Dissection of the Posterior Pharynx Resulting in Acute Airway Obstruction

Robert C. Baumann, M.D.,* Drew A. MacGregor, M.D.,†

TRAUMA to the structures within the nose, nasopharynx, and posterior pharynx is a potential complication from nasotracheal intubation.1,5 We report a case in which insertion of a nasal “trumpet” airway resulted in dissection of the retropharyngeal space, causing acute airway obstruction.

Case Report

A 46-yr-old male patient with a history of a gunshot wound to the spine with subsequent paraplegia 18 yr before the current admission was admitted from a chronic nursing care facility for surgical management of sacral/perineal decubiti. Oral tracheal intubation, anesthesia, and surgery were uneventful. At the conclusion of the case, the anesthetic agents were discontinued, neuromuscular blockade was reversed, and the trachea was extubated. After extubation, the patient responded to loud verbal stimuli with a deep breath and transient eye-opening. However, the patient became somnolent with very shallow respirations in the absence of repeated stimuli. A nasal airway (Concord/Portex, SIMS, Keene, NH) was placed, resulting in transient improvement in alertness and respiratory rate (approximately 12 breaths/min), and the patient was transported to the postanesthesia care unit (PACU). Within 5 min of PACU arrival, the patient’s oxyhemoglobin saturation (SpO2) had decreased to 88% with a simultaneous decrease in mental status to obtundation. Evaluation by the PACU staff demonstrated that chin-lift was required to maintain airway patency, and SpO2 increased to 100% with FIO2 at 1.0.

Fifteen minutes after PACU admission, SpO2 again decreased to 80%, and despite chin-lift and verbal stimulation, the respiratory rate remained low with minimal air movement by auscultation. Bag-valve-mask-assisted ventilation with 100% O2 was initiated to improve oxygenation and ventilation. The decreased mental status and hyperventilation did not improve with 0.4 mg of intravenous naloxone and continued bag-valve-mask ventilation. Peripheral nerve stimulation demonstrated intact train-of-four without fade and sustained tetany. However, because the blood gas revealed a pH of 6.97, Pao2 of 111 mmHg, and a Paco2 of 157 mmHg, the decision was made to reintubate the trachea.

During direct laryngoscopy, a bullous lesion was noted in the posterior pharynx that obstructed the majority of the pharyngeal space. Palpation of this lesion demonstrated it to be an air-filled sac within the submucosal tissue. A quick survey of the neck and upper chest failed to demonstrate any subcutaneous emphysema. Because clinical suspicion included a pharyngeal dissection, suction was connected to the nasal airway with subsequent reduction and disappearance of the bullous lesion. Once the airway obstruction was reduced, the nasal airway was removed and the trachea was reintubated orally, with rapid improvement in clinical condition.

Examination by an otoaryngologist demonstrated that the nasal airway had dissected into the retropharyngeal position, with a small (1.5 cm diameter) residual submucosal bulla. The trachea was left intubated overnight and was extubated the next morning without incident. No antibiotics were given. Subsequent examination by the otoaryngology service demonstrated no scarring or other chronic airway difficulty.

Discussion

Nasal airways (so-called “trumpets”) are airway adjuncts commonly used in PACUs and in intensive care units. The major advantages to the use of nasal airways are decreased airway obstruction, increased airway patency, improved ventilation, and decreased risk of aspiration. Bag-valve-mask ventilation is also easier in patients with nasal airways, with decreased chances of bag-valve-mask aspiration.

Clinical Airway Management

The use of nasal airways in the intensive care setting is controversial. The potential risks of airway obstruction, hypoxemia, and aspiration need to be considered. In this case, the use of a nasal airway resulted in significant airway compromise, which required reintubation.

units. Trumpets cause less stimulation than do oral airways and are commonly used immediately after extubation to help maintain airway patency in patients emerging from anesthesia. In addition to airway protection, trumpets allow easy access to the pharynx for suctioning and airway clearance, plus facilitation of bag-valve-mask-assisted ventilation. The established risks of nasal trumpets include traumatic injury to nasal turbinates, bleeding, and obstruction of sinus passages. We were unable to find any reports of dissection of the posterior pharyngeal wall using a nasal airway.

