

benzodiazepines accounts for the high incidence of explicit memory in our study."

Apparently, then, the investigators found some explicit memory for list words (3 patients) and frequent explicit memory for intraoperative events (9 patients). But they conclude that no significant explicit memory occurred: in their own words, "The findings of the present sufentanil/nitrous oxide study support those studies that have found neither explicit nor implicit memory after surgical anesthesia." In fact, their study simply finds no implicit memory for word lists, given the absence of explicit recall of those lists. The data seem to support the possibility of explicit memory itself, both for words and events. Furthermore, the data may suggest that patients remember what is important to them, since explicit memory for events seems to have occurred much more often than memory for words.

Details about the word and event recollections might clarify these

possibilities. This information would be an important addition to an intriguing research report.

ELANA B. DOERING, PH.D., M.D.
*Resident in Anesthesia
Hospital of the University of Pennsylvania
34th and Spruce Streets
Philadelphia, Pennsylvania 19104*

REFERENCE

1. Cork RC, Kihlstrom JF, Schacter DL: Absence of explicit or implicit memory in patients anesthetized with sufentanil/nitrous oxide. *ANESTHESIOLOGY* 76:892-898, 1992

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In Reply:—In our previous research, we showed a dissociation between explicit and implicit memory in surgical patients who experienced adequate anesthesia with isoflurane.* The purpose of our most recent study was to determine whether a similar dissociation could be observed with other anesthetic regimens. For this purpose, we restricted our analysis to those patients who, like the vast majority of surgical patients, showed no explicit memory whatsoever for any aspect of their surgical experience, including the words presented on the audiotape, as measured by a test of free recall. We were somewhat surprised to find that some of our patients anesthetized with sufentanil/nitrous oxide displayed hints of explicit memory for surgical events; but our protocol, which was designed to provide a replication of our isoflurane study (in which no such hints were apparent), required that these patients be eliminated from statistical analysis. To repeat our findings: with isoflurane, implicit memory was spared to some degree in patients for whom explicit memory was abolished entirely; however, when sufentanil abolished explicit memory, it also abolished implicit memory. This direct comparison, removed from our paper at the request of the Editor to avoid publication repetition, is documented elsewhere.²

Unfortunately, we have no way of gauging the accuracy of these particular patients' "vague, dreamlike" reports. For the most part, they were generic thoughts and images that could pertain to any surgical procedure; perhaps it was inaccurate to refer to them as "recollections," but they were made in response to a question about memory, so to be conservative, we characterized them as such. (We hasten to add that all of these patients were adequately anesthetized according to standard

clinical criteria, none of them reported anything more than a fleeting impression, and none of them found their recollections—if indeed that is what they were—to be disturbing in any way.)

As we noted in our paper, we suspect that the occurrence of these apparent recollections was due to our elimination of benzodiazepine premedication—again, following the procedure used in our isoflurane study. Certainly there was nothing remarkable about the patients' illnesses or the progress of their surgeries. The fact that isoflurane without benzodiazepine abolishes explicit memory reliably, but sufentanil administered under the same circumstances does not always do so, is a finding of some theoretical and practical interest, but further research is required to define it more precisely. In any event, nothing in our research justifies the speculation that "patients remember what is important to them," as suggested by Doering: presumably the details of surgical procedures are important to all patients who undergo them, regardless of the anesthetic agents employed; yet most patients remember nothing at all.

RANDALL C. CORK, M.D., PH.D., F.A.C.A.
*Associate Professor
Department of Anesthesiology
University of Arizona
Tucson, Arizona 85724*

REFERENCE

1. Cork RC, Kihlstrom JF, Schacter DL: Implicit and explicit memory with isoflurane compared to sufentanil/nitrous oxide. *Proceedings of the Second International Symposium on Memory Awareness during Anesthesia, 1992, in press*

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* Kihlstrom JF, Schacter DL, Cork RC, Hurt CA, Behr SE: Implicit and explicit memory following surgical anesthesia. *Psychological Science* 1:303-306, 1990.

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Partially Paralyzed: A Personal Experience

To the Editor:—I was one of the volunteers partially paralyzed to a T₁-T₄ ratio of 0.2 with atracurium in the study reported by Sharpe *et al.*¹ During the first phase of this study, I was lying supine. While in that position, I found it difficult to lift my limbs off the bed. All attempts to do so failed in midcourse. Although my tongue was lying limp in my throat, I was not choking. Difficult phonation was not due to inability

to breathe but to not being able to lift my lips off my teeth, so that I could only lisp. I could not focus my eyes, but I did not have diplopia.

At the end of the study, I was turned on to my right side. In that position, I could move my arms freely and kick my legs with ease, as long as I confined all movements to the plane of the bed. I could purse my lips again, and my speech cleared. My vision improved also, particularly

if I only focused on objects near the floor. I felt more comfortable and almost normal instantaneously.

