

Anesthesiology
69:436, 1988

In Reply:—We join Dr. Bromage in urging extreme care in the use of epidural opiates and agree that safety must be a primary concern. However, we have not found the regular use of apnea monitors, continuous monitoring of gas exchange, or the restriction of care to expensive and crowded special units necessary to achieve it.

Although early volunteer studies gave us valuable information about the effects of intraspinal opiates, more recent prospective studies in large patient populations^{1,2} indicate an incidence of respiratory depression comparable to that reported following the use of parenteral narcotics.³ Although early reports mentioned the occurrence of sudden respiratory arrest, all recent reports of which we are aware describe slowly increasing ventilatory insufficiency. It is not clear whether effective observer training, institutional protocols, standard orders, and adequate medical supervision were established prior to the "near misses" to which Dr. Bromage refers. We have emphasized the importance of these measures for safe practice.¹

Our experience now exceeds 1500 surgical patients and an additional 750 patients who received a single epidural or subarachnoid injection of morphine following cesarean section. In all cases of respiratory depression we have observed, increasing somnolence was a prominent feature. Our current monitoring practice relies heavily on well-trained nurses who check both respiratory rate and a simple bedside sedation scale hourly for the first 24 h in all patients receiving an epidural or intrathecal opiate.

We are surprised at the emphasis Dr. Bromage has placed on apnea monitors. Such devices, used on our first 1000 patients, were not as useful as expected. It is not surprising that they failed to detect our most serious cases of respiratory depression, because respiratory rate is a poor indicator of respiratory depression in patients receiving epidural opiates. This, coupled with a problem of frequent false alarms, has resulted in a decline in the use of apnea monitors in our practice.

Stenseth *et al.* reported a series of 1085 surgical patients treated with epidural morphine and subsequently monitored by human observers.² Similar to our experience in patients who developed respiratory depression, the onset of depression was gradual and the problem was recognized by nurses and effectively treated without injury or death.

We believe that some patients may be at increased risk of respiratory depression. They include elderly patients, patients with significant systemic disease, and those who have undergone extensive and/or lengthy surgery. In addition, patients who have received large doses of epidural opiate or who have been treated with parenteral opiates or other long-acting central nervous system depressants may be at extra risk. Special care should be used if these factors are present. Some of them place patients at risk for a variety of postoperative complications and increase the probability of their admission to intensive care facilities immediately after surgery whether or not epidural opiates are used.

The decision to adopt new techniques into clinical practice must be based on the balance between the benefits they offer and their risks. The efficacy of epidural opiate analgesia is established. We speculate that some of our patients who would have died are alive today because of the superior analgesia they received.⁴ Others may have been spared serious post-surgical complications.⁵ None were injured or killed in the course of offering that analgesia.

Without appropriate nursing education, monitoring practices, hospital protocols, standard orders, and medical supervision, epidural opiate analgesia may be dangerous. The same may be said for parenteral opiates.³ We have demonstrated that the safe use of epidural opiate analgesia is possible without restricting it to high-intensity nursing areas and without routine use of apnea monitors. We do not believe our practice is one of compromise.

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Breathing Circuit Mishap Resulting from Y-piece Disintegration

To the Editor:—The list of crises and near-disasters arising from mishaps with or defects of anesthesia equipment is long and diverse. Particularly worrisome are those intrinsic to the breathing circuit and its components, the disconnect or malfunction of which can lead to an

almost immediate crisis requiring instant rectification—or resuscitation. We report such an incident.

A 33-yr-old woman, ASA Physical status 1, was scheduled for excision of a ganglion cyst on her left wrist. Following midazolam 2.5 mg

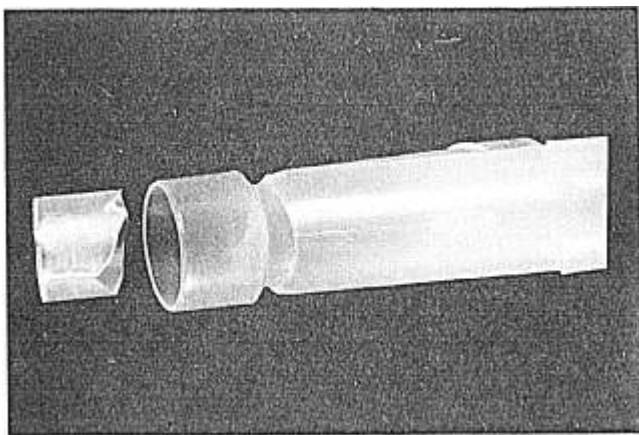


FIG. 1. Fractured inner 11 mm ring.

