Effect of Lateral Positioning on Upper Airway Collapsibility in Anesthetized Children
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Introduction: Lateral positioning may decrease upper airway collapsibility in anesthetized, paralyzed adults. This has not been investigated in anesthetized, spontaneously breathing children. We hypothesized that the lateral position is associated with less propensity toward upper airway obstruction in response to dynamic application of negative airway pressure (DNAP).

Methods: The protocol was approved by the institutional IRB and written consent was obtained from all parents. Healthy children aged 4-12 yrs requiring elective surgery with inhalation induction by facemask were included. Exclusion criteria included obesity, sleep apnea, tonsillar hypertrophy, previous tonsillectomy, significant medical disease, and anatomic abnormalities of the head or neck. Following anesthetic induction with sevoflurane, the concentration was decreased to 1 MAC value (2.5%) for this age group. A regulated source of negative pressure was incorporated into the ventilatory (circle system) circuit. Ventilatory flow and pressure were measured with a pneumotachometer and a pressure transducer, respectively, and attached to the subject’s facemask. These values were continuously downloaded to a laptop computer with data acquisition software. For each subject, upper airway collapsibility was measured in the supine and lateral positions, the order of each was set by a predetermined randomization scheme. Once steady-state concentrations of sevoflurane were attained, each patient’s airway was subjected to at least 3 different negative or positive airway pressures (in a random manner), following application of 10 cm H2O of CPAP. At the completion of the study, general anesthesia resumed as per the preference of the subject’s anesthesiologist. To determine the critical closing pressure of the upper airway (Pcrit), maximal inspiratory flow rates were plotted against the corresponding pressure value. Linear regression analysis was used to extrapolate to zero airflow to obtain Pcrit for each subject. Paired t-tests were used to determine differences in Pcrit between supine and lateral positions.

Results: Thus far, 13 children have been enrolled and analyzed. The mean ± SD Pcrit for the supine position was -7.1 ± 4.5 cm H2O and -8.5 ± 7.1 cm H2O for the lateral position (P= NS). Of the 13 subjects, 5 had a > 20% decrease in airway collapsibility in the lateral position, and 4 had a > 20% increase in airway collapsibility in the lateral position. The overall results are depicted in the figure.

Discussion: Placement of an anesthetized, spontaneously breathing child in the lateral position was not associated with changes in upper airway collapsibility when measured by DNAP.

References: