CORRESPONDENCE

Anesthesiology
81:1548, 1994

J. B. Lippincott Company, Philadelphia

Sympathetically Maintained Pain and the Use of Regional Anesthesia

To the Editor:—Although I agree that sympathetically maintained pain (SMP) may be "rekindled by surgery under general anesthesia" as described by Rocco,[1] it is important to emphasize that not all "regional techniques" may be efficacious in preventing its onset.

Pelisser and Eledjam[2] have described two cases in which patients with SMP developed a recurrence under general but not regional anesthesia following subsequent surgical procedures. The regional techniques employed were epidural anesthesia for lower extremity surgery and brachial plexus blockade for upper extremity surgery. It is important to realize that both of these regional techniques are associated with the preoperative onset of a sympathetic blockade, which could prevent the onset of SMP. Not all regional anesthetic techniques, however, result in a sympathetic block.

At our institution, carpal tunnel surgery frequently is performed using local anesthetic infiltration. From our experience, patients with SMP frequently develop a recurrence of their symptoms following this regional technique. Over the past year, it has been our practice to administer a stellate ganglion block to patients with SMP undergoing upper extremity surgical procedures with local anesthesia. Because of the success in decreasing the incidence of recurrent SMP, we also use this technique when these patients undergo general anesthesia.

Clearly, a large-scale randomized prospective study is required to confirm the possible benefit of preoperative sympathetic blockade in preventing recurrent sympathetically maintained pain.

Scott S. Reuben, M.D.
Director, Acute Pain Service
Department of Anesthesiology
Baystate Medical Center and the
Tufts University School of Medicine
Springfield, Massachusetts 01199

References

1. Rocco AG: Sympathetically maintained pain may be rekindled by surgery under general anesthesia. ANESTHESIOLOGY 79:865, 1993
2. Pelisser J, Eledjam JJ: Sympathetically maintained pain after surgery may be prevented by regional anesthesia. ANESTHESIOLOGY 81: 265–266, 1994

(Accepted for publication August 30, 1994.)

Anesthesiology
81:1548–1549, 1994

J. B. Lippincott Company, Philadelphia

Echocardiographic Identification of Paradoxical Air Embolism

To the Editor:—Bedell *et al.*[1] report the first case of intraoperative paradoxical air embolism (PAE) during an episode of venous air embolism (VAE), as documented by transesophageal echocardiography (TEE), which can be attributed to transpulmonary passage of air. The idea of transpulmonary air passage is not new, nor is it a rare event in certain clinical situations in which VAE occurs. We commonly observe transpulmonary PAE during liver transplantation at the time of donor liver reperfusion and the release of the cross-clamps on the inferior vena cava.

The authors state in the discussion section that, during most clinical episodes of VAE, TEE utilization as a monitoring modality does *not* allow one to discriminate between PAE due to right-to-left interatrial shunting and transpulmonary passage of air. TEE *can* discriminate between intracardiac and transpulmonary passage of air emboli (fig. 1). Patients with intracardiac communications display immediate opacification of the left heart chambers after arrival of air emboli into the right heart chambers (fig. 1B). Patients with transpulmonary passage of air emboli display opacification of the left heart chambers approximately three to six (or more) ventricular contractions after air emboli leave the right heart chambers (fig. 1D).[2,3] Furthermore, real-time TEE interrogation of the right and/or left upper pulmonary veins can detect air emboli as they exit the pulmonary circulation and enter the left atrium. Thus, TEE *can* easily distinguish PAE resulting from intracardiac or transpulmonary air passage.

During surgical procedures in which there is significant risk of VAE, it is recommended that (1) continuous TEE monitoring be used; (2) two-dimensional contrast TEE with positive end-expiration pressure testing be performed to evaluate for the presence or absence of a potential right-to-left shunt[4]; (3) during an episode of VAE, the right atrium, left atrium, and interatrial septum immediately be in-

