

Anesthesiology
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Adverse Reactions to Non-ionic Iodinated Contrast Media Do Occur during General Anesthesia

To the Editor:—The etiology of adverse reactions to intravenous radiopaque contrast media is not fully understood.¹ A recent review article stated that such reactions do not occur during general anesthesia.² With respect to ionic contrast media, this statement subsequently was shown to be untrue.³ Non-ionic preparations are believed to be less likely to elicit anaphylactoid reactions.⁴ We report a case of a severe systemic reaction to a non-ionic medium that occurred under isoflurane anesthesia.

An 18-yr-old caucasian girl weighing 58 kg underwent surgery for ventriculo-atrial shunting. Her medical history revealed two uneventful previous anesthetics for the same procedure, conducted with thiopental/isoflurane. Anesthesia was induced with a thiopental-succinylcholine-intubation sequence and maintained with isoflurane (0.8 vol.% end-tidal concentration) in O₂/N₂O (1:2 l·min⁻¹). Ventilation was controlled and monitored by end-tidal capnometry. The anesthetic course was uneventful, and a ventriculo-atrial catheter was inserted and advanced towards the right atrium *via* the right internal jugular vein. Its position was confirmed by x-ray, facilitated by administration of 20 ml of iopamidol (Solutrast 300™, = 6000 mg iodine). Subsequent to this, an abrupt increase of heart rate was noted, which was ascribed to mechanical stimulation of the sinus node by the VA-catheter. However, neither a 2-cm withdrawal of the catheter, nor the administration of lidocaine (1 mg·kg⁻¹) did reduce heart rate. Light anesthesia was suspected and an additional dose of thiopental (1.5 mg·kg⁻¹) was administered. After this failed to normalize cardiac rhythm, the extensively draped patient was uncovered and found to display an exanthema. The legs were erythematous and the abdomen and thorax were mottled with urticaria. At this point, blood pressure decreased to 60/40 mmHg, airway pressure increased, and expiratory obstruction ensued. This was reflected by the capnogram, which changed from a plateau to a slope. Auscultation revealed pronounced wheezing over both lungs. Treatment was instituted with rapid intravenous infusion of crystalloids, tracheal administration of a β₂-stimulant aerosol and iv administration of H₁- and H₂-blocking agents, theophylline, and corticosteroids. Hy-

potension and bronchospasm subsided rapidly; the exanthema resolved slowly. Recovery was uneventful.

Retrospectively, the tachycardia should be interpreted as the initial sign of an anaphylactoid reaction which, in this case, can only be ascribed to the radiopaque material.

To our knowledge, severe systemic reactions to non-ionic iodinated contrast media during general anesthesia have not yet been reported. It must be concluded that the use of such non-ionic compounds, although associated with a reduced incidence of anaphylactoid reactions, does not necessarily preclude such a complication. The anesthesiologist must continue to be vigilant for anaphylactoid reactions when using non-ionic contrast material.

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More On Anesthesia Machines and Malignant Hyperpyrexia

To the Editor:—The article by Beebe *et al.* provides some concrete information upon which to base a policy for preparation of anesthesia machines to be used with MH-susceptible patients.¹ But, some of the recommendations are not justified by the findings of the study, nor are they necessarily the most practical or safest among available alternatives.

The suggestion to remove the vaporizers is based on an experiment with only one brand and model of anesthesia machine and ventilator, neither of which represents the largest fraction of the anesthesia market. In fact, Ohmeda Modulus II® and Foregger F500® machines isolate the vaporizers from the anesthesia-machine gas circuit when all the vaporizers are in the "OFF" position. Thus, a leaking vaporizer would not introduce anesthetic to the patient circuit.

Exchanging the ventilator is not clearly justified from the results

presented. The ventilator relief valve is not necessarily the only source of residual anesthetic. To test the contribution of the ventilator, it should have been replaced entirely with one that had no store of anesthetic.