The immediate improvement in my well-being could not have been the result of spontaneous recovery from atracurium. I explain all my difficulties while supine by the inability of muscle groups to act against gravity. Since many anesthetized patients are still partially paralyzed during recovery,²⁻⁴ my observation adds weight to positioning them in the lateral decubitus.

DAVID C. CHUNG, M.D.
*The Mississauga Hospital
100 Queensway West
Mississauga, Ontario
Canada L5B 1B8*

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Intractable Cardiac Arrest in Children Given Succinylcholine

To the Editor:—Intractable, unexpected cardiac arrest has been reported, especially in children, following induction of anesthesia with halothane and succinylcholine (SCh). In some cases, the child was subsequently shown to have Duchenne's muscular dystrophy (DMD).¹

During the past 12 months, four boys younger than 8 years of age have died in the United States during or following halothane and SCh (Malignant Hyperthermia [MH] Hotline data). Evidence of massive rhabdomyolysis was noted in all, and hyperkalemia and acidosis in most. In one case, the diagnosis of DMD was made based on the absence of dystrophin in the muscle specimen.

In the other cases, necrotizing rhabdomyolysis was noted on muscle specimens obtained at autopsy. Whether these changes are indicative of DMD in all cases is unclear.

This catastrophe is not limited geographically. The German MH Hotline (courtesy of Dr. Uwe Schulte-Sasse of Heilbronn) has accumulated 11 similar cases.

We speculate that six cases of this syndrome of sudden, intractable cardiac arrest would be expected each year in the United States, with an approximate 60% mortality rate.

Typically, the child is apparently normal with no major motor developmental delays but manifests this abnormal response shortly after administration of SCh. Based on data obtained during resuscitation, the arrest is likely due to hyperkalemia, although rhabdomyolysis and acidosis are also striking features. Hyperkalemia is present during resuscitation, limiting its success.

The earliest sign is a serious arrhythmia, such as pronounced bradycardia, that progresses rapidly to asystole or ventricular fibrillation.

When such a syndrome occurs in a child, we suggest immediate therapy for hyperkalemia, including glucose, insulin, bicarbonate, and calcium. Dantrolene is an appropriate secondary drug because it is not acutely toxic and the clinical differentiations from malignant hyper-

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1. Sharpe MD, Lam AM, Nicholas JF, Chung DC, Merchant R, Alyafi W, Beauchamp R: Correlation between integrated evoked EMG and respiratory function following atracurium administration in unanaesthetized humans. *Can J Anaesth* 37:307-311, 1990
 2. Viby-Mogensen J, Jorgensen BC, Ording H: Residual curarization in the recovery room. *ANESTHESIOLOGY* 50:539-541, 1979
 3. Beemer GH, Rozental P: Postoperative neuromuscular function. *Anaesth Intensive Care* 14:41-45, 1986
 4. Bevan DR, Smith CE, Donati F: Postoperative neuromuscular blockade: A comparison between atracurium, vecuronium, and pancuronium. *ANESTHESIOLOGY* 69:272-276, 1988

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thermia susceptibility have not been clarified. Even in the absence of a direct relationship, dantrolene would not be harmful and might be helpful.

Surviving children should be evaluated for muscular dystrophy. We suggest that muscle specimens be frozen and analyzed for dystrophin levels.

We have notified the Food and Drug Administration of this potential problem and recommend that anesthesiologists carefully consider the indications for use of SCh in young children.

A full report concerning these cases is in preparation.

HENRY ROSENBERG, M.D.
*Department of Anesthesiology
Hahnemann University
Broad and Vine Streets
Philadelphia, Pennsylvania 19102-1192*
GERALD A. GRONERT, M.D.
*Department of Anesthesiology
University of California, Davis
TB 170
Davis, California 95616*

REFERENCES

1. Delphin E, Jackson D, Rothstein P: Use of succinylcholine during elective pediatric anesthesia should be reevaluated. *Anesth Analg* 66:1190-1192, 1987
2. Larsen UT, Juhl B, Hein-Sorenson O, Olivarius B: Complications during anesthesia in patients with Duchenne's muscular dystrophy (a retrospective study). *Can J Anaesth* 36:418-422, 1989

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A Double Tube Technique of Adult Fiberoptic Assisted Tracheal Intubation

To the Editor:—The problems associated with fiberoptic bronchoscope (FOB) assisted endotracheal intubation addressed by Marsh¹ result mainly from attempts to pass relatively large internal diameter endotracheal tubes (ETT) over small external diameter scopes. Marsh con-

sidered the problem of the size discrepancy permitting the bevelled tip of the ETT to protrude laterally from the FOB so that it may catch on structures such as the aryepiglottic folds. To minimize the size discrepancy, he suggested that one can thread a smaller ETT with the