Correspondence

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Air Embolism

To the Editor:—We found the recent article "Pulmonary Interstitial Edema after Multiple Venous Air Embolism" by Perschau *et al.* (ANESTHESIOLOGY 45:364–368, 1976) of considerable interest.

Venous air embolism is a major hazard during surgical procedures in the sitting position.[1] In reviewing our experience of 400 cases of patients operated on in the sitting position during the past five years, we have encountered a 25 per cent incidence of venous air embolism detected by an ultrasonic Doppler transducer and verified by aspiration from an atrial catheter. In a recently completed study that will be reported, we found venous air embolism in patients operated on in the supine, prone and lateral positions with gravitational gradients as small as 5.0 cm. Consequently, we believe that whenever a gradient exists between the right atrium and the incisional area, the patient should be monitored for venous air embolism with a Doppler ultrasonic transducer and a right atrial catheter utilized for aspiration.

In the presence of the signs cited by Perschau and co-workers, increased pulmonary arterial pressure, decreased arterial pressure, premature ventricular contractions, and a murmur heard on the Doppler unit, one would expect to find a large volume of air in the right heart. Instead, these investigators found that only 1.0 to 1.5 ml of air could be aspirated from a Swan-Ganz catheter. While the Swan-Ganz catheter has been shown to be an aid in the detection of venous air embolism[2] because of the hemodynamic changes that may occur, it does not have the direct sensitivity of the cloverleaf ultrasonic Doppler transducer we are now using, which can detect as little as 0.1 ml of air in the right atrium.

Furthermore, the entering venous air is probably detected earlier by the Doppler transducer than by Swan-Ganz pressure changes, thereby permitting earlier aspiration of the air. Finally, aspiration from a right atrial catheter is more appropriate than aspiration from a pulmonary arterial catheter, since the distal end of the latter affords access to only a limited portion of the venous circulation. Currently, we are using an improved right atrial catheter with multiple orifices at the distal end, which permits a large volume to be aspirated.

The etiology of pulmonary edema following massive air embolism is unknown. Several possibilities have been suggested by Perschau *et al.* In our institution we have observed three such cases, in each of which more than 140 ml of air was aspirated.

Currently, we perform lung scans postoperatively with Technetium MAA in every case in which air embolism is suspected. The findings of Carroll and co-workers[3] have demonstrated that the extents of the perfusion defects seen are proportional to the volumes of air aspirated, and that initial chest roentgenograms remain unchanged from pre-air embolism films. We feel that in cases of air embolism the lung scan is a more sensitive indicator of pulmonary insult than the chest roentgenogram and can be used as an indicator of the quantity of air embolized. Since the perfusion defects in the lung are similar to thromboembolic phenomena, knowledge of the causal factor would prevent treatment with heparin in a patient who has recently had neurosurgery.

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