were related to venous irritation (table 3). The other negative responses were attributed to nausea (2), prolonged drowsiness (1), headache (1). In most patients who experienced burning on injection, the intravenous site was the dorsum of the hand. Six additional patients who had burning on injection received diazepam through an intravenous site in the forearm or the antecubital space.

No significant change was seen in the results of laboratory tests.

DISCUSSION

Most noteworthy in this study was the low incidence of venous irritation following the use of either RO 21-3981 or thiopental, compared with diazepam. In addition to the chemical nature of the drug, several factors are likely to influence the incidence of burning or discomfort: rapid administration, injection into small, distal vessels, and the solvent used for water-insoluble substances. We administered all drugs at the same rapid rate, and used similar variations of intravenous sites within all drug groups. RO 21-3981 and thiopental produced milder burning sensations than did diazepam. Both thiopental and RO 21-3981 are water-soluble and thus are not dissolved in irritating solvents. Diazepam commonly precipitated in the intravenous tubing.

Phlebitis severe enough to necessitate treatment occurred in 16 per cent of the patients receiving diazepam in this study and in none receiving the other drugs. Phlebitis has been reported to occur after intravenous administration of diazepam in 3.5\% to 10\% per cent of patients, as well as in 11 per cent of patients who received flunitrazepam, another new benzodiazepine.

Although thiopental provided the shortest induction time, some patients who received RO 21-3981 had slurred speech, drowsiness, and disorientation after the initial induction dose, and did not object to breathing from an anesthetic mask. This phenomenon has also been reported to occur with diazepam, and suggests that inhalation anesthetics can be introduced before a dose sufficient to abolish the lid reflex is administered. We have shown that in the doses used in this study, RO 21-3981 mimics diazepam in its onset of action, cardiovascular stability, transient mild respiratory depression, and production of antegrade amnesia, but lacks the propensity to cause venous irritation and phlebitis. RO 21-3981 is a suitable agent for the induction of anesthesia and a less irritating substitute for diazepam in healthy patients. RO 21-3981 needs further study in more seriously ill patients, especially those who have cardiovascular disease.

REFERENCES


Difficult Extubation Following Nasotracheal Intubation

LENNART FAGRAEUS, M.D., PH.D.*

Compared with the careful technical measures taken during tracheal intubation, little attention is usually focused upon the technically much easier task of tracheal extubation. Recently, however, three cases of difficult extubation, all with different etiologies, have been reported, of which one had a fatal outcome.1–3

* Chief Resident, Department of Anesthesiology, Duke University Medical Center, Durham, North Carolina 27710.

Address reprint requests to Dr. Fagraeus.

The following case report describes a difficult extubation under circumstances that, although potentially dangerous, would be easy to manage.

REPORT OF A CASE

A 36-year-old white woman was scheduled for open reduction and internal fixation of mandibular and maxillary fractures. The patient had a past history of chronic alcoholism and seizures. Two days prior to operation she had been attacked and struck in the jaw with a stick.

After induction of anesthesia with thiopental and O₂–N₂O–
halothane, an atrumatic blind nasal endotrachal intubation through the right nostril was performed using a cuffed 7-mm Magill endotrachal tube. A #16 Salem sump nasogastric tube was easily inserted through the left nostril. The fractures were reduced, and good anatomic reappraisals made using 25-gauge stainless steel wires. No anesthetic problem was encountered during the procedure. The patient was awakened and taken to the recovery room with the nasotracheal and nasogastric tubes still in place.

Two hours later, when the patient was fully awake, tracheal extubation was attempted. However, the nasotracheal tube could be withdrawn only 1–2 cm, at which point it resisted even vigorous pulling. Since the cuff was easy to deflate, the surgeon was asked whether it was possible that the stainless steel wires used in the fixation of the fractures could have inadvertently transfixied the tube. This was regarded as unlikely, however, and further attempts to remove the endotracheal tube were made. It was then observed that at each attempted removal, the pilot tube would move slightly inward, until its adapter was wedged between the nostril wall and the nasotracheal tube. When the pilot tube was cut just behind the adapter, the nasotracheal tube was removed without difficulty. The patient had no airway problem following extubation, and subsequently returned to her ward in satisfactory condition.

**DISCUSSION**

The purpose in presenting the above case of difficult extubation is to illustrate a hitherto unreported complication of the use of endotracheal tubes. In an extensive review of complications of tracheal intubation, Blanc and Tremblay\(^1\) reported that difficult extubation could be attributed to three basic mechanisms: 1) inability to deflate the cuff; 2) an excessively large cuff catching on the vocal cords; 3) adhesion of the tube to the tracheal wall due to absence of lubricant. In three cases of difficult extubation recently described, one was caused by transfixation of the endotracheal tube to facial bony structures by a Kirschner wire,\(^2\) and the second by a suture from the pulmonary artery through the trachea and into the endotracheal tube.\(^3\) In the third case the pilot tube to a self-inflatable spongy-cuffed endotracheal tube was accidentally pulled off, thereby preventing deflation of the cuff.

In the present case the difficult tracheal extubation could not be related to any of the above-mentioned causes. Instead, a loop formed by the pilot tube apparently extended into the nasopharynx, allowing the nasogastric tube, when inserted through the other nostril to pass through the loop. Thus, normal extubation was prevented by tightening of the loop.

Repitition of this complication can be avoided in either of two ways. Endotracheal tubes could be made such that the pilot tube has a more proximal insertion into the endotracheal tube. However, more simply, keeping the pilot tube pulled tight during nasotracheal intubation would seem to be an adequate way to prevent a loop from forming in the nasopharynx.

The technical assistance of David A. Davis, M.D., is gratefully acknowledged.

**REFERENCES**

2. Lee C, Schwarz S, Mok MS: Difficult extubation due to transfixation of a nasotracheal tube by a Kirschner wire. Anesthesiology 46:427, 1977

---

**Myotonia and Neuromuscular Blocking Agents**

**MARK M. MITCHELL, M.S., M.D.,* HASSAN H. ALI, M.D.,† JOHN J. SAVARESE, M.D.‡**

Myotonic disorders present the anesthetist with a potentially hazardous anesthetic situation. Reports of experiences with patients having myotonic disorders are not uncommon.\(^1,2\) With few exceptions,\(^3,4\) operative case reports of these patients describe clinical observations concerning difficulty with tracheal intubation and/or ventilation secondary to myotonic contracture, usually associated with administration of depolarizing muscle relaxants.\(^5,6\)

---

* Anesthesia Fellow, Harvard Medical School at the Massachusetts General Hospital; currently Assistant Professor of Anesthesiology, University of California Medical School, San Diego, California.
† Assistant Professor of Anesthesiology, Harvard Medical School at the Massachusetts General Hospital, and Associate Anesthetist, Massachusetts General Hospital.
‡ Assistant Professor of Anesthesiology, Harvard Medical School at the Massachusetts General Hospital, and Associate Anesthetist, Massachusetts General Hospital.

0003-3022/78/0700/0044 $00.60 © The American Society of Anesthesiologists, Inc.