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In Reply:—We did not intend to suggest that transpulmonary air passage is a new phenomenon. Rather, we intended to document the "real-time" transesophageal echocardiographic (TEE) observation of transpulmonary air passage, the existence of which had been only postulated in previous case reports.

Suriani draws the interesting parallel between the transpulmonary air passage seen in our patient and that which he has observed following reperfusion of a donor liver. As referenced by Suriani, Krowka and Cortese[1] have described the hepatopulmonary syndrome of orthodeoxia/platypnea caused by anatomic shunts found within the lung of hepatic failure patients. Such shunts are not found in the normal population. Presumably the transpulmonary air passage seen by Suriani in this patient population would be through such shunt channels, and therefore, as he suggests, would not be an uncommon occurrence. Our patient had no known liver disease. As described in the discussion of our case report, we believe that air passage in our patient resulted from a different mechanism, *i.e.*, an overloading of the pulmonary system's capacity to remove air from the central circulation, thereby resulting in transpulmonary passage of what appeared to be a large volume of air emboli. In our extensive experience with the use of TEE in patients in the sitting position undergoing craniotomies, transpulmonary passage of air is a rare event.

The suggestion that transseptal *versus* transpulmonary shunting can be distinguished by the number of cardiac cycles that occur between initial arrival of air in the right atrium and the left heart chambers is not helpful in the face of ongoing venous air entrainment, as was seen in the case we described.

Suriani raises an excellent point regarding the ability of TEE interrogation of the pulmonary veins to distinguish transseptal *versus* transpulmonary air passage. Furthermore, we agree with several of his recommendations. However, in a sitting patient, manipulation of the TEE probe in an effort to identify a precise mechanism of paradoxical air embolism (PAE) increases the risk of eliciting a cough reflex or of dislodging the endotracheal tube at a time when reintubation would be extremely difficult. Intraoperatively, the highest priority is detection of venous air embolism (VAE) or PAE, followed by rapid identification and control of the source of venous air entrainment. For these reasons, we do not recommend nor, in our practice, routinely employ manipulation of the TEE probe to distinguish transseptal from transpulmonary passage of air emboli during an episode of VAE.

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Laryngeal Mask Airway-assisted, Wire-guided Fiberoptic Tracheal Intubation

To the Editor:—Use of the laryngeal mask airway (LMA) in conjunction with fiberoptic bronchoscopy-aided tracheal intubation has been described.[1,2] Recently, we managed the airway of a patient using an antegrade wire fiberoptic intubation that was assisted by the LMA and that has not been described previously.

A 65-yr-old, 98-kg man was to undergo coronary artery bypass grafting. His preoperative anesthetic evaluation did not note any airway abnormalities. In the operating room after placement of the usual monitors and intravenous and arterial catheters, anesthesia was induced with sufentanyl midazolam, and pancuronium. Initial laryngoscopy failed to permit visualization of any of the laryngeal structures. Further attempts at laryngoscopy using various types and sizes of laryngoscope blades were unsuccessful. Oral fiberoptic intubation was attempted with a 4-mm intubating fiberoptic bronchoscope (FOB) with suction channel (Olympus LF-1) through an Ovassapian (Kendall) airway. Multiple attempts using this technique were unsuccessful. A 4 LMA (Gensia) was inserted using the published technique.* Ventilation was maintained easily while a bronchoscope swivel adapter (Portex) was attached to the LMA to allow ventilation during the fiberoptic manipulations. The FOB then was placed through the LMA with excellent visualization of all the laryngeal structures and passed through the vocal cords into the trachea. A

* Brain AIJ: The Intavent Laryngeal Mask Instruction Manual. United Kingdom, Brain Medical Ltd., 1991, pp 9–16.

145-cm, 0.0032-inch sterile J-wire (Cook) was threaded through the suction port of the FOB (with suction control ring removed) and its endotracheal position confirmed by visualization. The FOB and LMA were removed from the trachea, while the J-wire position was maintained carefully. The FOB then was reinserted into the trachea over the wire through its suction port in an antegrade fashion. Tracheal placement was again confirmed by fiberoptic visualization. A lubricated 7.0 endotracheal tube that previously had been loaded onto the FOB was passed over it into the trachea using a rotating motion and mild anterior traction of the tongue. The FOB and J-wire were removed and ventilation was achieved through the endotracheal tube.

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Application of Negative-pressure Ventilation When Changing Endotracheal Tubes

To the Editor:—Negative-pressure ventilation using a chest shell or cuirass without an artificial airway has been shown to be an effective form of ventilation in patients with chronic respiratory insufficiency.[1] Using this type of ventilatory support, we successfully performed the exchange of an endotracheal tube from oral to nasal route in a quadriplegic patient who could not breathe spontaneously.

Recently, we were asked to change an orotracheal tube to a nasotracheal tube in a 41-yr-old woman suffering from cervical spinal cord injury. Her head and neck were rigidly fixed with a halo and chest cast so that even her epiglottis could not be visualized with direct laryngoscopy. Cricothyrotomy or tracheostomy could not be performed because of an infected neck wound.

Initially, we tried to exchange the endotracheal tubes using two precautions: the passage of a hollow 6.0-mm JEM tube changer through the existing orotracheal tube and the passage of a 4.8-mm fiberoptic bronchoscope (p 10, Olympus) *via* the nose into the trachea alongside the tube changer. However, with the tube changer in place and even with the endotracheal tube withdrawn, the fiberoptic bronchoscope could not be advanced through the glottis. Thus, the orotracheal tube was reinserted over the tube changer.

We then prepared a small-sized tube changer (7-Fr Mettro, Cook) and a 3.5-mm fiberoptic bronchoscope (3C 20, Olympus). We also obtained a negative-pressure ventilator (NEV-100, Lifecare) to maintain ventilation during exchange of the endotracheal tubes because the prepared small-sized tube changer was not hollow and thus jet ventilation could not be applied.

The patient's lungs were ventilated with 100% O_2, and midazolam (10 mg), pentazocine (30 mg), and vecuronium (4 mg) were administered intravenously. The 3.5-mm fiberoptic bronchoscope, which was jacketed on its proximal end with a new endotracheal tube, was passed through the nostril, and the glottis was observed. The 7-Fr Mettro tube changer was inserted through the orotracheal tube, and the tube was withdrawn. At the same time, ventilation using the NEV-100 was begun. Thereafter, the fiberoptic bronchoscope was easily passed into the trachea, and the nasotracheal tube was passed over the fiberoptic bronchoscope into the trachea. During the 8 min that elapsed between removal of the orotracheal tube and insertion of the nasotracheal tube, ventilation was maintained by the negative-pressure ventilator with oxygen insufflation, resulting in the arterial oxygen saturation by pulse oximetry at 98–100%. Immediately after reintubation, end-tidal carbon dioxide was 48 mmHg.

In the literature, we found a report by Benumof[2] that elaborates on his successful change of the endotracheal tubes by use of a method similar to our first procedure. In his method, the tube changer allows for jet ventilation if the new endotracheal tube does not enter the trachea. However, we failed to exchange endotracheal tubes using this technique, because the sizes of the tube changer and fiberoptic bronchoscope were too large for the patient. Therefore, we prepared a small-sized tube changer. Since it was not hollow, jet ventilation could not be used. By using negative-pressure ventilation, however, we could safely perform the exchange of the endotracheal tubes in a patient who could not breathe. Negative-pressure ventilation should be considered as a useful additional safety measure when changing endotracheal tubes.

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