because the ventilation mechanism is supraglottic, it suffers from the same limitations I outlined in my article for the supraglottic ventilatory mechanisms of the LMA and Combitube (i.e., the ventilatory mechanism can be proximal to a periglottic pathologic obstruction). Second, use of the nasopharyngeal route may cause nasopharyngeal bleeding, a most unwelcome happensstance in a "cannot ventilate, cannot intubate" situation. Although Burk may be dismayed that the ASA Difficult Airway Algorithm does not specifically mention his first choice emergency ventilation method, and many other practitioners have remarked on not specifically-mentioned tricks they have, the ASA Difficult Airway Algorithm does not exclude these methods. It is appropriate to conclude by reminding the anesthesia community that the ASA Difficult Airway Algorithm states that the recommendations therein "may be adopted, modified, or rejected according to clinical needs and constraints" and that "the techniques chosen by the practitioner in a particular case will depend upon specific needs, preferences, skills and clinical constraints."

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Effects of 0.86 mg/kg Cisatracurium in an Infant

To the Editor—Lack of familiarity with a new drug may increase the likelihood of errors in dosing. An instance of this occurred in our operating theater.

A 7-month-old, 7 kg infant received 6 mg cisatracurium intravenously after induction of anesthesia with nitrous oxide and halothane. There was no change in heart rate, noninvasive blood pressure obtained with the cuff on the upper arm, or skin color, but when the surgery was concluded, neuromuscular block persisted to the extent that no posttetanic count could be elicited. The infant received midazolam and mechanical ventilation in the recovery room. One hundred minutes after the dose of 0.86 mg/kg cisatracurium, a very slight response of the adductor pollicis to stimulation of the ulnar nerve with 2 Hz, a train-of-four (TOF) every 60 s was documented by the Datex neuromuscular transmission monitor electromyogram in the uncalibrated mode. One hundred and ten minutes after the bolus of cisatracurium, four responses to the TOF were recorded. At this time, the patient's diaphragm, fingers, and toes were moving spontaneously. Propofol was administered by infusion to produce immobility. During the following 15 min, the TOF ratio increased to >0.9. Propofol was discontinued, and 0.1 mg atropine followed by 5.0 mg edrophonium was administered to reverse any residual blockade. The trachea of the infant was extubated without complication several minutes later. This conservative approach was taken to be certain that the infant would not be clinically weak after extubation.

Because cisatracurium is one of the ten isomers that compose atracurium, it may be that the relatively minor age-related differences in potency that have been documented for atracurium could also be documented for cisatracurium. The potency of atracurium in infants during halothane anesthesia is greater by 50% than in children. The ED95 of cisatracurium in children is 0.911 mg/kg during halothane anesthesia. Assuming that age-related differences in the potency of atracurium and cisatracurium are similar, the ED95 of cisatracurium in the infant population could be close to 0.027 mg/kg. Given these assumptions, this patient received more than 50 times an ED95 dose of cisatracurium. With regard to neuromuscular blocking potency, this dose of cisatracurium is equivalent to more than 4.5 mg/kg atracurium, 0.75 mg/kg vecuronium, 2.5 mg/kg mivacurium, or 15 mg/kg succinylcholine in an infant during halothane anesthesia. The effects of such a relatively large dose of neuromuscular blocker have not been documented previously.

No data exist regarding the expected duration or the pharmacokinetics of cisatracurium in infants. The elimination half-life of cisatracurium in adults is similar after doses of two and four times the ED95. If the kinetics of cisatracurium are not dependent on dose, and the infant received approximately 32, or 64, times an ED95 dose, then five elimination half-lives of 20 min should pass from administration of the overdose to the beginning of spontaneous recovery. This explanation is an extrapolation beyond the region of published data regarding cisatracurium, but it is consistent with the events in this patient. Observation of more patients is necessary to appropriately compare variability in recovery from cisatracurium with variability in recovery from other drugs. However, we find it noteworthy that spontaneous recovery from one response to a train-of-four stimulus at the ulnar nerve to a train-of-four ratio of 1.0 occurred in this infant within an interval of 45 min. Similar recovery rates were observed after doses of one and two times the ED95 in children. The recovery index, the time from 25% to 75% recovery of the amplitude of the response of the adductor pollicis to stimulation of ulnar nerve, was an average of 11 min (SEM = 0.6 min) in these children. This suggests that the recovery index was between 10 and 15 min in our infant anesthesia.

