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Vagally induced bronchospasm could be completely relieved with atropine, and heart rate was essentially unaffected.⁷

Although monitoring of the vagus nerve during surgical procedures is a well-accepted technique for protection of the nerve during resection of glomus tumors,⁸ it is possible, as this case demonstrates, that direct stimulation of the vagus nerve in humans can lead to bronchoconstriction. This etiology should be considered in cases with sudden onset of increased PIPs when stimulation and monitoring of the vagus is performed intraoperatively. Patients with a history of bronchospastic disease may be at increased risk for this. This particular patient may have been at higher risk for developing bronchospasm in response to vagal stimulation because of his history of bronchospasm after intubation. To decrease the risk of vagally induced bronchospasm, current levels of the stimulus should be kept at the lowest possible level and shortest duration required to obtain a reproducible response and to prevent stimulus-associated side effects.

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The Cuffed Oropharyngeal Airway, a Novel Adjunct to the Management of Difficult Airways

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A CUFFED oropharyngeal airway (COPA) is a new airway device, which is fundamentally a regular oropharyngeal airway with a large cuff attached around the distal end. The cuff separates the tongue from the poste-

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rior pharyngeal wall to create a patent airway. Proximally it has a standard 15-mm adapter connectable to a breathing circuit. Like a laryngeal mask airway (LMA), it is intended primarily for use in spontaneously breathing patients who are not at risk of aspiration of gastric contents. Consistent with the preliminary reports by others,^{1,2} our initial experiences with COPA in more than 100 patients have been favorable.

We report here our experience of using this new device in two patients requiring general anesthesia for whom fiberoptic intubation was performed with the COPA in place.

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Case 1

A 50-yr-old woman with rheumatoid arthritis was scheduled for abdominal hysterectomy during general combined with epidural an-

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esthesia. Fiberoptic intubation was planned because her mouth opening was severely limited (approximately 1 finger breadth maximally). Her cervical spine was stable clinically and radiographically, although her neck rotation was moderately limited. To comply with her strong wish to be anesthetized during the intubation maneuvers, anesthesia was induced with 5% sevoflurane in oxygen *via* a face mask. Fiberoptic oral intubation was first attempted in a usual fashion, *i.e.*, with a face mask off. However, laryngospasm occurred before the trachea could be entered.

Once it resolved the patient was again allowed to spontaneously breathe 5% sevoflurane in oxygen. The COPA was inserted into the mouth, the cuff inflated, and the anesthesia circuit connected. With slight neck extension and modest chin lift, an adequate airway was obtained. Then fiberoptic nasal intubation was performed with the patient breathing 2–3% sevoflurane in oxygen *via* a COPA. The bronchoscope was gently advanced between the cuff of the COPA and the pharyngeal wall until the larynx was identified. After the bronchoscope had entered the trachea, the cuff of the COPA was deflated. The preloaded 7-mm inner diameter endotracheal tube was threaded over the bronchoscope into the trachea. The time required to accomplish nasal fiberoptic intubation was approximately 5 min. Her vital signs were stable throughout the procedure.

Case 2

A 22-yr-old man with a fracture of the zygoma was scheduled for its internal fixation. His preoperative evaluation revealed that he had a small, receding mandible with a thyromental distance <2 finger breadths. Mouth opening was also limited because of pain. Fiberoptic nasal intubation during general anesthesia was planned because he refused awake intubation. Anesthesia was induced with sevoflurane in oxygen *via* a face mask. The COPA was inserted into the mouth, and an adequate airway was established. After proper dilation and vasoconstriction of nasal passage, a 7.5-mm inner diameter endotracheal tube was first introduced through the nose to about 17 cm in depth where it had just passed beyond the cuff of the COPA. This was indicated by a sudden appearance of respiratory sounds through the tube. The bronchoscope was passed through the tube, the vocal cords identified, and the trachea entered. The endotracheal tube was then smoothly advanced into the trachea. It took 75 s from placement of the scope to attachment of the breathing circuit to the endotracheal tube. He remained stable during the entire procedure.

Discussion

Fiberoptic intubation of the trachea is a central strategy in the management of difficult airways, although there are two disadvantages when performed after the patient is anesthetized³: it interferes with mask ventilation leading to an increased risk of hypoxemia, hypercapnia, and even light anesthesia, and the loss of tone of the oropharyngeal structures produced by general anesthesia impairs visualization of the larynx. This is usually overcome by having an assistant provide a chin lift/jaw thrust or by using a specially designed airway (*e.g.*, an Ovassapian intubation airway³). Therefore an

assistant may be required to help the endoscopist by keeping the patient's airway patent during fiberscopy.

In this report we have circumvented these problems by using a novel airway device, the COPA. Our cases demonstrated that the COPA effectively permits inhalational anesthesia and spontaneous ventilation in patients with difficult airways while fiberoptic nasal intubation is being performed. This technique allows an anesthesiologist to perform fiberoptic laryngoscopy under much less hurried conditions. After the COPA is inserted, either the scope shaft can be first passed through nostril, or the endotracheal tube can be first introduced through the nose to the posterior nasopharynx.

We also found that the presence of the cuff of the COPA in the pharyngeal space did not interfere with the advancement of a fiberscope. Rather the cuff lifted the tongue, creating a space for a better bronchoscopic view. This is another feature of this method; the COPA eliminates the need of an assistant who holds the mask and applies a chin lift/jaw thrust, which may make this device more useful than the endoscopic mask. In addition, unlike the LMA, the COPA does **not** limit the size of the endotracheal tube because the tube is not passed *through* it.

These results led to the hypothesis that this methodology would be feasible in fiberoptic intubation training. Therefore after Institutional Review Board approval and informed consent was obtained, we measured the time required to pass a scope through the vocal cords in a separate series of 25 patients with normal airway anatomy who required elective nasal intubation. Two CA-2 residents, one fellow, one junior staff anesthesiologist, and one staff anesthesiologist were recruited to participate in this study. Each participant performed five fiberoptic intubations, and we have found the learning curve steep, independent of their previous experience in fiberscopy; although it initially took approximately 5 min on average to place the scope into the trachea, this time was rapidly reduced to no longer than 2 min (and usually less than 1 min) by the fourth patient. The initial difficulty appears to be mainly caused by the fact that the actual view of the larynx is often at the 9 o'clock position, making the orientation of the subject difficult. This is probably because when the scope goes down through the nostril, it is naturally deviated from the midline, forcing the scope to pass around the lateral side of the cuff of the COPA. Consequently visualization of the vocal cords requires the 90° rotation of the scope and the 90° downward bending of the distal tip.

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In conclusion the COPA allows an anesthesiologist to perform unhurried nasal fiberoptic intubation in an anesthetized patient by keeping the patient adequately ventilated and anesthetized. The caveat is that because the COPA frequently requires cervical extension or rotation for an optimum airway patency, it is probably not suitable in patients with the unstable neck spine. Nevertheless the COPA appears to be a promising aid to fiberoptic intubation, and accumulation of clinical experiences is encouraged to evaluate its role in the management of difficult airway.

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