

was that during the operation the patients were in the severely flexed lateral position, which may make cardiac output determinations invalid. We chose a dose of dopamine of 20 $\mu\text{g}/\text{kg}/\text{min}$ because that is the dose most commonly used following cardiopulmonary bypass, and this is where the question first arose. To elucidate the exact mechanism will probably require animal studies where cardiac output and renal blood flow can be monitored with more ease and accuracy.

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Anesthesiology
48:154, 1978

Intracardiac Catheters Unnecessary in Neurosurgical Anesthesia

To the Editor:—The placement of a central venous catheter in patients undergoing neurosurgical procedures in the sitting position has become an accepted technique. Dr. Munson and colleagues have advocated the placement of a pulmonary-artery catheter to further facilitate the withdrawal of entrained venous air.¹ After a brief trial of right atrial catheterization, we abandoned placement of any type of intracardiac catheter for three reasons. First, there are serious risks associated with both right atrial²⁻⁵ and pulmonary arterial catheterization.⁶⁻⁹ Second, attaining proper catheter placement may be time-consuming and troublesome. Third, our experience in a large institution with an active neurosurgical service has led us to believe that with proper management, venous air embolism is not the great hazard some believe it to be.

To verify our clinical impression, all neurosurgical procedures done with the patients in the sitting position during the last five years were reviewed. Anesthesia technique included placement of an esophageal stethoscope, intravenous infusion of large volumes of lactated Ringer's solution, and the use of continuous positive airway pressure. The cases of 461 patients, including 87 undergoing posterior-fossa craniotomy and 374 undergoing cervical laminectomy, were reviewed. All patients had inhaled nitrous oxide, at flow-meter concentrations ranging from 50 to 66 per cent.

Three patients (0.7 per cent) experienced air embolism sufficient to produce a murmur audible with an esophageal stethoscope and changes in vital signs. In all three tachycardia to 120–150 beats/min developed, and two showed decreases in systolic blood pressure of 20–30 torr. Packing the wound and discontinuing nitrous oxide effected prompt recovery in all three cases.

We are now using a Doppler monitor for detecting air embolism, but were not during the period re-

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REFERENCES

1. Yeh BK, Goldberg LI: Attenuation of dopamine renal and mesenteric vasodilation by haloperidol: Evidence for a specific dopamine receptor. *J Pharmacol Exp Ther* 168: 303–309, 1969
2. Robie NW, Goldberg LI: Comparative systemic and regional hemodynamic effects of dopamine and dobutamine. *Am Heart J* 90:340–345, 1975

(Accepted for publication September 21, 1977.)

viewed. This probably accounts for our low incidence compared with that reported by others.¹⁰ This failure of detection, however, in no way detracts from the fact that with proper management, the incidence of clinically important air embolism is very low; hence our conclusion that routine use of central venous or pulmonary-artery catheters is not necessary.

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REFERENCES

1. Munson ES, Paul WL, Perry JC, et al: Early detection of venous air embolism using a Swan-Ganz catheter. *ANESTHESIOLOGY* 42:223–226, 1975
2. Adar R, Mozes M: Fatal complications of central venous catheters. *Br Med J* 3:746, 1971
3. Homesley HD, Zelenik JS: Hazards of central venous pressure monitoring: Pericardial tamponade. *Am Heart J* 84:135–136, 1972
4. Quan KC, Monaco FA: Recurrent iatrogenic ventricular fibrillation induced by malpositioned central venous catheter. *NY State J Med* 75:2244–2245, 1975
5. Norman WJ, Moule NJ, Walrond ER: Lung abscess: A complication of malposition of central venous catheter. *Br J Radiol* 47:498–500, 1974
6. Abernathy WS: Complete heart block caused by the Swan-Ganz catheter. *Chest* 65:349, 1974
7. Smith WR, Glauser FL, Jemison P: Ruptured chordae of the tricuspid valve. The consequence of flow directed Swan-Ganz catheterization. *Chest* 70:790–792, 1976
8. Lemen R, Jones JG, Cowan G: A mechanism of pulmonary-artery perforation by Swan-Ganz catheters. *N Engl J Med* 292:111–121, 1975
9. Cairns JA, Holder D: Ventricular fibrillation due to passage of a Swan-Ganz catheter. *Am J Cardiol* 35:589, 1975
10. Chang JL, Chestnut JS, Carroll RG, et al: Air embolism. *ANESTHESIOLOGY* 46:307, 1977

(Accepted for publication September 13, 1977.)