Measuring Anesthetic Concentrations in the Exhaust Gas of the Oxygenator During Cardiopulmonary Bypass Can Be Unreliable

To the Editor

We congratulate Barry et al.\(^1\) for the outstanding review of the current knowledge regarding strategies to handle anesthetic management during cardiopulmonary bypass (CPB). Given the increasing use of volatile anesthetics during CPB, this comprehensive review was needed. The authors cited our previous study in which we showed a lack of correlation between the sevoflurane concentration measured at the oxygenator exhaust port and the sevoflurane partial pressure in blood in patients with various neuromuscular diseases.\(^2\) In vitro concentration measured at the oxygenator exhaust port and we showed a lack of correlation between the sevoflurane was needed. The authors cited our previous study in which volatile anesthetics during CPB, this comprehensive review cardiopulmonary bypass (CPB). Given the increasing use of.

We concluded that measuring oxygenator exhaust is not dynamically relevant variable, which depends on blood/gas partition coefficients.\(^3\) We agree that it is difficult to exist, we would expect a reasonable correlation between sevoflurane concentration in the exhaust port and the parallel-derived bispectral index as well. However, we could not find any relevant correlation between the sevoflurane concentration measured in the exhaust port and the bispectral index values in our study sample (\(r = 0.071\)).\(^2,6,7\) Besides, if such a correlation existed, we would expect a reasonable correlation between sevoflurane concentration in the exhaust port and the parallel-derived bispectral index as well. However, we could not find any relevant correlation between the sevoflurane concentration measured in the exhaust port and the bispectral index values in our study sample (\(r = 0.071\)).\(^2\) A possible explanation is that the gas exhaust of the oxygenator was connected to an anesthetic gas scavenging system with pressure-limited suction, which might have facilitated room-air admixture (Fig. 1). The results of other publications with good correlations might have been found without a scavenging system and a suction connected to the exhaust port. However, because of occupational medical reasons, we find a scavenging system necessary to minimize the workplace exposure to volatile anesthetics.

This substantiates our conclusion that the concentration of volatile anesthetics measured in the exhaust port must be cautiously handled when dosing volatile anesthetics during CPB.

Barry et al.\(^1\) cited a letter to the editor that criticized our findings because we measured the SPC although the sevoflurane partial pressure is probably the pharmacodynamically relevant variable, which depends on blood/gas partition coefficients.\(^3\) We agree that it is difficult to directly estimate sevoflurane partial pressure in blood from our results. However, measuring plasma concentrations of volatile anesthetics during CPB and reporting changes during CPB have been performed in clinical studies previously.\(^5,6\) Furthermore, the degrees of hypothermia and hemodilution are not so severe that they could influence the partition coefficient in a way, which makes measuring the SPC useless.

We believe a clinically relevant correlation between sevoflurane in the exhaust port and the sevoflurane partial pressure is very unlikely, taking into consideration that in a routine clinical setting, the correlation coefficient of sevoflurane in the exhaust port and the SPC was \(r = -0.044\) (\(P = 0.530\)) in our study.\(^2,6,7\) Besides, if such a correlation existed, we would expect a reasonable correlation between sevoflurane concentration in the exhaust port and the parallel-derived bispectral index as well. However, we could not find any relevant correlation between the sevoflurane concentration measured in the exhaust port and the bispectral index values in our study sample (\(r = -0.13, P = 0.071\)).\(^2\) A possible explanation is that the gas exhaust of the oxygenator was connected to an anesthetic gas scavenging system with pressure-limited suction, which might have facilitated room-air admixture (Fig. 1). The results of other publications with good correlations might have been found without a scavenging system and a suction connected to the exhaust port. However, because of occupational medical reasons, we find a scavenging system necessary to minimize the workplace exposure to volatile anesthetics.

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REFERENCES
Letters to the Editor

To the Editor

We thank Morey et al.1 for referencing the Institute for Safe Medication Practices’ (ISMP) plea to focus on proper labeling and identification of high-alert medications. However, we strongly caution against their use of trailing zero decimals (4.0 should be 4) and U (for units). A trailing zero in the decimal portion of a medication dose has no role in accurate dosing but has been a frequent source of 10-fold overdoses when the decimal point was overlooked in handwritten, electronic, and typed doses, including doses published in professional journals. Similarly, the use of U for units has been mistaken for the number zero and has also been associated with 10-fold overdoses. The ISMP, the nation’s only nonprofit medication safety agency, has long opposed the use of trailing zero decimals (4.0 instead of the proper “4”) and using the traditional but incorrect “U” instead of “Units.”2 As pointed out, these are proven sources of medication errors. We thank them for their vigilance, because we neglected to apply our usual clinical practice to our writing. In our defense, we were fractionally (0.3) distracted during writing the manuscript by all the regulations without compelling supporting data. We commit to fractionally (1) reducing our Institute for Safe Medication Practices failure rate. We completely agree with the Institute for Safe Medication Practices that all of us, including the Journals, need to be intellectually consistent in practicing what we preach.

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In Response

We thank Cohen et al.,1 representing the Institute for Safe Medication Practices, in their letter to the editor for pointing out our improper use of a trailing zero (using “4.0” instead of the proper “4”) and using the traditional but incorrect “U” instead of “Units.”2 As pointed out, these are proven sources of medication errors. We thank them for their vigilance, because we neglected to apply our usual clinical practice to our writing. In our defense, we were fractionally (0.3) distracted during writing the manuscript by all the regulations without compelling supporting data. We commit to fractionally (1) reducing our Institute for Safe Medication Practices failure rate. We completely agree with the Institute for Safe Medication Practices that all of us, including the Journals, need to be intellectually consistent in practicing what we preach.

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