Halothane: I am still there

Sir,

Modern anaesthesia workstation uses advanced electronic and software technologies to provide low-flow anaesthesia which requires monitoring of oxygen (O_2), carbon dioxide (CO_2) and volatile anaesthetic agents (VAA). These advanced gas monitoring (AGM) devices help in accurate titration of delivery of anaesthetics to patients. However, the erroneous reading of agents by these monitors may incite alteration of vapouriser output with inherent danger of light anaesthesia or VAA toxicity. In analyses conducted by Cassidy *et al*. on critical incidents related to anaesthetic equipment, 13.4% of incidences were reported with gas monitoring.[1] We report a case of erroneous detection of halothane despite the fact that the agent was never used with this workstation.

A 45-year-old patient was planned to be operated for laparoscopic abdominal hysterectomy under general anaesthesia, for which Drager Fabius GS™ premium anaesthesia workstation was used. The patient was induced with intravenous propofol and fentanyl. Anaesthesia was maintained with O_2-air mixture and isoflurane, maintaining its end-tidal concentration at 1.2. Just before the end of surgery, isoflurane was turned off. Meanwhile, monitor started showing halothane concentration up to 1.3% and residual isoflurane concentration of 0.2% simultaneously. The minimum alveolar concentration (MAC) value increased to 1.7 despite no agent being administered [Figure 1]. Halothane was never used with this workstation and anywhere in the operation theatre (OT) complex. It was considered as erroneous reading, and the patient was extubated when clinical recovery was appreciable as MAC value was not considered reliable in this case.

The agent analyser with this workstation works at the principle of pulsed, non-dispersive infrared radiation (IR) method and a multispectral detector. IR absorption is a common method of gas analysis for measuring concentrations of CO_2, nitrous oxide (N_2O) and VAA in gas mixture during anaesthesia. Different wavelengths of IR light are used to determine concentrations of CO_2, N_2O and VAA. Although the same wavelength is used for all current VAAs, different sensitivities are set for each agent, typically the highest for halothane and lowest for sevoflurane. Furthermore, the refractive indices of halothane, isoflurane and sevoflurane are overlapping (1603.2, 1563.3 and 1538.3, respectively), and complex mathematical calculations are used to identify and measure them.[2]

Switching over of anaesthetic (one for induction followed by other agent for the maintenance of anaesthesia), vaporiser filling with an incorrect agent, the absence of scavenging system leading to accumulation of anaesthetic in OT and anaesthesia machine leading to false agent identifications were explanations given by service engineer for this problem. As halothane is not available anywhere in OT complex and only isoflurane was used throughout surgery, so above possibilities were ruled out. Hawkes *et al*. reported wrong detection of halothane during trigger-free anaesthesia in malignant hyperthermia susceptible patient. It was a factitious reading resulting from incorrect identification of patient's expired methane as halothane by agent analyser.[3] Similarly, halothane misinterpretation for hydrofluoroalkane-based medical aerosol propellant by agent analyser has been reported.[4,5] Agent analyser using a lower wavelength of IR spectra (3–5 μm) range can lead to false interpretation of halothane for methane, water vapour and isopropyl alcohol, etc. Above conditions could not explain this case as agent analyser with this workstation uses a higher wavelength of IR spectra for VAA discrimination.

Figure 1: Erroneous display of halothane

On examination, we noted condensation in sampling line and the presence of water in water trap of gas analyser. After changing this part, sensor started identifying agents correctly. Water vapour and secretions in the sampling line of side stream could damage expired gas membrane of AGM sensor. This could be an explanation of agent misidentification in our case.

It is recommended that water trap and sensor of gas analyser should be periodically checked and replaced according to manufacturer's recommendation, and sensors with higher wavelengths (10–13 μm) which do not cross-react with gases exhaled from patients such as methane, acetone, alcohol and CO_2 should be used with closed circuit anaesthesia.

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Conflicts of interest
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