and fentanyl 100 μ g iv, anesthesia was induced with thiopental 250 mg iv. While establishing comfortable mask fit to the patient's face, all breathing circuit connectors were turned (without undue force or difficulty) to a workable configuration. In doing so, a cracking noise was heard, and the inner 11 mm ring of the breathing circuit Y-piece was found to have fractured and broken out (fig. 1). This made connection of the circuit to the elbow connector impossible; lacking a spare breathing circuit in the room, the anesthesiologist commenced "mouth-to-mask" ventilation, which was easily accomplished. Continuous pulse oximetry suggested moderate arterial desaturation (from 99% to 91%), which then stabilized. A new circuit was obtained, the old replaced, and the case proceeded uneventfully, with a smooth intraoperative course and emergence, followed by complete recovery.

This case illustrates a type of breathing-system mishap for which many anesthetizing locations are poorly prepared. In retrospect, the use of the portable oxygen cylinder (stationed outside the room) might have provided an acceptable alternative circuit. Alternatively, the breathing circuit Y-piece might have been connected to the mask directly, without swiveling connectors, which is as simple as it is unfamiliar and awkward. However, this case suggests that a spare breathing circuit should be at hand within each anesthetizing location, rather than in a central supply area as is common in many institutions. Far worse consequences might have resulted if, for example, this had occurred during an anesthetic in a radiology suite.

We are unaware of other reports of this type of occurrence, and we are unqualified to judge whether this is a single "fluke" episode, or evidence of a design or manufacturing defect that has broader implications. The need for preparedness for either of these possibilities, however, remains indisputable.

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More on Black and White Granules in the Closed Circuit

To the Editor:— Delayed washout of volatile anesthetics and increased absorption of carbon dioxide by soda lime are specific features of closed circuit anesthesia systems. The latter requires frequent exchange of the carbon dioxide absorbent, the first can be dealt with by adding an activated charcoal filter to the circuit. Control of both is

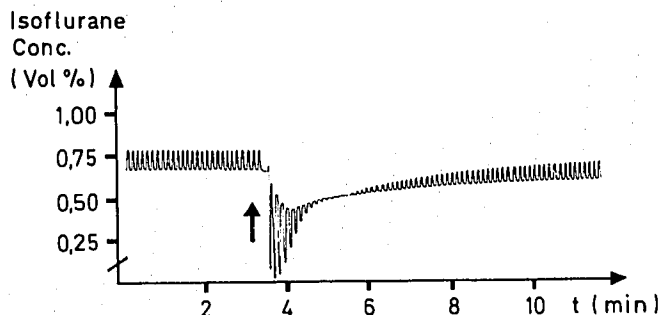


FIG. 1. Isoflurane concentration during minimal-flow anesthesia (FGF 0.5 l·min⁻¹). Arrow indicates exchange of soda lime canisters.

facilitated by anestheticography (on-line monitoring and recording of anesthetic vapor concentration¹).

Soda lime exchange during minimal-flow or closed circuit anesthesia results in a long-lasting reduction of vapor concentration (fig. 1). The immediate decrease is due to dilution, as one set of canisters—besides soda lime—contains 1.5 l of air. The delayed return to the initial concentration is caused by vapor adsorption onto fresh soda lime.² Anesthetic gas monitoring provides the information needed to rapidly restore the desired vapor concentration.¹

Maintaining a closed circuit throughout emergence requires vapor elimination by activated charcoal. A number of devices for this purpose have recently been described.^{1,3,4} The principle of volatile anesthetic agent's adsorption onto charcoal was discussed by Epstein in 1944⁵ and clinically applied by Bushman in 1977.⁶ Such a filter was, however, employed for the elimination of ether vapor from anesthesia systems as early as 1934.*

No mention has yet been made as to the position such a filter should occupy within the circuit. A position upstream from the soda lime

* Jantzen JP, Kleemann PP: Clinical application of anaesthetic gas monitoring. *Fortschr Anaesth* 2:59-63, 1987