REPORTS OF SCIENTIFIC MEETINGS

John J. Downes, M.D., Editor

Society of Cardiovascular Anesthesiologists 11th Annual Meeting April 16–19, 1989 Seattle, Washington

The 11th Annual Meeting of the Society of Cardiovascular Anesthesiologists was held in Seattle, Washington, April 16–19, 1989.

The workshop on transesophageal two-dimensional echocardiography the subject of some excellent scientific papers. Acampora *et al.* (Sloan-Kettering) reported the use of 2DTEE to study load-independent relationships that represent left ventricular contractility in 33 healthy patients receiving isoflurane after anesthetic induction with an opioid N_2O muscle relaxant technique. Plotting end-systolic meridional wall stress versus velocity of circumferential shortening corrected for heart rate provides a description of contractility that nullifies loading conditions. Measurements were made following anesthetic induction, after administration of isoflurane to an 0.8% end-tidal concentration, and following return to 0% end-tidal isoflurane. Isoflurane caused a downward and leftward shift of the plotted relationship indicative of diminished contractility. Following discontinuation of isoflurane, data returned to baseline values. In a separate paper, Acampora *et al.* reported use of the same load-independent relationships to determine the effect of esmolol on ventricular contractility during nitroprusside-induced hypotension in six patients undergoing retroperitoneal node dissection. Data were tabulated following induction with N_2O-fentanyl-pancuronium, with induction of hypotension using sodium nitroprusside, 20 min after addition of esmolol (200 $\mu g \cdot kg^{-1} \cdot min^{-1}$), and 20 min after addition of esmolol (400 $\mu g \cdot kg^{-1} \cdot min^{-1}$). Results indicate that esmolol, particularly at 400 $\mu g \cdot kg^{-1} \cdot min^{-1}$, impairs myocardial performance even when afterload is reduced by sodium nitroprusside.

Lasker *et al.* (Mount Sinai) compared ejection fraction determined by using 2DTEE in patients undergoing myocardial revascularization with a measure of maximal aortic blood flow acceleration obtained by placing a 3-mHz Doppler probe in the patient's suprasternal notch. They found a significant correlation between ejection fraction and maximal aortic blood flow acceleration.

Cardiac effects of inhalation anesthetics were described by a number of investigators. Neutsch *et al.* (University of Michigan) studied the *in vivo* effects of halothane, enflurane, and isoflurane on arrhythmic potential in a canine model of chronic infarction. Excitation thresholds, relative and effective refractory periods, and intraventricular conduction times were determined during 1.1 and 1.8 MAC of each anesthetic given (in random order) on days 4, 5, and 6 after infarction. Halothane and enflurane increased effective refractory periods without significantly prolonging intraventricular conduction in both normal and infarcted zones. Isoflurane increased refractoriness in normal zones only.

Bollen *et al.* (Stanford) examined the ability of halothane *versus* isoflurane to relax previously constricted isolated porcine coronary segments as a function of vessel diameter. They found that halothane (1%, 2%, and 3%) caused significant relaxation in previously constricted 0.5–1-mm pig endocardial coronary arteries, whereas only 3.0% isoflurane caused significant relaxation. For 1–1.5-mm coronaries, halothane (2% and 3%) caused significant relaxation, whereas isoflurane did not cause relaxation at any concentration studied. Based on their study, the authors concluded that for isoflurane to cause greater coronary dilation than halothane, as is generally believed, the dilation must be occurring in vessels distal to those that are 0.5 mm in diameter. In a separate study, the same authors presented evidence that halothane was able to relax previously constricted human epicardial coronary artery segments (obtained from recipient patients' hearts at the time of cardiac transplantation) at lower concentrations and to a greater extent than isoflurane. Based on their results and those of other investigators, they concluded that isoflurane-induced coronary artery dilation must be occurring distal to large epicardial arteries. However, they also concluded that for isoflurane to have a greater vasodilatory action than halothane on small *versus* large coronary arteries, these two anesthetics must have different mechanisms of action.

Levy *et al.* (Emory) reported heparin dose responses before and after cardiopulmonary bypass. In 20 patients they determined baseline ACT prior to cardiopulmonary bypass and constructed heparin dose-response curves before cardiopulmonary bypass and after administration of protamine. They concluded that heparin dose responses for anticoagulation do not significantly change following protamine reversal. This is important to know for the hemodynamically unstable patient who requires reheparinization after protamine reversal.

