

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).² 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).¹ 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 euvolemic 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.³

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.⁴ Furthermore, reversal agents and anticholinergics are known to have documented cardiovascular and respiratory adverse effects.^{5,6} 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.⁷ 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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(Accepted for publication October 21, 2010.)

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

To the Editor:

The recent article of Racine *et al.*,¹ 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

The authors are not supported by, nor maintain any financial interest in, any commercial activity that may be associated with the topic of this letter.

Supported solely by institutional and/or departmental sources.

believe that such information would be helpful for others who would like to try this technique.

As the authors note, in the presence of persistent air leaks for five consecutive breaths during standard face mask ventilation, they changed its placement to the lower lip by repositioning the caudal end of the face mask above the lower lip. However, the cephalad end of the face mask remained in the same location for both positions.

Our concern is that, if the cephalad end of the face mask is kept at the same location when moving the caudal end of the face mask upward to the site above the lower lip, this action may distort the shape of the face mask and increase its transverse dimension. This action can result in an increased risk of air leaks through the hollow cheeks because of an inadequate external face mask fit.

By comparing the authors' first two figures, one can see that the cephalad end of the face mask is in a different location in these two placements. Therefore, we would like to know in detail the method they use to obtain an adequate seal when the face mask is changed to the lower lip placement and the location of the cephalad end of the face mask is not changed.

In addition to the techniques mentioned by the authors,¹ readers may wish to learn about a method we prefer. For edentulous patients, we apply a large face mask so that the chin fits entirely inside the face mask with the seal on the caudal surface of the chin, the cheeks fit within the face mask, and the sides of the face mask seal along the lateral maxilla and mandible. If an adequate seal cannot be achieved using a large face mask, placing the moistened gauzes with the suitable size at the hollow cheeks can often improve contact between the cheeks and face mask.²

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(Accepted for publication October 27, 2010.)

Another Way to Eliminate an Air Leak during Mask Ventilation in Edentulous Patients

To the Editor:

I read with interest the article by Racine *et al.*¹ that demonstrated that repositioning of the caudal end of the mask above the lower lip resulted in a reduced air leak in edentulous

patients. Another effective technique for a problematic situation is always welcome. However, my concern, based on personal experience and figure 2 from the study by Racine *et al.*, is that, in some patients, pressure may be applied to the eye, risking ocular damage. I have been around situations in which the facemask was moved cephalad to obtain a better seal. On occasion, the facemask would then be in direct contact with the closed eyelid. In addition, I am confused by their statement that the cephalad end of the mask stayed in the same location for both positions. First, a comparison of their figure 1 with their figure 2 would suggest otherwise. Second, how can one end of the facemask be moved without moving the other end?

Because of the potential risk of ocular damage, I would try other methods first. As an alternative, head straps can be used to buttress the cheeks against the facemask in a standard position. There was no mention of using head straps during their study or in any of the background studies discussed. I am unaware of any data that evaluate the efficacy of head strap use in this situation. I have been highly successful in dealing with air leaks in edentulous and bearded patients by inserting an oral airway and using head straps. In a few patients, a variable-sized leak may remain, but it is rare to not be able to achieve adequate ventilation. This avoids the risk of ocular trauma. Although not always necessary for ventilation, the oral airway tends to lessen the magnitude of the positive pressure required for adequate ventilation, thus reducing the tendency for an air leak *via* the facemask-patient interface. By using head straps, usually only one person is needed to manage such an airway. Head straps may be particularly helpful for those practitioners who have small hands, short fingers, or limited hand-finger strength by virtue of fatigue or constitution. A formal evaluation of head strap efficacy would be welcomed.

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(Accepted for publication October 27, 2010.)

In Reply:

We would like to thank Xue *et al.* for their comments on the placement techniques we recently described¹ for face mask ventilation in edentulous patients. Their concerns focused on the exact position of the cephalad end of the mask.

In our original description, we stated that the cephalad end of the mask stayed in the same location when moving the mask's caudal end above the lower lip. In fact, the cephalad end of the mask may shift upward slightly, as shown in our original figures.