

Aerosol propellants leading to factitious reading by gas monitoring



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Vijay Adabala,* Priyanka Gupta

Department of Anesthesiology, All India Institute of Medical Science (AIIMS) Rishikesh, Uttarakhand, India

Dear Sir,

A well-equipped anesthesia workstation is a boon for safe anesthesia practice. Anesthesia agent gas monitoring has become an integral part of intra-operative monitoring. The infrared analyzers are commonly used for measuring anesthetic agents. These advanced gas monitoring devices help in the accurate titration of delivery of anesthetics to patients, particularly at low flows. However, as with any technology, gas monitoring is also associated with inherent errors. Newer aerosol propellants like hydro-fluoro-alkanes (HFA) are known to cause erroneous detection of inhalational anesthetic agents during general anesthesia. We report a case where older anesthetic agents like halothane and enflurane were found on the screen of the anesthetic monitor (Drager primus infinity C700 anesthesia workstation) when metered dose inhalers (salbutamol) was used to relieve bronchospasm of the patient.

A 45-year-old, chronic smoker male patient having right chronic suppurative otitis media of ASA physical status II, was posted for right radical mastoidectomy. Following induction of anesthesia patient developed bronchospasm immediately after endotracheal intubation. Anesthesia was maintained with O₂, N₂O, and sevoflurane. He was given 4-5 puffs of salbutamol inhaler via the endotracheal tube. A bright red rectangle with halothane suddenly printed on the monitor screen. One minute later enflurane also appeared on the screen. The Drager Primus Infinity C700 workstation flashed a note reading "mixed agents" (sevoflurane, N₂O, halothane, enflurane). As soon as the salbutamol puffs were given the monitor started showing inspiratory halothane as 0% followed by end-tidal halothane 0.7% gradually falling to 0% approximately after 3-4 min. Halothane was never used in our OT and there is no vaporizer for halothane present in whole OT complex. We use only isoflurane and sevoflurane as inhalational anesthetics yet the gas monitoring was erroneously measuring halothane and enflurane. After 3-4 minutes these gases disappeared from the monitor. It was a surprising observation, which was further investigated.

In an attempt to minimize "greenhouse gas effect", aerosol propellants based on carbon

fluorocarbons (CFC) has been replaced with eco-friendly hydro-fluoro-alkanes (HFA). Levin PD et al studied and concluded that HFA based inhaler can cause short-lived, but clinically significant false positive readings for all five (desflurane, sevoflurane, isoflurane, enflurane, and halothane) commonly used anesthetic gases.¹

Halothane misinterpretation for hydro-fluoro-alkane based medical aerosol propellant by agent analyzer has been reported.² Agent analyzer using a lower wavelength of IR spectra (3-5 μm) range can lead to false interpretation of halothane and enflurane for methane, water vapor, isopropyl alcohol, etc.³ The refractive indices for the volatile anesthetic vapors are 1,603.2 for halothane, 1,540.4 for enflurane, 1,563.3 for isoflurane, 1,538.3 for sevoflurane, and 1,211.7 for desflurane.⁴ The 134a HFA, the propellant in inhalers is chemically 1,1,1,2-tetrafluoroethane, also known as norflurane.⁵ Infrared (IR) analyzers which are in common use are based on the principle that gases with two or more dissimilar atoms in the molecule (nitrous oxide, CO₂, and the halogenated agents) have specific and unique IR light absorption spectra. HFA134a demonstrates significant infrared absorbance across the whole 8±12 μm wavelength range. This high absorbance completely overlaps the peaks on the anesthetic gas spectra in the 8±12 μm range and presumably accounts for the interference in monitoring function.

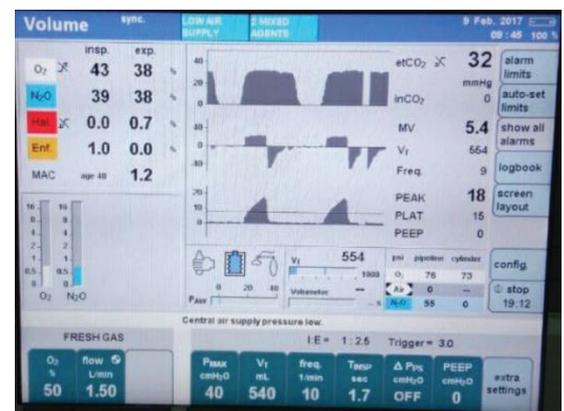


Figure 1 The screen of the workstation during mixed-agent reading

*Correspondence to: Vijay Adabala, Department of Anesthesiology, All India Institute of Medical Science (AIIMS) Rishikesh, Uttarakhand, India
vijay.adabala96@gmail.com

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