Anesthesiology
73:193, 1990

The Word "Awareness": Its Ambiguous and Confusing Use in Anesthesia Literature on Memory

To the Editor:—We noted, while reviewing articles on learning and memory during anesthesia published in anesthesia journals, the ambiguity of the term "awareness" as used in this literature. Awareness is the quality or state of being aware, *i.e.*, watchful, vigilant, informed, cognizant, or conscious.[1] Patients can respond to commands under anesthesia with no recall postoperatively, and the opposite is also possible; *i.e.*, patients may not follow commands but may exhibit some postoperative recall of intraoperative experience.

An additional problem with the term became obvious with the identification of implicit or nondeclarative memory as a separate form of memory.[2] Patients under anesthesia may show some evidence of implicit memory[3-5] without being "aware" or able to "monitor" their environment. On the other hand, many patients with organic amnesias display normal implicit memory without awareness deficit. Thus the terms "memory" and "awareness" should be used separately.[6,7] The word "awareness" as used in this context is anesthetic jargon and is irrelevant to cognitive psychology under which memory is studied. If anesthesiologists are to contribute effectively to this body of knowledge, they need to communicate with clarity and conciseness to cognitive psychologists.[8]

M. M. GHONEIM, M.D.
Professor

R. I. BLOCK, PH.D.
Assistant Professor
Department of Anesthesia

College of Medicine
University of Iowa
Iowa City, Iowa 52242

REFERENCES

1. The Oxford English Dictionary, 2nd edition. Oxford, Clarendon Press, 1989
2. Squire LR, Zola-Morgan S: Memory: Brain systems and behavior. Trends Neurosci 11:170–175, 1988
3. Evans C, Richardson PH: Improved recovery and reduced postoperative stay after therapeutic suggestions during general anesthesia. Lancet II:491–493, 1988
4. Bennett HL, Davis JA, Giannini J: Non-verbal response to intraoperative conversation. Br J Anaesth 57:174–179, 1985
5. Goldman L, Shah M, Hebden M: Memory and cardiac anaesthesia. Anaesthesia 42:596–603, 1987
6. Jacoby LL, Witherspoon D: Remembering without awareness. Can J Psychol 36:300–324, 1982
7. Schacter DL: Multiple forms of memory in humans and animals, Memory Systems of the Brain. Edited by Weinberger NM, McGaugh JL, Lynch G. New York, Guilford Press, 1985, pp 351–379
8. Eger EI II: A glossary of anesthetic jargon. Anesth Analg 68:740–743, 1989

(Accepted for publication April 19, 1990.)

Anesthesiology
73:193–194, 1990

Nitroglycerin Antagonism of Heparin

To the Editor:—Preliminary work done in our department may provide insight to the phenomenon of nitroglycerin-induced heparin resistance, as discussed recently by Barnette.[1]

Based on decreases in activated partial thromboplastin time, Habbab *et al.* suggested that nitroglycerin may interfere with the anticoagulant effects of heparin.[2] Postulating that this effect may arise from a change in the activity or concentration of antithrombin III (AT3), we determined AT3 concentrations in an *in vitro* experiment.

Three healthy volunteers supplied fresh blood by antecubital fossa venipuncture. After addition of citrate, the blood was separated into 12 polypropylene tubes, representing the permutations of four nitroglycerin concentrations (0, 2, 10, or 20 ng/mL) and three heparin concentrations (0, 2, or 5 units/ml). The tube containing neither nitroglycerin nor heparin served as control. The nitroglycerin concentrations reflect therapeutic levels.[3] The tubes were incubated for 2 weeks at 37° C, centrifuged, and the plasma frozen at −20° C. Plasma was defrosted for measurement of AT3 concentration (Nor-Partigen AT3 kit, Behring Diagnostics, Somerville, NJ) and determination of AT3 activity (Coatest, Helena Labs, Beaumont, TX). The activity assay adds an excess of heparin; thus, tubes previously containing 0, 2, or 5 units/ml of heparin were essentially identical with respect to heparin concentrations. Plasma from the 12 tubes for each subject thus provided three replicates for the four nitroglycerin concentrations.

Two-way analysis of variance separated effects due to nitroglycerin and individual subjects. Results appear in tables 1 and 2. Varying concentrations of nitroglycerin and heparin had no statistically significant

TABLE 1. Antithrombin III Concentrations (mg/dl)

Nitroglycerin Concentration (ng/ml)	Heparin Concentration (U/ml)			Mean + SD (n = 18)
	0	2	5	
0	23.7	24.3	22.1	23.4 ± 4.7
2	23.8	23.7	23.8	23.8 ± 4.2
10	21.7	24.3	19.7	21.9 ± 4.1
20	23.8	23.9	22.8	23.5 ± 3.9
Mean (n = 18)	23.2	24.1	22.1	23.1 ± 4.2*

Each entry is the mean of six observations, except where noted.
* n = 72.