

CORRESPONDENCE

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Minimum Alveolar Concentration of Nitrous Oxide in Humans

To the Editor:—I write concerning the letter from Glass on the minimum alveolar concentration (MAC) of nitrous oxide in humans.¹ Glass contends that the published value of 105% of 1 atm may underestimate the correct value. Although three arguments are offered, each is flawed. First, Glass cites our work showing that the MAC of nitrous oxide in rats is higher than found in previous experiments.² However, this must be interpreted in the light of the previous experiments (see next argument). Second, Glass cites the argument of Cole *et al.* that the combination of nitrous oxide and other potent inhaled anesthetics does not produce an additive effect.^{3,4} Indeed, the reports of Cole *et al.* prompted our direct determination of the MAC of nitrous oxide in rats. We did not agree with the interpretation proposed by Cole *et al.*, who estimated MAC by extrapolation.^{5,6} Our report suggests that the extrapolation was incorrect and that, contrary to the original interpretation by Cole *et al.*, the effects of nitrous oxide and potent agents *are* additive. Third, Glass cites the abstract by Schwilden and Ropecke.⁷ Extrapolation of the data in this report on the interaction of nitrous oxide and isoflurane and how these anesthetics affect the electroencephalogram suggests to Glass a MAC value for nitrous oxide greater than 105%. The problem with this argument is that MAC is not mediated by an effect on the brain (the locus of the electroencephalogram) but rather by an effect on the spinal cord.^{8,9} Thus, the Schwilden and Ropecke report is not relevant to this discussion.

And yet, Glass may be right. The MAC of nitrous oxide in humans was determined directly, but the stimulus used was a tetanic pulse applied to the ulnar nerve.¹⁰ Although this usually produces a result comparable to that found with surgical stimulation, such is not always the case. Surgical stimulation can produce a MAC value greater than produced by electrical stimulation.^{11,12} Still, the 105% value accords with many other bits of information. Extrapolations from the MAC determinations for the combination of nitrous oxide with other anesthetics in humans are consistent with the 105% value.¹³⁻¹⁶ Finally, Bert's reports of operations on humans anesthetized only with nitrous oxide (in a pressure chamber) suggest that MAC cannot be much more than 1 atm.^{17,18}

Perhaps Glass will settle the issue by using the pressure chamber at Duke to perform surgery under nitrous oxide alone, applying measurement techniques more precise than those available to Bert. I stand ready to be of assistance.

Edmond I. Eger II, M.D.
Professor, Anesthesia
Vice Chairman for Research
Department of Anesthesia
455 Science, Box 0464
University of California, San Francisco
San Francisco, California 94143-0464

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Subarachnoid Hemorrhage Unexpectedly Found on Spinal Anesthesia

To the Editor:—We describe a patient with unexpected subarachnoid hemorrhage found during spinal anesthesia for an operation of urethrocele.

A 59-yr-old woman who had been suffering from migraine for 30 yr was admitted to undergo an operation for urethrocele. On the day of surgery, she complained of slight headache beginning at 6 AM, when a preoperative glycerin enema was administered. She was transferred to the operating room at 11 AM without premedication. She was conscious, and vital signs were normal. Subarachnoid puncture was performed at the L4-L5 interspace with a 22-G spinal needle. Cerebrospinal fluid (CSF) was found to be bloody. We suspected CSF was stained with blood because of traumatic puncture. However, 2-3 ml of bloody CSF was obtained through the spinal needle. A second puncture at the L3-L4 interspace again disclosed bloody CSF. Because subarachnoid hemorrhage was suspected, the operation was postponed, and computed tomography scan was performed, which revealed subarachnoid hemorrhage. A cerebral aneurysm at the bifurcation of right internal carotid-posterior communicating artery was found by cerebral angiography. On the next day, a clipping of the cerebral aneurysm was performed uneventfully.

In this case, the subarachnoid hemorrhage was thought to have occurred at 6 AM, when the glycerin enema was performed. However, because of her previous history, the headache was assumed to have

been caused by a migraine attack. Furthermore, the headache was mild and was accompanied by no other signs or symptoms. Obviously, proper management of such a patient is necessary if complications related to this potentially devastating problem are to be kept to a minimum.

Kazuhiko Saitoh, M.D.
Clinical Assistant

Yoshihiro Hirabayashi, M.D.
Lecturer

Hiromasa Mitsuhata, M.D.
Lecturer

Reiju Shimizu, M.D.
Professor and Chairman of Anesthesiology

Department of Anesthesiology
Jichi Medical School
3311-1 Minamikawachi-machi
Tochigi, 329-04 Japan

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