CORRESPONDENCE

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Sympathetic Hyperactivity during Desflurane Anesthesia

To the Editor:—Although the article of the above title[1] contains useful information, the design of the study compromises one of its aims, a comparison with isoflurane. The investigators provided their subjects with 0.5, 1.0, and 1.5 MAC (minimum alveolar concentration) as defined by vaporizer settings. That is, the concentrations *delivered* to the anesthetic circuit (and from the circuit to the volunteer) equalled 0.5, 1.0, and 1.5 MAC desflurane or isoflurane. Given the differences in solubility and uptake of these anesthetics,[2–4] identity (in terms of MAC multiples) of delivered concentrations does not produce identity of *alveolar* concentrations. The alveolar MAC multiples of desflurane must be greater than those of isoflurane because the uptake of isoflurane will be greater. The difference for both the inspired-to-alveolar anesthetic concentrations and the delivered-to-inspired anesthetic concentrations will be larger for isoflurane, the latter because of the impact of rebreathing of gases from which a greater amount of anesthetic has been extracted. Therefore, the alveolar MAC multiples of isoflurane will be less, the step sizes of isoflurane will be smaller, and the rise in the alveolar concentration of isoflurane will occur over a longer period than that in desflurane. If the MAC multiples and step sizes applied were unequal and if the rates of rise in the alveolar concentrations differed, nothing can be said about the comparative effects of these two anesthetics.

Publication of the end-tidal desflurane *versus* end-tidal isoflurane concentrations and the time course of the changes in concentration might have diminished or eliminated the above concerns. Perhaps the MAC multiple differences, the differences in step sizes, and the differences in the rates of change were too small to have affected the results. However, although end-tidal concentrations were measured, they were not reported.

The manner of selection of subjects further compromises the comparison of the results with isoflurane *versus* desflurane. The data for each anesthetic were obtained from different volunteer pools (*i.e.*, no subject received both anesthetics). The anesthetics were not randomly assigned to the subjects, and it appears that the subjects given isoflurane were studied after the subjects given desflurane: "In seven additional subjects, isoflurane was administered at time intervals and MAC equivalents identical to those employed in the subjects receiving desflurane." However, these are relatively minor flaws compared to the flaws of imposing different MAC multiples, different step sizes, and different rates of rise in end-tidal concentrations.

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In Reply:—Eger and Weiskopf have expressed some concerns over the experimental design of our study but admit that we have provided "useful information." Their first concern is that our comparison of desflurane to isoflurane in equivalent minimum alveolar concentration (MAC) increments during induction is scientifically invalid because the rate of rise of the alveolar concentration would be dissimilar. This is because of the different solubility and uptake of these anesthetics. We have two responses to this concern. First, it is very likely that clinicians will want to take advantage of the kinetic properties of desflurane, *i.e.*, they will attempt to rapidly deepen anesthesia to establish a plane sufficient to obtund stress responses. Thus, our experimental design was driven by a clinically relevant desflurane administration paradigm. The rapid administration of desflurane can trigger substantial tachycardia and hypertension. Second, the suggestion that we compare the neurocirculatory responses to increasing anesthetic levels at equi-alveolar MAC is an excellent one, and in fact, we have begun work along these lines. In our first of two unpremedicated volunteers, we slowed the rate of desflurane administration to achieve 1-MAC (7.25%) end-tidal concentrations within 12 min (beginning 1 min after anesthetic induction with 2.0 mg/kg

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