LETTERS

Are Pigs the Right Model for Lipid Resuscitation?

To the Editor: We read, with interest, the study by Bushey et al1 that analyzed the efficacy of lipid emulsion treatment following cardiovascular collapse caused by the combination of bupivacaine plus hypoxia. The authors showed that lipid emulsion provided no benefit in return of spontaneous circulation or in survival rates compared with saline control. While these results would seem to suggest that lipid emulsion may not be as clinically effective as commonly supposed, it is important to consider the effect of the experimental design on the authors’ findings.

We believe that introducing hypoxemia introduces an unnecessary confounding factor insofar as tissue asphyxia can exacerbate local anesthetic toxicity and impair lipid resuscitation.2 It is also possible that swine do not provide an accurate model for lipid resuscitation because of a type of hypersensitivity reaction that can occur following treatment with liposomes.3 Complement activation-related pseudoallergy (CARPA) can cause cardiac arrhythmias, decreased cardiac output, shock, and death in pigs. Swine are found to be especially sensitive to this condition, compared to dogs and rats.

We wonder if CARPA might interfere with effective resuscitation with lipid emulsion in the setting of bupivacaine-induced cardiotoxicity.4 Additional research is needed to further investigate the possible adverse effects of CARPA associated with lipid infusion in pigs.

REFERENCES

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Response: I would like to thank Brian Zider, BS, and Guy Weinberg, MD, for their comments and insight on our recently published article. Since hypoxemia was uniformly established and measured in all animals, I believe it does not create a confounding factor. However, readers should consider our introduction of hypoxemia when interpreting and applying our results. Similarly, we must consider the clinical applicability of published studies demonstrating lipid emulsion efficacy in animals that received mechanical ventilation with 100% oxygen at the time of bupivacaine-induced cardiovascular collapse. Early case reports have indicated that hypoxia may quickly develop during local anesthetic-induced convulsions.1,2 We suggested that hypoxia may alter the ability of lipid emulsion to restore cardiovascular function.

It is not known from our study or the published literature whether the administration of lipid emulsion causes complement activation-related pseudoallergy (CARPA). The lipid emulsion (Intralipid 20%) used in our study does contain small unilamellar liposomes.3 Complement activation-related pseudoallergy is caused by some, but not all, liposomal drugs and lipid particles.4 Factors related to the development of CARPA include liposome composition, size, and rate of intravenous administration.5 Complement activation-related pseudoallergy potentially produces rash/mottling, significant hypotension or hypertension, pulmonary hypertension, major cardiac arrhythmias, decreased cardiac output, shock, and death.5,6 Therefore, we would anticipate that our experimental group that received lipid emulsion would have been negatively impacted if CARPA had been induced. However, there were no differences between groups in survival, time to return of spontaneous circulation, or hemodynamics. The addition of lipid emulsion did not significantly affect any of the variables that we measured.

Szébeni and colleagues4 proposed that swine, because of their high sensitivity, are the most suitable animal model for determining the safety of liposomal drugs. Nearly 100% of swine will present with a hypersensitivity reaction to liposomes identified to produce reactions in only 5% to 7%
of humans.4 Recently, Niiya et al7 demonstrated that lipid emulsion administered as 1.5 mL/kg bolus followed by a 0.25 mL/kg/min infusion prevents intravenous amiodarone-induced hypotension in pigs. The investigators observed mottling in all 10 experimental animals receiving lipid emulsion but not in animals receiving the control treatment of normal saline. Two of the 10 pigs receiving lipid emulsion also had a significant reduction in pulse oximetry readings. Pulse rates were not significantly different between groups, and there were no reported arrhythmias.7 The mottling and pulse oximetry changes observed may be signs of a lipid hypersensitivity reaction.

Given the sensitivity of swine to some lipid particles and the observations of Niiya et al,7 I agree with Mr Zider and Dr Weinberg that further research is needed. Specifically, future investigations should determine to what extent lipid emulsion causes CARPA and if CARPA inhibits lipid resuscitation of bupivacaine-induced cardiovascular collapse.

