ased judgment about patients' readiness for discharge. No explicit discharge criteria beyond the unit's standard policies (PARS 10; orientation to time, place, and person; ability to walk without assistance; and ability to void) were incorporated in the study protocol. Blinding and random assignment of patients minimized the likelihood that recovery room nurses changed their usual procedures because of the study.

Recovery room stay may be prolonged by nausea and vomiting, dizziness, or the sedative effects of postoperative pain medication. The incidence of nausea and vomiting in the recovery room was not significantly different between the groups, nor was the administration of antiemetic medication. No sedative agents other than antiemetics were administered in the recovery room.

Simple heating and humidification of inspired gas in patients undergoing laparoscopic ovum retrieval was associated with a higher temperature on arrival in the recovery room and a 31% decrease in recovery room stay. This time saving can reduce the per-patient costs. An informal survey of area hospitals reveals the charge for recovery room care ranging between $58 and $182 per hour. Even at the low end of this range, the approximately $12 cost for one use of the heater/humidifier appears justified if 1 h of recovery time can be saved. Additionally, prolonged discharge times in an ambulatory unit with limited recovery room capacity may force delay of succeeding cases.

Methods of heat conservation and heat transfer, such as artificial noses, space blankets, warming blankets, and warmed iv fluids, have been suggested as potential aids in reducing heat loss in outpatients. This study has shown that the use of a relatively inexpensive heating system can eliminate almost an hour of recovery room time, and is one cost-effective approach to patient management in this outpatient population.

The balance among cost, convenience, and effectiveness of any intervention assumes particular importance in outpatient anesthesia, and should be addressed in the planning of future studies of clinical practices in this group of patients.

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Histaminoid Reaction from Vecuronium Priming: A Case Report

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Vecuronium apparently is free of cardiovascular and histamine-releasing properties.[1,2]‡§ However, three recent case reports claimed possible histamine release after vecuronium administration. Levery *et al.*[3] reported erythema in the face, neck, and upper extremities after 6 mg vecuronium iv; Clayton *et al.*[4] reported an erythemathous rash on the entire body following 0.1 mg/kg iv vecuronium administration on two separate occasions in the same patient, and, lastly, Spence *et al.*[5]

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‡ Basta SJ, Savarese JJ: Comparative histamine-releasing properties of vecuronium, atracurium, d-tubocurarine and metocurine. Excerp Medica Current Clinical Practice Series 11:183–184, 1983

§ Booij LHDJ, Crul JF: A comparison of vecuronium with the hypothetical ideal neuromuscular blocking drug. Excerp Medica Current Clinical Practice Series 11:3–8, 1983

reported a skin rash in a patient who had just received 4 mg of vecuronium that lasted an unusually long duration of 4 h. We describe a histaminoid reaction following only a priming dose of vecuronium in a patient without any previous allergies or reactions to any other intravenous anesthetics.

Case Report

A 41-year-old, 60 kg woman considered to represent ASA physical status I was admitted for a urologic procedure for stress incontinence. Past medical history included a T_4-T_5 laminectomy and vaginal hysterectomy, both of which were performed under general anesthesia. Succinylcholine iv was utilized for endotracheal intubation during both procedures, with d-tubocurarine being utilized for skeletal muscle relaxation during the laminectomy and pancuronium during the hysterectomy; and both procedures were reportedly "uncomplicated." She had no known history of allergies, and was not taking any medications. When a cystometrogram revealed a non-neurogenic bladder, she was scheduled for the present surgery. Her pre-medication included morphine 6 mg, phenergan 25 mg, and glycopyrrolate 0.2 mg im about 1 h preoperatively. While breathing oxygen, fentanyl 100 μg was given iv, followed after 7 min by an iv priming dose of 1 mg of vecuronium.[6,7] Sixty seconds after the administration of vecuronium, the patient experienced difficult breathing, but there was no evidence of bronchospasm. Forty seconds later, the patient developed a uniform macular rash sequentially on the chest wall, neck, face, and shoulders. During this time, the arterial blood pressure decreased from 130/80 to 122/70 mmHg and the heart rate increased from 85-90 bpm. Since the rash lasted only 5 min, and the patient remained hemodynamically stable throughout this time, anesthesia was induced with thiopental 3 mg/kg iv, but pancuronium 0.1 mg/kg was utilized for tracheal intubation. Anesthesia was maintained with isoflurane in nitrous oxide and oxygen throughout the 2½-h surgical procedure, with only one additional iv dose of pancuronium for skeletal muscle relaxation. The patient remained hemodynamically stable throughout the procedure, and did not recall any unpleasant experience during the pre-induction period.

Discussion

One of the desirable criteria of an ideal muscle relaxant is that it should not release histamine, since histamine can cause hypotension, bronchospasm, skin rash and, possibly, an anaphylactoid reaction.§ Two separate studies[8,9] which compared the cutaneous responses to vecuronium, atracurium, pancuronium, d-tubocurarine, and metocurine after intradermal injection concluded that vecuronium caused the lowest amount of histamine release of all of the muscle relaxants studied. Levery *et al.*,[10] comparing the response after atracurium, vecuronium, and d-tubocurarine, after both intradermal and intravenous injection, concluded that, although the histamine response was the highest with d-tubocurarine, and least with vecuronium by either route, they found that "the response to intradermal injection was no guide to the subsequent response after intravenous administration of a muscle relaxant."