Dissection of the posterior wall of the oropharynx as well as other nasopharyngeal trauma seen with endotracheal tubes is related to the anatomic arrangement of tissues in the head and neck (figs. 1 and 2). The posterior wall of the pharynx is composed of a mucosal layer, a submucosal muscular layer, and a less well delineated connective tissue layer, which includes both the pharyngobasilar fascia and buccopharyngeal fascia. The pharyngobasilar fascia is well developed in the upper portion of the pharynx, diminishing lower in the airway. The nasal portion of the pharyngeal wall is lined by pseudostratified columnar epithelium and has relatively less musculature than the hypopharynx, which is lined with stratified squamous epithelium. The pseudostratified epithelium presumably is more susceptible to perforation by an artificial airway entering at an acute angle. The airway then may track underneath the mucosa, well contained by the stratified squamous tissue of the hypopharynx. The space generated can serve as a compartment containing blood (hematoma), pus (abscess), or in this case, air. Once within the submucosa, air may track further into the neck and chest, resulting in subcutaneous emphysema. It is unclear why in this patient air did not dissect into his mediastinum or subcutaneous tissue, despite the size of the loculated air pocket in the posterior pharynx.

The nasal airway employed was made of polyvinyl chloride, which is somewhat stiffer than the red rubber used by other manufacturers. Whether the physical properties of the tube contributed to this complication cannot be established. Retropharyngeal perforation by
standard polyvinyl chloride endotracheal tubes has been estimated to occur 2% of the time during emergent tracheal intubation in an emergency department. Presumably this number is far less in the controlled setting of the operating room, but no data are available. Perforation by nasal airway, with or without inflation of the retropharyngeal space, is likewise a rare occurrence but must be considered in the appropriate setting as a cause of acute airway obstruction.

References

Intraoperative Hyperkalemia as a Triggering Mechanism or Presenting Sign of Malignant Hyperthermia in Two Patients with Chronic Renal Failure
Juraj Sprung, M.D., Ph.D.,* Glenn DeBoer, M.D.,* Giorgio Zanettin, M.D.,* Zeyd Ebrahim, M.D.,* Joseph Ryckman, M.D.,* Santosh Kalhan, M.D.,* David Otto, M.D.†

AN unexplained increase in end-tidal carbon dioxide is the earliest and most sensitive presenting sign of malignant hyperthermia (MH), whereas hyperkalemia and hyperpyrexia are late symptoms. The presumed mechanism underlying MH is an abnormal handling of myoplasmic calcium released from the sarcoplasmic reticulum of skeletal muscles. Increased cellular metabolism leads to an increase in carbon dioxide and H⁺ production. The increased myoplasmic calcium may result in an abnormal myofibrillar contracture. The metabolic and respiratory acidosis may further affect the redistribution of intracellular potassium to the extracellular space. In addition, increased permeability of the muscle cell membranes will increase serum levels of potassium, ionized calcium, creatine phosphokinase (CPK), lactate dehydrogenase, and myoglobin. Renal excretion and cellular reuptake of potassium both protect against hyperkalemia. However, in patients with end-stage renal disease (ESRD) and diabetes, both of these mechanisms are adversely affected; thus such patient may manifest acute hyperkalemia. Hyperkalemia triggers MH in MH-susceptible swine, but this mechanism has never been reported in humans. We believe that, in diseases with impaired potassium handling (ESRD, diabetes mellitus), acute hyperkalemia may either trigger an MH episode or be its presenting sign. We present two cases of MH with this atypical presentation. The first occurred recently at our institution and the second, which occurred in 1982, was obtained from our archives.

* Staff Anesthesiologist.
† Resident in Anesthesiology.

Received from the Department of General Anesthesiology, The Cleveland Clinic Foundation, Cleveland, Ohio. Submitted for publication November 23, 1994. Accepted for publication February 15, 1995.

Address correspondence to Dr. Sprung, The Cleveland Clinic Foundation, Department of General Anesthesiology, M-26, 9500 Euclid Avenue, Cleveland, Ohio 44195-9247.

Key words: Chronic renal insufficiency, General anesthesia; halothane; isoflurane; Hyperkalemia, Malignant hyperthermia.