*In Reply:*

We thank Dr. Eisenkraft for taking the time to write regarding our recent article[1] and describe to us a detailed alternative scheme by which expiratory limb ventilation can be provided. The suggestion is valid and not the one that we thought of in this emergency. We were unaware of the Kummar *et al.* description, which does not explain how the Bain circuit was pressurized on his Aisys machine (GE Healthcare, Madison, WI). Dr. Eisenkraft's alternative demands mental preparation for such emergencies, just as we taught our option in previous simulations, and would require that the clinician recall the alternate common gas outlet circuitry immediately within a crisis situation. Although we admire his technically accurate methods of scavenging the volatile agent, we believe that such connections would not be available or clinically necessary in a brief emergency situation. From a technical perspective, we would like to raise three issues with his alternative.

1. *Room air entrainment*: what Dr. Eisenkraft describes is analogous to a Mapleson D (Bain) circuit, with the fresh anesthetic gas traveling down the inspiratory limb from the alternate common gas outlet to the Y-piece, but it differs on the distal expiratory limb end because the exhaled gas from the patient is scavenged to atmosphere upon reaching the self-inflating manual ventilation device (SIMVD) valve, and it does not mix within the SIMVD reservoir. When the reservoir is released after a manual inspiratory squeeze, it will entrain room air. When it is subsequently squeezed, the SIMVD reservoir would deliver room air retrograde to the patient, thereby diluting the exhaled and fresh anesthetic gas and oxygen mixture. Our alternative to connect the SIMVD to oxygen would theoretically deliver a higher concentration of oxygen, but it would not provide anesthetic gas.
2. *High fresh gas flow*: Dr. Eisenkraft's alternative is superior to ours in delivering anesthetic agent but would deliver enriched oxygen and maintain desired anesthetic concentration only if high fresh gas flow is provided *via* the alternate common gas outlet. We calculate a minimum fresh gas flow requirement of 18 l/min to prevent dilution by the SIMVD room air, given the example of 600 ml $V_T$ delivered over 2 s. If oxygen was connected to his SIMVD, it would further enrich the oxygen concentration, but it would dilute the anesthetic agent. We agree that this connection is not necessary if his fresh gas flow is high enough.
3. *Rebreathing carbon dioxide*: analogous to the Bain system, and at high fresh gas flow, Dr. Eisenkraft's alternative ought to cause less rebreathing of carbon dioxide than our to-and-fro ventilation method.

In summary, we applaud this alternative suggestion as long as the clinician uses high fresh gas flow and desires the continuity of volatile anesthetic, but in the emergency situation we describe, we feel more secure in delivering higher oxygen concentrations from our SIMVD reservoir connected to auxiliary oxygen and do not see the need for scavenging arrangements. Our technique can be used on ANY anesthesia machine (without the alternate common gas outlet) and may require less technological understanding.

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## Reference

1. Seif DM, Olympio MA: Expiratory limb ventilation during unique failure of the anesthesia machine breathing circuit. Anesthesiology 2013; 118:751–3

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# Cuffed and Uncuffed Tubes and the Geometric Correlation with Pediatric Airway

*To the Editor:*

We read with great interest the article by Litman[1] concerning the problems surrounding the choice of cuffed and uncuffed tracheal tubes in anesthesia and pediatric intensive care. Although the issue has been on debate for many years and now there is a general belief that cuffed tubes can also be safely used in children, I think it is important to make some reflections on the strict geometrical relationship between tracheal tubes and the anatomy of the cricoid and trachea. Both Litman and Weiss[2,3] have frequently reported and demonstrated that the cricoid lumen is not circular but rather of an ellipsoidal shape. By performing investigations with nuclear magnetic resonance, Litman has shown that the cricoid ring in its cross section is narrower than the anteroposterior section. This finding is, in our opinion, of considerable clinical importance and should not be overlooked. Considering that the orotracheal tubes have a perfectly circular shape, they are ill-adapted within an ellipsoidal structure. If we try to draw a circle inside an ellipse, imagining that the circle represents the tube and the ellipse is the cricoid, we can easily demonstrate that the tracheal tube, even if the proper size, can apply excessive pressure on cricoid structures along the minor axis of its elliptical shape. At the same time, the tube would not adhere well to the lateral areas of the cricoid corresponding to the major axis of the ellipse. This circumstance, in the presence of uncuffed tubes, creates the condition for an imperfect seal in the tube airway system with an increased risk of micro-inhalation, loss of gas, requiring repeated adjustments of mechanical ventilation parameters. Another risk present is the excessive movement of the tube and its tip with