Kuitunen *et al.* (Helsinki University) obtained plasma heparin concentrations, ACT, and thromboelastographic measurements preoperatively, before protamine, and at intervals up to 6 h after protamine in 14 patients receiving protamine chloride and 16 patients receiving protamine sulfate after cardiopulmonary bypass for coronary artery bypass grafting. They found that the two protamine salts are equally effective antidotes to heparin after cardiac surgery. The doses derived from the heparin-ACT response curves failed to prevent the appearance of small amounts of free heparin, which peaked 2 h after protamine. There was no correlation between blood loss and peak heparin-rebound level.

Earl Wynands was inducted as the new president of the Society. The 1990 meeting is scheduled for May 13–16 in Orlando, Florida.

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Anesthesia Simulator Curriculum Conference September 22–24, 1989 Rockville, Maryland

The "Anesthesia Simulator Curriculum Conference" was held September 22–24, 1989 in Rockville, Maryland. Sponsored by

the United States Food and Drug Administration (Center for Devices and Radiologic Health) and the Anesthesia Patient Safety Foundation, the meeting attracted 78 individuals representing five countries. The meeting was planned with the guidance of J. S. Gravenstein, A. J. L. Schneider, and A. J. Berry and focused on computer-based methods for teaching the fundamentals and nuances of inhalational anesthetic uptake and distribution. Eight invited presentations accompanied by complete demonstrations were made on September 22–23. In addition, a free paper session was held on September 24 where four projects were discussed.

The presentations were arranged from the simple to the sophisticated: relatively modest programs that simulate uptake and distribution were shown followed by complex physiologic and drug models that interact to simulate human responses to drugs. Finally, complete mock-ups of the operating room with "wired" manikins and anesthesia machines were presented to the participants. Opening remarks defined the topic of anesthesia education and the evolving role of computers in the educational environment. D. Westenskow demonstrated a simple yet effective "oil/water" four-compartment physical model for demonstrating the uptake and distribution of anesthetics. This apparatus is used by the University of Utah Bioengineering group as an uptake simulator for ongoing research on anesthesia machines and monitors. J. H. Philip presented his prototypic Gas Man® four-compartment computer simulation of gas uptake and distribution. Soon to be released on the Apple Macintosh® computer accompanied by a tutorial workbook, Gas Man® pioneered the potential of computers to simulate the kinetics of uptake and distribution. J. M. Calkins described a 12-compartment model of the anesthetic circuit and anesthesia uptake called G.U.S. (the Gas Uptake Simulation). This PC-compatible graphic software package adds feedback on some of the effect of the anesthetics on the physiologic compartments, such as changes in P_{CO_2} and cardiac output, with deepening anesthetic concentrations. Debate about model complexity, accuracy, and the ability of the learner to directly access elements of the computer models became a major theme during the course of the conference. The participants questioned the need to depict many compartments in these simulators in that the patient appears as a "black box" in clinical practice.

The Sleeper® computer simulation of physiology and pharmacology and the anesthesia circuit was introduced by N. Ty Smith. This proved to be the most complex computer-based simulator shown, representing 20 yr of effort. Over 160 separate interactive models create a multiple transport simulator that incorporates numerous additive and subtractive links to represent the effects of drugs on physiology and vice-versa. Soon to be released on PC-compatible microcomputers, Sleeper® provides a graphic interface for understanding human pharmacokinetics, pharmacodynamics, and the anesthesia machine.

The Anesthesia Simulator and Recorder (ASR) developed by H. Schwid was introduced next. It is a specific application of the interactive modelling typified by Sleeper,® targeted to drive a simulation that creates critical incidents in anesthesia. Emphasis is placed on clinical signs and symptoms, as well as the representation of realistic monitored patient parameters, all aimed at evaluating, anesthetizing, and treating the "simulator-patient." This software package runs on graphic capable PC-compatibles. These two intricate simulators fueled several discussions on model validity and the usefulness of such simulators for developing hypotheses on drug effects for examination in the laboratory. The authors of the simulators pointed out the difficulty in creating such models due to the paucity of data upon which to design them and the difficulty in accurately representing elaborate interactions between multiple drugs and the human body.