There are always new hazards, costs, and inconveniences associated with any recommendation. Removing vaporizers can be hazardous, since this creates the possibility of their being dropped or tipped over. On some models of machines, it is necessary to install a fitting to bypass the gap left by removing the vaporizers. Maintaining a special ventilator in a place where it is readily accessible can be impractical in a large institution.

Until recently, it was our policy to maintain two entirely separate anesthesia machines solely for use with MH-susceptible patients. Continuing the policy entailed fully equipping each of these machines with

a full array of monitors, which was cost prohibitive. An alternative would be to use a second anesthesia machine for its monitors alone. The latter was impractical due to space considerations in the operating room. The data from Beebe *et al.* suggest that a much simpler approach is sufficient. Our policy now calls for using either a Modulus II® or Foregger F500® machine, changing the breathing tubes, fresh gas hose, and absorber canister (which shouldn't really be necessary) and purging and ventilating the system with a 5 liter/minute fresh gas flow for 10 min. This is also similar to the suggestions of McGraw and Keon.² Vaporizers can be removed from the Modulus II® at the request of the anesthetist. In any event, it seems that the more stringent suggestions from the 1982 American Society of Anesthesiologists Technical Bulletin are no longer justified.*

An alternative approach to this problem could be to change nothing except the breathing tubing and to insert a charcoal canister on the inspiratory port of the absorber after or during purging [ironically, data on the effectiveness of charcoal in removing anesthetics from a low-flow system appeared in the same issue of ANESTHESIOLOGY.³ Hypothetically, the charcoal would absorb any residual anesthetic following a purge.

We appreciate the availability of the results of this investigation. We do, however, suggest that alternative interpretations and approaches be considered for preparing an anesthesia machine for MH susceptible patients.

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In Reply:—The results of any study directly apply only to the model tested. Because it is impossible to test every model, results are usually extrapolated with appropriate modification to other situations. Our data indicate that vaporizers should be removed from the anesthesia circuit. It seems obvious that this can be accomplished by an isolation valve, on machines so equipped.

Our study clearly indicates that the Air-Shields® ventilator releases halothane during machine washout (compare the open squares in figure 3 with the filled squares in figure 4). These results also indicate that the source is a component other than the bellows. Therefore, the test of an uncontaminated ventilator suggested by Cooper and Philip is redundant. It is not necessary to further identify the halothane source because no part of the ventilator, other than the bellows, is easily accessible.

Our study evaluated simple modifications to an ordinary anesthesia machine, and documented the residual halothane concentrations produced by each. Using our recommendations, residual anesthetic concentrations will be <1 PPM. For reasons discussed in our manuscript, concentrations this low are unlikely to trigger malignant hyperthermia. It is probable that somewhat higher concentrations are also safe: in the absence of specific data, each anesthesiologist must determine the residual concentration he or she finds acceptable. The concentration chosen will presumably reflect the risks and costs associated with asuring extremely low residual concentrations.

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A Potential Complication of Fiberoptic Intubation

To the Editor:—The fiberoptic bronchoscope can be a useful aid to tracheal intubation.^{1,2} We wish to report a potentially serious complication associated with the use of this instrument.

A 41-yr-old man with an unstable fracture of the lumbar spine was

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* American Society of Anesthesiologists: Technical Bulletin for Malignant Hyperthermia, *ASA Newsletter*, November, 1982

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3. Jantzen JAH: More on black and white granules in the closed circuit (letter to editor). *ANESTHESIOLOGY* 69:437-438, 1988

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We agree that activated charcoal *hypothetically* reduces residual anesthetic concentrations. Although charcoal does seem useful for reducing anesthetic depth while maintaining a closed circuit, the Letters to the Editor proposing this technique do not adequately evaluate its safety for patients susceptible to malignant hyperthermia.^{1,2}

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scheduled for posterior instrumentation and fusion under general anesthesia. The surgeons had requested awake tracheal intubation and positioning of the patient because of the unstable nature of the injury. Following intravenous sedation and the topical application of local an-