



FIGURE 1. EtCO₂ and N₂O values before (A) and after (B) changing the gas analyzer module.

of the adjacent nature of their filters on the wheel, it can be surmised that a problem in any of these filters might affect the other.

The important clinical aspect of this report is that if N₂O had not been used, the flaw would not have come to fore. Relying on falsely low values of EtCO₂ could lead to dangerous levels of hypercapnia if the anesthesiologist tries to maintain pseudo-normal values. Even if the anesthesiologist does an arterial blood gas analysis on clinical suspicion and detects the discrepancy, the cause would be attributed to the patient's high alveolar dead space,³ rather than to the gas analyzer. We could only detect the flaw because the anesthesiologist was vigilant enough and the N₂O level discrepancy was detected. The flaw persisted even after zero calibration. Hence, we advise maintaining a high level of clinical suspicion for such a problem if low EtCO₂ values are detected immediately after endotracheal intubation and low levels of minute ventilation are required to maintain normal EtCO₂ values.

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Is Sevoflurane Responsible for Postoperative Myoclonic Seizure?

To JNA Readers:

Sevoflurane, volatile induction agent, has several postoperative complications varying from mild (nausea, vomiting, hypertension, hypotension, pain, and shivering) to severe ones (respiratory impairment and unexpected neurological events such as seizure, motor and sensory deficit, and unexpected delay of awakening).¹ We report a case of immediate postoperative neurological complications associated with sevoflurane.

A 53-year-old woman with American Society of Anesthesiologists classification I presented with painful ophthalmoplegia and unruptured aneurysm at the left anterior choroidal artery. After successful steroid pulse therapy, her aneurysm was treated by surgical clipping under general anesthesia with sevoflurane and remifentanyl. Anesthesia was maintained using sevoflurane with an end-tidal concentration of 1.5% to 2.0% to achieve 1.3 to 1.8 times the minimum alveolar concentration, end-tidal PaCO₂ ranged between 35 and 40 mm Hg with tidal volumes between 400 and 450 mL, and PaO₂ > 98% during the entire surgical procedure. There was no noticeable intraoperative in-

cident except meticulous temporal lobe manipulation. During anesthetic recovery, she showed a focal myoclonic seizure on the right side of mouth and neck. She was transferred to the intensive care unit and valproate sodium was loaded with side-shooting of 4 mg of lorazepam. She failed to regain consciousness and bucco-facio-cervical myoclonus became more prominent with right limb paralysis (grade III). Head computed tomography scans and magnetic resonance imaging diffusion-weighted images revealed neither bleeds nor infarction. Myoclonic seizure sustained for additional 20 minutes, and meanwhile, intense odor was felt when the patient exhaled. After confirming normal blood laboratory results, add-on midazolam 5 mg was injected. The patient showed gradual recovery by 3 hours from first myoclonus.

Rapid increase in sevoflurane concentration, minimum alveolar concentration > 2.0, and hyperventilation during induction have been identified as important risk factors for epileptiform electroencephalography activity.² However, the occurrence of seizure activity during recovery from sevoflurane anesthesia is exceptionally rare. Possible mechanisms for seizure activity during recovery period from sevoflurane anesthesia are a precipitous decline in sevoflurane concentration, and central nervous system excitation by sevoflurane and hypercarbia during anesthetic recovery.³

In this case, postoperative myoclonic seizure, motor deficit, and unexpected delay of awakening could be sufficiently explained by sevoflurane. When early postcraniotomy neurological complications develop, physicians should consider both surgical and anesthetic culprits. However, as illustrated in this patient, the strong possibility of sevoflurane anesthesia as a cause of postoperative neurological complications should be considered in the differential diagnosis.

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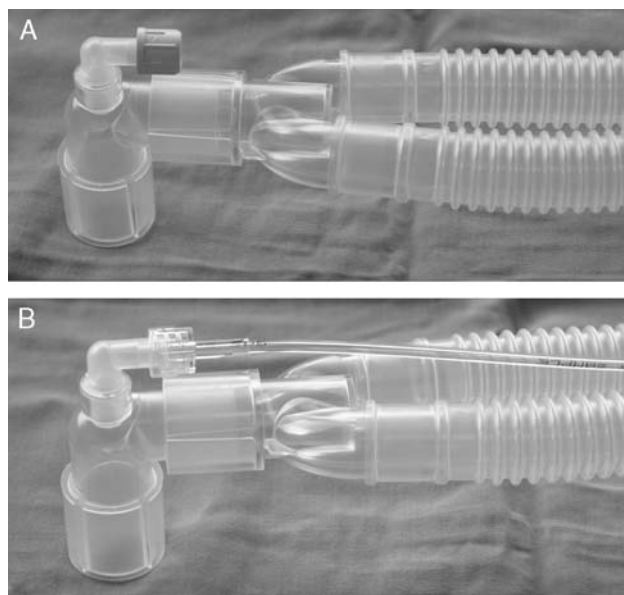
Using a Paralleled Origin of Sampling Line to Prevent its Intraoperative Kinking

To the Editor:

The recent article by Dubey and Kumar¹ using small piece of a tracheal tube as splint to prevent intraoperative kinking of the gas sampling line was of great interest. Because kinking of gas sampling line is not an uncommon event and can occur multiple times during head and neck surgeries,² many methods to address this issue have been suggested, such as looping the sampling line at its attachment to the breathing circuit,³ using an angled insertion point for the sampling line,³ or adding a 3-way stop cock to the sampling line near the breathing circuit,⁴ and threading the sampling tube through the unused elbow connector.² The authors should be thanked for providing another solution to this problem. Just like Dubey and Kumar have described, however, none of these methods is failproof.

As intraoperative kinking of the sampling line is mainly due to its vertical origin from the connecting point of the breathing circuit,^{2,3} using a paralleled origin of the sampling line can significantly minimize this problem. Now, there are such commercial breathing circuits with a special adapter at the elbow connector for paralleled origin of the sampling line available, for example, the anesthesia breathing circuits produced by Teleflex Medical (Research Triangle Park, NC) (Fig. 1). To avoid intraoperative kinking of sampling line, we

FIGURE 1. The breathing circuit with a special adapter for paralleled origin of the sampling line (A) and paralleled attachment of the sampling line that prevents kinking (B).



prefer to use this breathing circuit during head and neck surgeries. On the basis of our experience, this breathing circuit can avoid kinking of the sampling line by compression from the weight of the drapes and surgical equipment such as drapes, suction tubings, surgical equipments, or pressure from the assistant's hands. Furthermore, this method is less likely to fail because it does not require additional equipment modification or airway maneuvers.

The condensed water droplets from humidified sample gas are another common cause of the sampling line obstruction, especially during long procedures or when a single sampling line is used for a number of cases.⁵ In their article, Dubey and Kumar describe that during anesthesia, the gas sampling line is kept vertical to prevent moisture entering the line. That is, a paralleled attachment of the sampling line may be less effective to prevent humidified sample gas entering the sampling line than a vertical attachment of the sampling line.¹ In the available literature, however, there is no evidence supporting this view. Thus, we strongly suggest that randomized controlled clinical trials with large sample of patients undergoing head and neck surgeries should be performed to compare incidence of the sampling line ob-

struction by condensed water droplets when using the breathing circuits with vertical and paralleled origins of the sampling lines. If further studies show consistent beneficial effect of using a paralleled origin of the sampling line on the sampling line obstruction events, manufacturers of the breathing circuit should be encouraged to provide such attachment module to their products to prevent the intraoperative kinking of sampling line.

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