A computer-assisted patient emulator (CAPE) representing real-life hemodynamic waveforms was shown by R. Rubsamen. This data included time-synchronous five-lead ECG, arterial, and pulmonary catheter data uniformly recorded from patients on a high-fidelity FM recorder with complete clinical annotations. This data is available in analog and digital form. It can serve as a source library for other simulators to draw upon, and has been used as a standardized means of testing new physiologic monitors. Many at the meeting readily recognized the robust qualities of this database, its potential educational benefits, and the need for a set of "computer tools" to rapidly manage the data.

Two "full-cockpit" simulators were shown at this conference. M. L. Good discussed the "Gainesville Anesthesia Simulator" featuring an infant manikin and a typical cluttered anesthesia work station. These devices are "wired" and computer-controlled to create a variety of critical events. In addition, a graphics display visualizes the "programmed" event in order to teach the underlying physiologic reactions and machine responses. Finally, D. B. Gaba demonstrated the Comprehensive Anesthesia Simulation Environment (C.A.S.E.). This "full-cockpit" simulator includes a highly sophisticated manikin to which drugs and fluids can be administered as well as an anesthesia work station. This manikin can simulate bleeding, vomiting, and other surgical stresses commonly presented to the anesthesiologist in the operating room. As in the other simulators, computers play a major role in creating monitored data and anesthesia machine data. To enhance analysis and evaluation of anesthesiologist performance, a video camera is positioned to completely record the simulation.

The "full-cockpit" simulators generated tremendous discussion on the role of such devices in physician education. Similarities were repeatedly drawn between these simulators and those used in the airline industry. The possibility for grading and evaluating physicians during residency was considered, and awarding continuing education credit was suggested. The organizational dilemmas and the medical and budget implications of such a program within anesthesiology was discussed in depth during the meeting.

On the morning of September 24 a computer-based predictor of anesthetic uptake was described by P. Tonner. Data on its efficacy in correctly predicting end-tidal concentrations was presented and several useful suggestions were made for further refinement. A computer-aided tutorial was presented by R. D. Levine, patterned after the oral examinations administered by the American Board of Anesthesiology. Although not a true simulator, the "lessons" and responses of the participant can be fully recorded. This program is currently being evaluated as a tool for screening potential applicants to anesthesiology residency, which prompted discussion on the usefulness of simulators as a means for evaluating anesthesiology applicants and residents during their training. A fully programmable model of pulmonary mechanics (and patient ventilator interactions) was presented by M. A. Leon. This microprocessor-based simulation was designed

as a signal source for artificial intelligence expert systems being designed for respiratory care. However, this developer has offered the simulation as the core for other computer applications. C. F. McKenzie presented plans, currently under review for funding, for the development of an expansive trauma anesthesia simulator. This computer simulator would be driven by the Sleeper® model and will be designed to teach the fundamentals of shock trauma evaluation, resuscitation, and anesthesia. When added to interactive video technology, this simulator could be used to teach sophisticated principles of shock trauma to physicians and military personnel involved in the medical care of the trauma patient.

The entire history of computer-aided teaching in anesthesiology from Gas Man® to plans for a comprehensive shock trauma interactive simulator was represented at this landmark meeting. The giant leaps in computer technology, including computer tools for human interfacing, artificial intelligence, and neural networks have demonstrable potential in the future practice of anesthesiology. More attention can be paid to the contents "taught" by these devices and their role in our educational structure rather than the typical preoccupation with the computers themselves characteristic of the past. Most importantly, it is clear that the time and effort devoted to designing, building, and validating such simulators, as well as the challenge of pioneering their applicability and acceptance in anesthesiology, has created a new academic endeavor requiring our attention and recognition.

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American Society of Clinical Oncology (ASCO) 25th Annual Meeting May 21–23, 1989

The American Society of Clinical Oncology (ASCO) is to medical and surgical oncologists what the ASA meeting is to Anesthesiologists. This is the meeting where clinical oncologists can gather with bench research experts to share the latest information in a diverse field that is expanding exponentially. Of the 1,334 papers that were presented, there was a small but well-defined group relevant to anesthesiologists. What was particularly gratifying to anesthesiologists in attendance was the overwhelming interest that clinical oncologists showed with regard to possible contributions that anesthesiologists could make to the care of cancer patients. The papers pertinent to anesthesiology could be divided into two major categories: problems related to pain control in terminal cancer patients and problems related to perioperative management of patients undergoing surgical treatment for cancer.