In our case, we believe that the rash which appeared transiently after the administration of a priming dose of vecuronium represents what would best be termed a "histaminoid response" to the muscle relaxant. Whether the "difficult breathing" was part of this response or was simply due to an unexpected neuromuscular blockade is open to question, though, in the absence of demonstrable bronchospasm, the latter explanation is the more probable one. While both the morphine given as pre-medication and the fentanyl given 7 min prior to vecuronium are known to release histamine, the temporal proximity of the appearance of the rash to the intravenous dose of vecuronium would make this the more probable causative agent.

It has been claimed that, in clinical doses, vecuronium does not cause any histamine release. The basis for the claim is the work of Basta and Savarese,‡ who found that 3.5 times the ED_{95} dose of vecuronium did not cause any change in the plasma levels of histamine. However, cases reported by Levery *et al.*,[4] Clayton *et al.*,[3] and Spence *et al.*[9] suggest that vecuronium might release significant amounts of histamine in certain individuals. However, in all the above-mentioned case reports, a priming dose of vecuronium was not given. In the patient reported here, it was a priming dose of 1 mg of vecuronium which produced a histaminoid response and suggested to the authors that the full dose of vecuronium should not be given, lest more serious sequelae might result. Despite having a steroid structure similar to vecuronium, pancuronium was selected as the alternative because, after vecuronium, it is considered to be the least histaminogenic of the non-depolarizing muscle relaxants.[9] We believe that the use of a priming dose, in addition to priming the neuromuscular junctions, may also serve as a test to identify individuals who may respond to vecuronium with the release of histamine. To this aim, we recommend the routine use of a "priming dose" of all non-depolarizing muscle relaxants as a predictive test of histamine release.

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Anesthetic Management of Tracheal Esophageal Fistula with Distal Tracheal Stenosis

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Esophageal atresia with tracheal esophageal fistula (TEF) is a rare anomaly of the aerodigestive tract. Although closure of the TEF is usually successful, postoperative morbidity and mortality may occur from perioperative reflux and pulmonary aspiration of gastric contents; therefore, the TEF should be closed as soon as the infant's condition permits operative intervention. Congenital anomalies of the respiratory tract are rare, although tracheal stenosis and atresia proximal to the tracheal esophageal fistula have been reported.[1–6]

We report a case of severe distal tracheal stenosis in a child with esophageal atresia (EA) with TEF and associated duodenal atresia.

CASE REPORT

A 12-h-old 2.0-kg male delivered at 32 weeks because of placenta previa was scheduled for emergency gastrostomy and TEF ligation. The apgar score was 4 and 8 at 1 and 5 min, respectively. Respiratory distress occurred immediately, and necessitated tracheal intubation. During transport to our hospital, the trachea was extubated accidentally, but the infant remained stable with only mild respiratory distress. Therapy included supplemental oxygen and constant suction of the blind proximal esophageal pouch.

Prior to induction of anesthesia, electrocardiographic leads, arterial blood pressure cuff, precordial stethoscope, and pulse oximeter were applied to the infant. Systemic arterial blood pressure was measured with an existing umbilical arterial cannula connected to a transducer and displayed. Atropine, 0.10 mg iv, and oxygen preceded intubation of the trachea. Laryngoscopy was uneventful, and the trachea was intubated with a 3.0-mm i.d. endotracheal tube (ETT). The bevel of the ETT was rotated posteriorly to avoid accidental intubation of the TEF. Breath sounds were bilaterally equal, and oxygenation was maintained. Gallamine, 10 mg, was administered iv.

With the onset of positive-pressure ventilation, the infant became intensely cyanotic (*p*H, 6.8; Pa_{O_2}, 2 mmHg; Pa_{CO_2}, 121 mmHg; BE, −17 mEq/l) and bradycardic (40 bpm). Equipment malfunction was ruled out, and repeated laryngoscopy twice confirmed translaryngeal placement of the ETT. After emergent percutaneous decompression of the stomach and placement of a 3.5 mm ETT, oxygenation improved immediately. *Via* a right thoracotomy with retropleural dissection, the distal tracheoesophageal fistula was ligated and divided, and primary esophagoesophagostomy was performed without difficulty. Correction of the duodenal atresia was postponed.

Neuromuscular blockade was reversed with neostigmine, 70 μg/kg, and atropine, 0.10 mg iv. After clinical evaluation and train-of-four determination, the trachea was extubated. Respiratory distress and cyanosis recurred immediately, but were relieved by positive-pressure ventilation by mask. Endotracheal reintubation was unsatisfactory because the ETT appeared to enter the remnant of the TEF. On the third attempt, laryngoscopy, bronchoscopy, and intubation with a rigid fiberoptic light (Storz-Hopkins Zero-Angle Rod Light; Karl Storz, Inc., Culver, CA) allowed placement of an ETT beyond the orifice of a large blind pouch into the proximal end of an extremely narrowed trachea.

Abnormal findings during diagnostic laryngoscopy and bronchoscopy with a 3.0-mm rigid ventilating bronchoscope were confined to the distal trachea. A circumferential stenotic congenital segment of trachea with a fibrous band in the posterior wall was seen (lumen diameter estimated at 2 mm). Immediately cephalad and posterior to this stenosis was a large, pouch-like remnant of the TEF. The carina could not be visualized. After bronchoscopy, a 3.5-mm ETT was placed in the correct intratracheal position, as previously described. The right thorax was again opened, and tracheoplasty was accomplished by rotating a portion of the wall of the TEF pouch onto the trachea. Because the ETT could still not be advanced, it was exchanged using a guide-wire technique for a 2.0-mm ETT which was left across the tracheoplasty as a stent.

Initially, the infant was mechanically ventilated (FI_{O_2} = .30–.35;

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