Anesthesiology
59:151, 1983

Venous Air Embolism is not Restricted to Neurosurgery!

To the Editor:—The recent case report by Naulty *et al.*[1] in ANESTHESIOLOGY is important because it emphasizes that the occurrence of venous air embolism (VAE) does not lie exclusively in the domain of neurosurgical procedures. Historically, the plethora of clinical reports in the 19th century emphasized that the overwhelming incidence of VAE was associated with procedures on the head, neck, chest[2–4] and in the postpartum period,[5–8] the causative factor in the latter being the entrance of air via tears in the uterine veins and sinuses. Recently, VAE has been noticed in orthopedic procedures involving total hip replacement.[9,10] Abdominal procedures have not been immune from VAE. Stallworth *et al.*[11] reported that it occurred during a laparotomy. Rich[12] noted that it occurred during the lysis of abdominal adhesions and stated "Pulmonary air embolism, fortunately, is rare following abdominal surgery. As shown by this case, however, the possibility always is present and should be kept in mind by the surgeon. Some of our so-called "anesthetic deaths" may possibly be caused by this phenomenon." Lembcke[13] described a serious case that occurred during a hysterectomy in 1946, in which case the air was aspirated via a right heart puncture.

The critical factor in VAE lies in the gradient enhancing the negative venous pressure between the right heart and the superior border of the open vessel. In this case, the 10-degree head-down tilt indicated a gradient of at least 10 cm, which is large enough to facilitate the entrance of air. VAE has been reported in neurosurgical cases with a gravitational gradient as small as 5 cm, and air was detected in 13 of 118 patients in the lateral, supine, or prone position, for an overall incidence of 11%.[14]

Contrary to the statement in the case report, the persistence of the pulmonary perfusion deficit following VAE is not unusual. Albin and coworkers[14] studied 50 patients who had VAE verified by Doppler monitoring and aspiration of more than 25 ml of air from the right atrial catheter. These patients had postoperative and follow-up lung scans, and final resolution of perfusion deficits in some cases took as long as 11 days.

To delineate VAE incidence rates in non-neurosurgical rates, clinical studies are needed, using the Doppler device for air bubble detection, with a properly placed right atrial catheter[15] for aspiration.

MAURICE S. ALBIN, M.D., M.Sc.
Professor of Anesthesiology and Neurological Surgery

MACIEJ F. BABINSKI, M.D.
Associate Professor of Anesthesiology

JAMES GILBERT, M.D.
Associate Professor of Anesthesiology

SUSAN L. SMITH, M.D.
Fellow in Neuroanesthesia

Department of Anesthesiology
Neuroanesthesia Service
University of Texas Health Science Center
San Antonio, Texas 78284

REFERENCES

1. Naulty SJ, Meisel LB, Datta S, Ostheimer GW: Air embolism during radical hysterectomy. ANESTHESIOLOGY 57:420–422, 1982
2. Amussat JZ: Recherches sur L'introduction Accidentelle de L'air dans les Veins. Paris, Germer Bailliere, 1839, p 255
3. Senn N: An experimental and clinical study of air embolism. Ann Surg 2:197–313, 1885
4. Ericksen JE: On the proximate cause of death after spontaneous introduction of air into the veins, with some remarks on the treatment of the accident. Edinburgh Medical Surgery Journal 61:1–24, 1844
5. Legallois E: Des Maladies Occasionees par la Resorption de Pus. J Heb de Med 3:166–192, 1829
6. Cormack JR: The entrance of air by the open mouths of the uterine veins, considered as a cause of danger and death after parturition. London Medical Journal 2:928–951, 1850
7. Davidson DC: Death from air in the veins after parturition. Lancet 1:999, 1883
8. Stroh JE, Olinger MT: Air embolism. Am J Obstet Gynecol 35:711–712, 1938
9. Ngai SH, Stinchfield FE, Triner L: Air embolism during total hip arthroplasties. Br Med J 3:460–461, 1974
10. Michel R: Air embolism in hip surgery. Anaesthesia 35:858–862, 1980
11. Stallworth JM, Martin JB, Postlethwait RW: Aspiration of the heart in air embolism. JAMA 114:1250–1251, 1950
12. Rich RE: Fatal pulmonary air embolism following lysis of adhesions. Surgery 32:126–128, 1952
13. Lembke W: Ueber erfolgreiche Behandlung einer schweren Luftembolie durch Herzkammerpunktion. Chirung 17–18: 31–35, 1946
14. Albin MS, Carroll RG, Maroon JC: Clinical considerations concerning detection of venous air embolism. Neurosurgery 3:380–384, 1978
15. Bunegin L, Albin MS, Helsel PE, Hoffman A, Hung TK: Positioning the right atrial catheter. ANESTHESIOLOGY 5:343–348, 1981

(Accepted for publication December 28, 1982.)