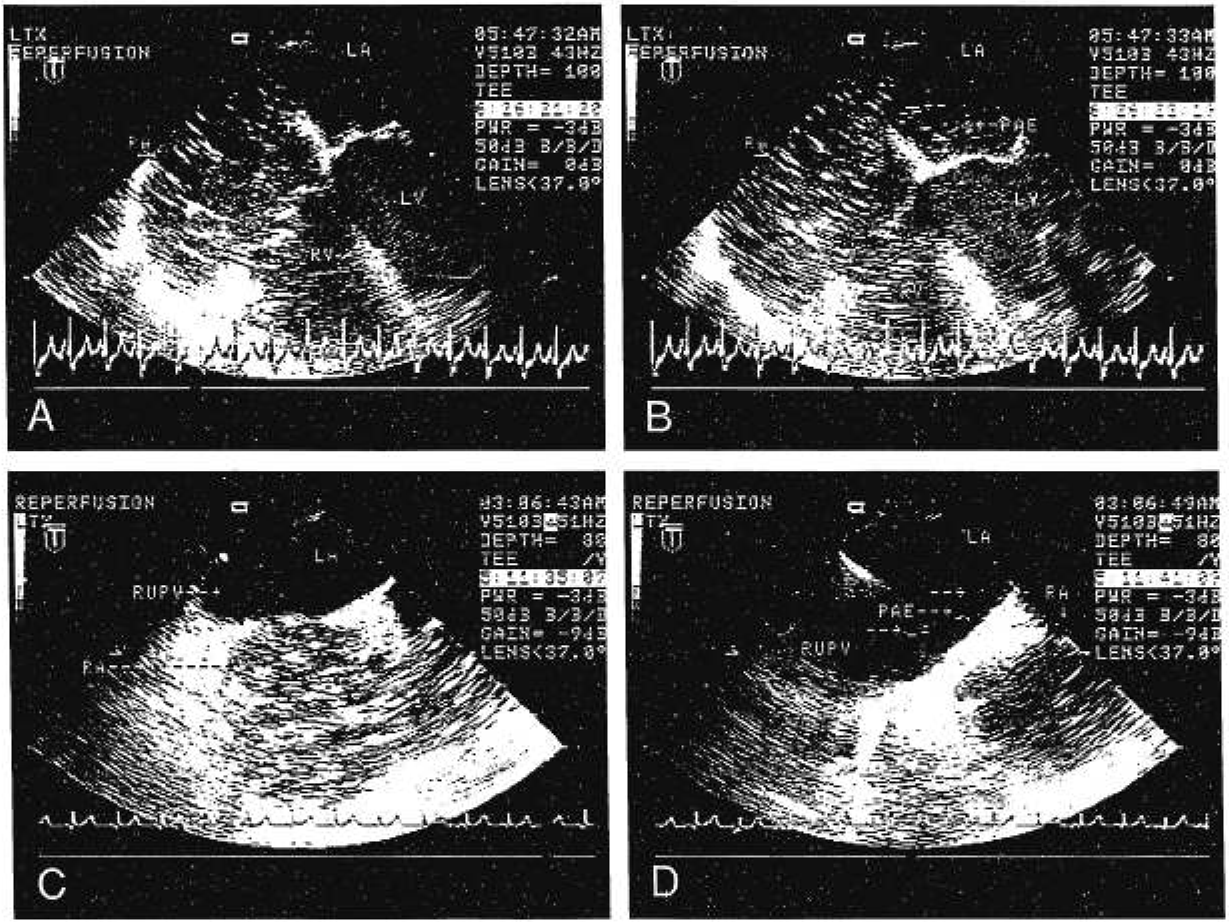

Fig. 1. (*A*) Long-axis transesophageal echocardiogram demonstrating the right atrium (RA), left atrium (LA), right ventricle (RV), and left ventricle (LV). Note the air emboli within the RA. One heartbeat later (*B*), air emboli appear within the LA, emanating from a patent foramen ovale discovered earlier. (*C*) Short-axis view of the base of the heart from another patient demonstrating the RA, LA, and right upper pulmonary vein (RUPV). Note the air emboli within the RA. Six heartbeats later (*D*), air emboli are clearly visible within the RUPV as they enter the LA. The quantity of air emboli within the RA has decreased at this point. PAE = paradoxical air embolism.

terrogated for evidence of PAE from a patent foramen ovale; and (4) during an episode of VAE, the right and/or left upper pulmonary veins also be interrogated for evidence of transpulmonary PAE.

Robert J. Suriani, M.D.
Department of Anesthesiology
Mount Sinai Medical Center
1 Gustave L. Levy Place
New York, New York 10029

References

1. Bedell EA, Berge KH, Losasso TJ: Paradoxical air embolism during venous air embolism: Transesophageal echocardiographic evidence of transpulmonary air passage. ANESTHESIOLOGY 80:947–950, 1994

2. Krowka MJ, Cortese DA: Hepatopulmonary syndrome: An evolving perspective in the era of liver transplantation. Hepatology 11:138–142, 1990

3. Hind CRK, Wong CM: Detection of pulmonary arteriovenous fistulae in patients with cirrhosis by contrast two dimensional echocardiography. Gut 22:1041–1045, 1981

4. Konstadt SN, Louie EK, Black S, Rao TLK, Scanlon P: Intraoperative detection of patent foramen ovale by transesophageal echocardiography. ANESTHESIOLOGY 74:212–216, 1991

(Accepted for publication September 7, 1994.)

Anesthesiology
81:1550, 1994

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.

Keith H. Berge, M.D.
Thomas J. Losasso, M.D.
Department of Anesthesiology
Mayo Clinic
Rochester, Minnesota 55905

Reference

1. Krowka MJ, Cortese DA: Hepatopulmonary syndrome: An evolving perspective in the era of liver transplantation. Hepatology 11:138–142, 1990

(Accepted for publication September 7, 1994.)

Anesthesiology
81:1550–1551, 1994

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.