Oral morphine is often used as the first-line therapeutic modality for terminal cancer pain control, and a sustained-release preparation is widely employed for this purpose. R. Dalton (Rochester, Minnesota) compared three oral doses (30, 60, and 90 mg) of sustained release morphine to 30 mg of immediate release oral morphine. The 30- and 60-mg sustained-release doses were found not to differ significantly from immediate-release morphine either in toxicity or duration of action. By contrast, the 90-mg dose of sustained-release morphine improved analgesia but, at the same time, increased the risk of toxicity as compared with 30 mg of immediate release morphine. R. J. Osborne (London, England) examined the analgesic activity and metabolism of synthetic morphine-6-glucuronide (M-6-G), a morphine metabolite in humans. M-6-G was found to be tenfold more potent than morphine. It was concluded that M-6-G contributes to the clinical effects of morphine treatment and that its elimination was found to be reduced in renal failure, thus explaining increased morphine sensitivity in azotemic patients. Alternative analgesics were also presented. Z. P. Bernstein (Buffalo, New York) studied proglumide, a cholecystokinin antagonist. It was found to act as an opioid agonist in a double-blind cross-over trial comparing the efficacy of patients' usual opioid regimen with a regimen that included proglumide and a reduced opioid dose.

Alternative routes of opioid administration are likewise being pursued for pain relief in cancer patients. R. F. Kaiko (Norwalk, Connecticut) compared the bioavailability of oral *versus* rectally administered morphine. The extent of morphine absorption was found to be similar, but the maximal concentration achieved was delayed and somewhat attenuated, suggesting reduced absorption *via* the rectal route. There was no difference in the side effects between the two routes of administration. B. Kinzbrunner (Broward County, Florida) reported on the use of morphine suppositories for terminally ill cancer patients who could not take oral medications. He concluded that morphine suppositories were as effective as morphine taken by the oral route and it was not necessary to change to parenteral morphine when patients could not take oral medication. S. Hassenbusch (Cleveland, Ohio) evaluated continuous epidural morphine infusion in 65 terminally ill cancer patients, confirming other reports that the technique was effective and had a suitably low risk benefit ratio. Patient-controlled analgesia (PCA) has also proven to be useful, according to I. G. Kerr (Toronto, Canada). He reported on successful use of outpatient infusion of opioids *via* a PCA pump in patients whose pain was suboptimally controlled with more conventional methods. Another approach, Transdermal Therapeutic System (TTS) was described by M. A. Simmonds *et al.* (Hershey, Pennsylvania). TTS fentanyl was administered to 39 patients with advanced cancer. Patient compliance and acceptance were rated as excellent. Some tolerance to TTS was noted over the 1-month trial, but overall it was felt to be a useful adjunct for achieving pain control in advanced cancer patients.

Nausea, vomiting, and anxiety remain the major side effects of chemotherapy administration. M. Citron (New Hyde Park, New York), using a placebo-controlled double-blind crossover trial found no advantage in early administration of droperidol to control chemotherapy-induced nausea and vomiting as compared with giving droperidol just 1 h before chemotherapy. L. M. Potanovich (New York, New York) evaluated the efficacy of five different doses of midazolam as adjuncts to antiemetics in patients receiving cancer chemotherapy. They found 0.04 mg/kg of midazolam to be optimal with regard to minimal side effects and brevity of action.

The use of Celiac Plexus Block (CPB) remains controversial in cancer pain management. W. Sharfman (Cleveland, Ohio) reviewed 17 published series in an attempt to determine whether

as a signal source for artificial intelligence expert systems being designed for respiratory care. However, this developer has offered the simulation as the core for other computer applications. C. F. McKenzie presented plans, currently under review for funding, for the development of an expansive trauma anesthesia simulator. This computer simulator would be driven by the Sleeper® model and will be designed to teach the fundamentals of shock trauma evaluation, resuscitation, and anesthesia. When added to interactive video technology, this simulator could be used to teach sophisticated principles of shock trauma to physicians and military personnel involved in the medical care of the trauma patient.

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