CORRESPONDENCE

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Potential Physiologic Mechanism for Ketamine-induced
Emergence Delirium

To the Editor.—I read with interest the recent article concerning the attenuation of cardiostimulatory and psychotomimetic effects of ketamine by dexmedetomidine.1 This represents a definite advance in alleviating the side effects of ketamine anesthesia. However, in the conclusions, the authors state that their finding that dexmedetomidine prevented central nervous system (CNS) side effects was "difficult to explain." Several studies by Olney et al. have begun to investigate the underlying mechanism of NMDA antagonist (of which ketamine is an example) induced neurotoxicity. It has been shown that ketamine causes damage to neurons in the posterior cingulate and retrosplenial cortex of rats,2 areas postulated to mediate affective and emotional responses. It has also been shown that anti-cholinergics, GABAergic agonists, and NMDA antagonists may function to inhibit this neural damage.3-5 It could be that this mechanism accounts for the remarkable absence of CNS side effects in groups treated with NMDA antagonists. Paradoxically, this would suggest that the routine administration of centrally acting anti-cholinergics, such as scopolamine and atropine, which may be psychotomimetic in their own right, may be warranted when ketamine is used. These studies also predict that GABA agonists, such as benzodiazepines and barbiturates, should be protective against emergence delirium. The current study had no untreated control group. So this direct comparison could not be made. However, barbiturates may be more effective in blocking CNS side effects than benzodiazepines because they act as more complete agonists at the GABA receptor channel and can block NMDA receptors.2

In sum, it seems that there is a plausible scientific basis for the authors’ findings. This literature suggests other premedication regimens that may be helpful in preventing the CNS side effects of ketamine. It is hoped that the authors will continue to pursue this interesting line of investigation.

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References

5. Olney JW, Farber NB: NMDA antagonists as neurotoxic therapeutic agents: interactions and research tools for studying schizophrenia. Neuropsychopharmacology (in press)
6. Farber NB, Foster J, Duhan NL, Olney JW: NMDA antagonist-induced lesions are prevented by MK-801 neurotoxicity. Neuropsychopharmacology (in press)
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Effect of 7.2% Hypertonic Saline/6% Hetastarch on Left Ventricular Contractility in Anesthetized Humans

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To the Editor.—Goertz et al.1 described the effects of hypertonic saline/hetastarch on left ventricular contractility. A number of years ago, we performed a study2 examining the hemodynamic response to 25% mannitol (a hypertonic solution) in patients before and during cardiac bypass. We found a 23 ± 6% (SE) decrease in systemic arterial pressure with a 38 ± 7% (SE) reduction in systemic vascular resistance in prebypass patients. During cardiopulmonary bypass, patients experienced a 30 ± 5% to a 40 ± 3% (SE) decrease in mean systemic pressure depending on dose and rate of mannitol administration. We also found that the patients not on bypass were able to compensate for the decreasing cardiac output by altering other vasoconstrictor responses. However, when the data were transferred to baseline within a matter of days, we also performed radioluclide response studies in rabbits using pentobarbital anesthesia. We found an influencing change in systemic arterial pressure, i.e., the greater the osmotic load, the greater the vasodilatory effect of the vascular bed primarily resulting from a local vasodilation and not a redistribution of the vascular reflex rather than a direct vasodilatory effect. Thus, this study corroborates the findings of the human study and further suggests that hypertonic saline is a useful treatment for hypotension and cardiac output in non-cardiac surgery patients.

REFERENCES


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In Reply.—As expected in response to hypertonic saline, cardiac output decreased. However, we evaluated a possible positive response using changes in left ventricular contractility occurring at the time of colloid instillation (length, area, respective changes in left ventricular contractility, pressure maneuvers using esophageal pressure monitoring). While we did not evaluate the source of this positive response, we demonstrated that hypertonic saline is a useful treatment for hypotension and cardiac output in non-cardiac surgery patients.
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able to compensate for the decrease in peripheral resistance by increasing cardiac output by approximately 0.81/min. These changes, however, were short-lived, and all hemodynamic parameters returned to baseline within a matter of several minutes.

We also performed radiolabeled microsphere studies and dose-response studies in rabbits, examining hypertonic glucose and hypotonic mannitol. We found that rate and dose were important factors influencing change in systemic vascular resistance and in systemic arterial pressure, i.e., the faster the rate of administration and the greater the osmotic load, the greater the hemodynamic effect. The vascular bed primarily responsive to this hypertonic load was in muscle tissue. One wonders how long the hypotension lasted in the patients studied by Goertz et al., whether this was an effect that was sustained for more than a transient period (as we observed with 25% mannitol), and whether the phenomena might have been caused by vasodilation of the vascular supply to muscle tissue, resulting in a reflex rather than a direct cardiac effect.

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References

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Defective Carbon Dioxide Absorber as a Cause for a Leak in a Breathing Circuit

To the Editor—We would like to bring to attention an unusual cause of a leak in the breathing circuit involving the carbon dioxide absorber canister (Soda Sorb SSN 6505-00-782-6484, WR Grace, Lexington, MA).

During a routine pre-use machine check, we noted a leak within the breathing system. Visual inspection of the breathing circuit did not reveal the source of the leak, and all joints appeared to be intact. A draft could be felt near the carbon dioxide canisters, initially, we thought that they were misaligned and removed them and changed them from top to bottom. However, the leak persisted. Thinking that the absorbers were still out of alignment, we removed them from the housing. This caused some free granules to fall to the floor. On closer inspection of the canister, it was noted to be defective. The canister is made of a clear plastic cylinder, filled with absorbent

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In Reply.—As expected, we found a decrease of arterial pressure in response to hypertonic saline/leukostarch that was caused by peripheral vasodilation. However, the primary aim of our study was to evaluate a possible positive inotropic effect of hypertonic saline. With changes in left-sided loading and possibly left ventricular contractility occurring at the same time, end-systolic pressure-volume (length, area, respectively) relationship (ESPVR) had to be used to assess left ventricular contractility. To obtain the ESPVR curve, arterial pressure recordings must be performed (e.g., phenylephrine bolus administration), which in turn interfere with alterations of blood pressure in response to hypertonic saline. Obviously, a comment on the time course of blood pressure changes after that maneuver is not possible. Furthermore, because we did not use different rates of administration or doses of hypertonic saline, we are not able to comment on the interesting questions addressed by Coté concerning the influence of both variables on the degree of hemodynamic changes.

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