

*In Reply:*

The comments of Drs. Maxwell and Mihm invite a further discussion of diuretic use in the setting of postoperative negative-pressure pulmonary edema (NPPE).<sup>2</sup> Although diuretics were administered to the patient in our case, as originally stated, it is debatable whether this therapy benefited the patient in the case scenario.

In NPPE, the primary problem is not fluid overload but a combination of negative intrathoracic pressure-induced fluid shifts from the microvessels to the perimicrovascular interstitium (hydrostatic edema, as seen in patients with congestive heart failure) and disruption of the alveolar epithelium and pulmonary microvascular membranes from severe mechanical stress (high-permeability edema, as seen in patients with acute lung injury).<sup>1</sup> Diuretic therapy is a key component of hydrostatic pulmonary edema therapy, and it is being used for treatment in some patients with acute lung injury. In the euvoletic patient with NPPE, diuretic treatment is usually not required because most patients recover quickly after the airway obstruction is resolved. However, because NPPE is a diagnosis of exclusion, a single dose of diuretic under appropriate monitoring while a final diagnosis of NPPE is determined may be reasonable to treat causes of pulmonary edema that would be responsive to diuresis.

Salem *et al.* bring up the important question of how to determine whether a patient is “ready” for extubation. We argue that any patient developing NPPE after extubation, in retrospect, obviously was not ready for extubation: laryngospasm and retroglossal airway obstruction occur infrequently in the calm, completely awake, neuromuscularly intact patient with minimal oropharyngeal secretions. We administered 250 µg fentanyl to a young patient for a 65-min procedure. Despite the ability to follow commands, it remains possible that some degree of narcosis contributed to the clinical situation, although case series of NPPE have not yet identified this as a major risk factor.<sup>3</sup>

With respect to neuromuscular blockade, we agree that full neuromuscular blockade recovery is necessary before extubation to prevent upper airway obstruction due to pharyngeal muscle weakness in the presence of a neuromuscularly intact diaphragm. Several previous studies have demonstrated that a train-of-four ratio greater than 0.9–1 predicts recovery of the pharyngeal musculature, resulting in reduced postoperative upper airway obstruction, postoperative hypoxemia, and shorter postanesthesia care unit length of stay; a train-of-four of 0.9 represents the best available evidence to indicate adequate recovery of respiratory function from the effects of nondepolarizing neuromuscular blocking agents.<sup>4</sup> Furthermore, reversal agents and anticholinergics are known to have documented cardiovascular and respiratory adverse effects.<sup>5,6</sup> It was recently shown that 2.5 mg neostigmine coadministered with glycopyrrolate, when given after full

recovery, increases upper airway collapsibility and impairs genioglossus muscle activation, further supporting the notion that quantitative measurement of neuromuscular blockade is crucial to the decision to administer reversal agents before extubation.<sup>7</sup> For these reasons, we strongly believe that reversal agents in the presence of full neuromuscular blockade recovery should not be given.

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## Face Mask Ventilation Using a Lower Lip Face Mask Placement in Edentulous Patients

*To the Editor:*

The recent article of Racine *et al.*,<sup>1</sup> which compared face mask ventilation using mandibular groove and lower lip placement in edentulous patients, was of great interest to us. Although the technique they describe appears interesting, one technical clarification is required regarding face mask ventilation using a lower lip placement with two hands. We

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