Jonathan L. Benumof, M.D.
Professor of Anesthesia
UCSD Medical Center
Department of Anesthesiology
402 Dickinson Street, 8812
San Diego, California 92103-8812

Barbara L. Dettlaff, M.D.
Pediatric Critical Care
Children's Hospital of Pittsburgh
5800 Connellsville Avenue
Pittsburgh, Pennsylvania 15232

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To the Editor—Administration of drugs to criticize anesthesiologists and colleagues was at our recent journal meeting in high incidence. Patients were told that they would receive a saline drip and intravenous fluids. This is not true, of which they are being told. The most commonly used method of humidification is an air entrainment system, but the authors are using humidifiers. The use of water baths necessitates the use of filters. The author is not a patient with a tracheostomy and, as a consequence, may have a filter in place. These patients are at risk for infection with the Salmonella species. The author should be reported to the appropriate regulatory body. In the future, the author should be more careful in his statements.

CORRESPONDENCE

during spontaneous recovery from cisatracurium overdose. It has not always been the case that spontaneous recovery occurs at the same rate after administration of increasing doses of neuromuscular blocker. For example, the recovery index after administration of vecuronium increased significantly from an average of 7.9 min (SEM 0.6 min) to 22.6 min (SEM 1.1 min) as the dose of vecuronium was increased from 0.1 to 0.4 mg/kg in children during balanced anesthe-
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Barbara W. Brandom, M.D.
Professor of Anesthesiology/Critical Care Medicine

Helen R. Westman, M.D.
Associate Clinical Professor of Anesthesiology/
Critical Care Medicine
University of Pittsburgh School of Medicine
Department of Anesthesiology
Children’s Hospital of Pittsburgh
3705 Fifth Avenue
Pittsburgh, Pennsylvania 15213-2583

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Method of Humidifying Inspired Gas Influences the Type of
Ventilator-Associated Pneumonia

To the Editor.—The recent article on the histopathologic and mi-
Crobiologic aspects of ventilator-acquired pneumonia by Fabregas
and colleagues was very interesting and provoked much discussion
at our recent journal club.1 We noted that these workers reported a
very high incidence of Pseudomonas aeruginosa and putida infec-
tions in patients whose lungs were mechanically ventilated. Humidi-
fication of the inspired gas is necessary because the patients own
mechanisms have been bypassed. There are a variety of devices for
this, of which the water bath and heat and moisture exchangers are
most commonly used. Although the authors do not comment on the
method of humidification they used for the ventilator circuits, we
assume they are using a water bath device because of the high rates
of infection with the above-mentioned organisms. Gallagher and coworkers
reported that the use of heat and moisture exchangers in the ventil-
tor circuit reduced the incidence of these infections from 55% to 21%.
and, as a consequence, we have abandoned the routine use of water
bath humidifiers.2 In addition, Ahlgren and Redding showed that the
use of water bath-type humidifiers creates a reservoir for infection,
necessitating filters between inspiratory and expiratory ports and be-
tween the patient and humidifier.3,4 The heat and moisture exchanger
incorporates a filter that prevents bacterial contamination of the circuit
and patient, and is an efficient method of humidification itself. However,
if we have supposed wrongly, then the levels of Pseudomonas and
similar infections are high, in comparison with Gallagher’s article.

H. Stuart, F.R.C.A.
A. Rhodes, F.R.C.A.
F. J. Lamb, F.R.C.A.
Y. Lam, F.R.C.A.
Department of Intensive Care Medicine
St George’s Hospital
Blackshaw Road
London SW17 0QT
United Kingdom

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