REFERENCES

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Syringe Size Effect on Delivered Versus Calculated Dosages of Propofol: A Bench Experiment Using the Baxter InfusOR Syringe Pump

To the Editor: In response to the excellent article by Randall Klotz, CRNA, MEd, MSN,1 I would like to add the following suggestion. We in the profession of administering anesthesia during monitored anesthesia care/ sedation cases frequently omit the documentation of the drugs’ effects on our patients, such as the patient’s level of consciousness, any pain experienced, perceived anxiety, airway management needed, etc. Granted, documenting that the patient received a dose of propofol at a particular micrograms per kilogram per minute vs merely a total dose of propofol over a particular time period is a more accurate manner of describing drug use, but it in no way documents the patient’s response to that particular infusion rate, which is ultimately the goal.

I personally use the Ramsay sedation scale 1-6 in documenting a patient’s response to sedatives, hypnotics and anxiolytics during monitored anesthesia care. There are other scales as well, such as the Glasgow coma scale. Anesthesia drugs affect different patients differently and even though 50 μg/min for one patient may be an adequate dose with or without other adjuncts, it may be suboptimal or lethal for another patient. It is the continued documentation of the dose delivered and the patient’s response to that dose throughout the case that demonstrates vigilant anesthesia care.

REFERENCE

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Response: I would like to thank Mark A. Klapperich, CRNA, for his thoughtful and insightful letter concerning my October 2011 AANA Journal article, “Syringe size effect on delivered versus calculated dosages of propofol: A bench experiment using the Baxter InfusOR syringe pump.”

In the article I am advocating, based on ethical and legal standards, that each and every dose of a drug and the effect of that drug is to be charted. Any change in dosage of a drug is to be recorded. If the patient’s heart rate increases and an additional 50 μg of fentanyl is administered, it is charted. It can then be noted if the additional dose of analgesic medication resulted in a lower heart rate. This is the same principle for a dose of Esmolol (brevibloc) administered in response to an increase in heart rate. The change in heart rate, blood pressure, bispectral index level, etc is the charting of a response to the drug dosage administered. Any review of the chart, legally or otherwise, would show what changed in the patient’s status before and after the administration of additional medication.

Therefore, as the patient’s status changes, the change in administered dosage of propofol needs to be documented, as shown in the anesthesia record (Figure 4 in article and shown on page 455).
To draw a straight line and total the dose of propofol at the end is not consistent with the ethical and legal standards of the American Association of Nurse Anesthetists and the American Society of Anesthesiologists. The anesthesia provider is held accountable to the standards of both organizations. Therefore, in a legal action, the Certified Registered Nurse Anesthetist or anesthesiologist could be held culpable if there was a real or perceived negative outcome.

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Authors’ Corrections

Reference Citations
In the June 2011 issue, the author makes the following correction. On page 215, right column, last line, reference number 24 is changed to 23. On page 216, left column, line 13 of Conclusion, reference 25 is changed to 24. See Kline JP. Ultrasound Guidance in Anesthesia. AANA J. 2011;79(3):209-217.

Figure 2 Title
In the August 2011 issue, page 308, the authors correct the title of Figure 2 from “Proportion of Patients at a Given Sensory Level by Time and Group” to “Proportion of Patients at a Given Motor Block by Time and Group.” See Williams M, Dodson T, Banek RB, Osborne L, Pellegrini J, Spence D. Effect of Epidural Normal Saline Bolus Prior to Catheter Removal on Parturient Sensory and Motor Function Recovery: A Pilot Study. AANA J. 2011;79(4):306-310.

Sentence
In the October 2011 issue, the author corrects the sentence on page 372, left column, lines 8-10 by changing “etCO2” to “end tidal,” so the sentence reads: “The patient was continued on a mixture of sevoflurane maintaining an end tidal of 2.3%, with 1-L flows of both oxygen and air.” See Smith HJ. Carbon Dioxide Embolism During Pneumoperitoneum for Laparoscopic Surgery: A Case Report. AANA J. 2011;79(5):371-373.

The online versions of these articles have been corrected.