

As the neurosurgeon was completing hemostasis of the tumor bed, he noted the presence of small microbubbles coursing through the arterioles in brain and I visualized the movement of these bubbles for more than 15 ss through the operating microscope. The surgical procedure rapidly was terminated, the patient taken down to the supine position, and the anesthesia terminated. The patient awakened within 15 min without a neurologic deficit, and a subsequent computerized axial tomography (CAT) scan showed no evidence of cerebral edema or pneumocephalus. In the event that the patient had not awakened within a reasonable period of time after termination of the anesthetic (fentanyl-thiopental continuous infusion with pancuronium and 100% O<sub>2</sub>), our plan was to obtain a CAT scan and if diffuse cerebral edema was present, to move this patient to a nearby hyperbaric chamber. The use of frequent Valsalva maneuvers is a common practice during neurosurgery in order to identify and control bleeding, and this was practiced on numerous occasions in this case. It is paradoxical that the very use of this maneuver, which is thought capable of raising the relatively negative central venous pressure to a positive level and thus arrest the inflow of air, is in reality one of the mechanisms that enhances the development of a right to left shunt through a PFO.

With a high percentage of the normal population having a PFO, and the transatrial pressure gradient possibly reversed in the sitting position, or with PEEP and the Valsalva maneuver, the chance of paradoxical air embolism with its potentially serious sequelae becomes evident. Under these conditions, one must question the benefits ob-

tained in using the sitting position for neurosurgical procedures, for even if a PFO is not present, the consequences of venous air embolism itself still exist.

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### Intubation, Aspiration Prophylaxis in Midtrimester Abortions?

*To the Editor:*—In their report "Comparison of Continuous Infusion Fentanyl or Ketamine versus Thiopental—Determining the Mean Effective Concentrations for Outpatient Surgery,"<sup>1</sup> White *et al.* provide useful information for performing outpatient anesthesia. Their protocol for elective, midtrimester abortions (15 ± 1 week) utilized "a tight-fitting face mask." The question arises, "Are these patients at increased risk for aspiration?"

Nausea was present preoperatively in 12-32% of the patients in the three groups. This may indicate that prostaglandin suppositories were utilized. Nausea and vomiting are common side effects from the increased smooth muscle tone from prostaglandin abortifacents.

Pregnancy affects the gastrointestinal system. Gastrin

is produced by the placenta as early as the twelfth week of pregnancy. This hormone increases the acid, chloride, and enzyme content of the stomach to levels above normal.\* Older literature indicates that gastric emptying time may be delayed in early pregnancy, but this is not well substantiated.<sup>2</sup> Early in pregnancy, progesterone relaxes the phrenicoesophageal ligament with the possible production of a functional or actual hiatus hernia. Roberts states that, "This problem is a strong argument for con-

\* Attia RR, Eberd AM, Fischer JE: Gastrin: Placental, maternal, and plasma cord levels, its possible role in maternal residual gastric acidity. Abstracts of Scientific Papers, Annual Meeting, American Society of Anesthesiologists, San Francisco, 1976, p 547.

sidering patients requiring anesthesia during the first trimester with the same regard for the dangers of regurgitation as the patient in later pregnancy."<sup>2</sup> Authors of recent review articles recommend intubation for surgical procedures during pregnancy.<sup>3,†</sup> However, Levinson and Schnider consider intubation "necessary," only during the third trimester or "any time during pregnancy if she has symptoms of esophagitis."<sup>4</sup>

A previous study<sup>5</sup> from White *et al.*'s institution reported on the number of patients undergoing midtrimester abortions at risk for aspiration. Thirty-seven per cent of these patients had a gastric pH less than 2.5 and a gastric volume of greater than 25 ml. In the control group of nonpregnant outpatients, 45% of the patients were at risk of developing aspiration pneumonia if aspiration occurred. In contrast, a study of nonpregnant outpatients by Ong *et al.*,<sup>6</sup> showed 85% of the patients had a pH less than 2.5 and a gastric volume greater than 25 ml.

Perhaps the authors did not mention preoperative measures taken to decrease gastric volume and increase pH. The literature does not mandate intubation in these patients. Rapid-sequence induction and intubation are the most conservative approach in conjunction with appropriate pharmacologic treatment to decrease the risk factors for aspiration.

† Blass NH: Non-obstetric surgery in pregnant patient, Annual refresher course lectures, American Society of Anesthesiologists Annual Meeting, Atlanta, 1983, lecture 135, pp 1-5.

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*In reply:*—Drs. Dehring and McDonald ask an extremely important question, are outpatients undergoing elective midtrimester abortions at increased risk for aspiration? Unfortunately no clear answer emerges from existing data. The study most relevant to that question was by Wyner and Cohen<sup>1</sup> who found no significant difference between pregnant and nonpregnant (control) outpatients in terms of their residual gastric volume at the time of induction. These investigators demonstrated that early pregnancy (<20 wk gestation) conferred "no additional anesthetic hazard due to a large gastric volume or low pH."

Other investigators<sup>2</sup> reported greater residual gastric volumes in nonpregnant outpatients than in a comparable group of inpatients. They recommended the use of oral antacids before outpatient anesthesia. Unfortunately, colloid antacid suspensions can produce serious pulmonary sequelae if aspirated, and the only widely studied

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nonsuspension antacid, sodium citrate, has been unreliable in neutralizing gastric acid. Furthermore, all antacids increase gastric fluid volume.

A recent study by Manchikanti and Roush<sup>3</sup> reported no increased risk of aspiration pneumonitis in outpatients undergoing elective surgery compared with a similar group of inpatients. However, these investigators recommended the "addition of cimetidine, 300 mg, po, to preanesthetic preparation of outpatients" because 48% of these patients (*vs.* 40% of their inpatients) were reportedly at risk for acid pneumonitis as a result of a high residual gastric volume (>20 ml) and low gastric pH (<2.5). Given the inherent unpredictability of aspiration, is it prudent to require that every outpatient (and inpatient) receive preoperative prophylaxis with an H<sub>2</sub>-receptor antagonist? A recent editorial concluded that "patients receiving anesthesia by face mask without an endotracheal tube can and should be protected against the