung compliance. Rebreathing is not detected if sampling from the filter.

REFERENCES: 1. *Br J Anaesth* 1985 Jun; 57(6): 562-8.