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Author's reply

E J Damrose[1], L Manson[1], V Nekhendzy[2], J Collins[2] and R Campbell[1]

Departments of [1]Otolaryngology/Head and Neck Surgery and [2]Anesthesiology, Stanford University Medical Center, California, USA

Reply

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Dear Editors,

We read and appreciated the insightful letter from Drs Habib and Esquinas regarding our recent publication, and take pleasure in responding to their note.[1]

The authors make a valid point that with the patient's mouth open during suspension laryngoscopy, the upper airway pressure may not be high enough to recruit dependent lung regions, and to improve ventilation-perfusion matching and oxygenation, especially in a patient with a pregnancy-induced physiological decrease in functional residual capacity. Parke and colleagues have shown that high-flow nasal oxygenation in spontaneously breathing patients provides flow-dependent, low-level positive airway pressure, which may be responsible for lung recruitment.[2–4] Such pressure will be approximately halved if the patient's mouth is open.

Intra-operatively, other high-flow nasal oxygenation mediated mechanisms contribute to improved and sustained superior patient oxygenation, such as maximal fraction of inspired oxygen, flow-dependent dead space flushing of anatomical dead space, decreased airway resistance due to the administration of fully conditioned (heated and humidified) oxygen, and enhanced gas exchange caused by an interaction between the entrained and highly turbulent supraglottic flow vortices created by high-flow nasal oxygenation and cardiogenic oscillations.[5–8] In addition, patient pre-oxygenation using high-flow nasal oxygenation did assure at least some degree of lung recruitment prior to the induction of anaesthesia.

One of the limitations of transnasal humidified rapid-insufflation ventilatory exchange ('THRIVE') is the inability to monitor end tidal carbon dioxide (CO_2) during high-flow nasal oxygenation administration. The rate of partial pressure of CO_2 increase during transnasal humidified rapid-insufflation ventilatory exchange has been found to be between 1.1 and 1.8 mmHg per minute, and is probably closer to 1.8 mmHg per minute.[9,10] Therefore, it is possible for a clinician to determine a safe operating time depending on the accepted anticipated calculated partial pressure of CO_2 level without invasive partial pressure of CO_2 monitoring, which is our current practice. Transcutaneous CO_2 monitoring, if available, will provide a better appreciation.

The rate of partial pressure of CO_2 increase during transnasal humidified rapid-insufflation ventilatory exchange in obstetric patients has not been determined, but may be expected to be higher given the increased metabolic rate.

In our patient, we elected to monitor the arterial blood gases intra-operatively with a point-of-care iSTAT handheld blood analyser (Abbott Point of Care, Princeton, New Jersey, USA). We documented a partial pressure of CO_2 increase from 31 to 80 mmHg, representing a change of 3.2 mmHg per minute over the course of a 22 minute procedure. This physiological change was within the safe pH limit for both a mother and a child, as was confirmed clinically by peri-operative fetal monitoring. The oxygen saturation in our patient remained in the range of 95–98 per cent throughout the surgery.

When managing pregnant patients, the clinician must have a lower threshold for invasive or non-invasive CO_2 monitoring, limit apnoea times, or temporise the hypercapnia with a period of positive pressure ventilation.

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