

Difficult Mask Ventilation and Muscle Paralysis

To the Editor:

We read with great interest the study by Ikeda *et al.*¹ and the accompanying editorial.² It is now increasingly recognized that muscle relaxants are beneficial in overcoming difficult mask ventilation in adults.²⁻⁴ However, both current papers are lacking a sufficient discussion of the reasons why muscle relaxation improves difficult mask ventilation. This can primarily be deduced from recent pediatric evidence where functional airway obstructions are the main reason for difficult mask ventilation.

Difficult mask ventilation in otherwise normal children is exceptionally rare and usually caused by anatomical/mechanical or functional airway obstructions.⁵ Functional airway obstructions (laryngospasm, insufficient depth of anesthesia, opioid-induced muscle rigidity with glottic closure, and bronchospasm) are common in children,⁶ result in significant morbidity,⁷ and require clear concepts and algorithms.⁸ Early muscle relaxation or even "pre-ventilation" muscle paralysis will overcome all functional airway problems with the exception of severe bronchospasm for which systemic epinephrine should be immediately available.⁹ This approach will also allow early and less traumatic direct laryngoscopy and tracheal intubation, if required urgently, without provoking coughing and straining or regurgitation and vomiting.

Amazingly, although muscle paralysis has been shown to improve mask ventilation in adults and is increasingly becoming a key role in the difficult mask ventilation in children with normal airways,⁹ none of current difficult airway algorithms in adults consider functional airway obstructions. However, this view is shifting in adults too, as the recently published NAP4 report recommends muscle paralysis prior to proceeding with an invasive (surgical) airway in the "cannot intubate - cannot ventilate" scenario or when waking the patient up is not an option.^{10†}

Difficult mask ventilation due to functional airway obstruction with increasing hypoxemia requires muscle paralysis. "Cross the Rubicon fast" in patients with a normal airway.

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(Accepted for publication January 4, 2013.)

In Reply:

We appreciate the comments of Xue *et al.*, who highlight important aspects of our study design,¹ which likely influenced the results. We sought to establish a patent, yet less than fully dilated upper airway, in order to assess whether muscle relaxants dilate or narrow the pharyngeal airways of anesthetized subjects. Had the initial airway been fully optimized by airway maneuvers, we might have failed to observe succinylcholine-induced pharyngeal airway dilation; therefore, we chose to maintain a neutral head and mandible position in anesthetized normal subjects. Furthermore, the tightly fitted facemask and mouthpiece may have further narrowed the airway.² Although the experimental settings were different from our usual clinical practice of airway management, we aimed to test the research hypothesis successfully while assuring patient safety. Our experimental design limits application of these results to patients with obstructive sleep apnea, an independent risk factor for impossible mask ventilation.³ In the future, direct assessments of behavior of the whole upper airway, including both pharyngeal and laryngeal regions, in this patient population will address the important questions raised by Xue *et al.*

† Full report available at: <http://www.rcoa.ac.uk/nap4>. Accessed October 20, 2012.