Difficult airways are by definition complex to manage. But some of these cases are more challenging than others. We asked several clinicians to give us examples of their more memorable airway cases.
Large trauma hospitals often receive challenging cases in which staff from anesthesia, the trauma team, or emergency medicine—and sometimes all three—may be called to secure the airway and intubate patients with unusual foreign bodies in their faces.

These objects may impede the adaptation of a mask to the face and/or the insertion of a laryngoscope into the mouth. The gentle and gradual passing of an endotracheal tube while listening to the respiratory sounds was a technique mastered by N.A. Gillespie who supposedly always had a tube in his back pocket and seldom used a laryngoscope.1

More recently, a young male involved in an argument ended up with a pocket knife stabbed into his left orbit.2 When he arrived at the emergency department, the knife was still in place (Figure 1). The weapon had been inserted at an acute angle so that the application of a mask was impossible. However, the right nostril remained accessible.

X-rays taken of the lateral view showed the tip of the knife located against the C1 vertebra (Figure 2). As a result, extending or flexing the neck might have produced further injury.

With the head immobilized, after insufflating oxygen beside the patient’s face, benzocaine was sprayed into the right nostril. Two minutes later, a 6-mm nasotracheal tube was inserted through the nostril and advanced gradually, by the “Gillespie method” of listening to the breathing sounds transmitted through the tube as the tip approached the larynx.

At onset of inspiration, the tube was advanced promptly through the larynx, and 250 mg of propofol was administered. The tube cuff then was inflated and manual ventilation begun.

Although various endoscopic devices are available, procuring and preparing equipment takes time. With a knife blade in the eye, manipulation of an intubating bronchoscope, which frequently requires 4 hands, could have proven difficult and damaging to the patient. Guiding the endotracheal tube by ear is a potentially lifesaving maneuver that clinicians should preserve.

References
Case 2

Accessing the Nasal Airway

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A 25-year-old homeless man presented with an ulcerated fungating mass of his lower lip. On biopsy the mass, which had been growing over the previous 9 months, was identified as a squamous cell carcinoma invading the mandible.

Radical resection of the mandible with a free flap from the scapula was considered the best course of management. A tracheostomy was planned because postoperative airway compromise was likely. The patient spoke little English and was judged to be a poor candidate for awake tracheostomy or awake fiber-optic intubation.

As the tracheostomy was the initial procedure, on discussion with the surgical team, we proposed tracheostomy facilitated by placement of an LMA (LMA North America). Following topical anesthesia of the left nares, a 34 Fr Robertazzi airway was placed and the connector from an 8-mm endotracheal tube inserted to permit connection to the anesthesia circuit.

An inhalational induction was performed with 8% sevoflurane administered with a fresh gas flow of 12 L per minute. Mandibular advancement was performed to manage obstruction (Figure 1).

After 5 minutes, the patient was judged adequately anesthetized and a No. 5 LMA was placed. With the patient deeply anesthetized, a tracheostomy was performed. Fiber-optic confirmation of tracheal entry was performed, and a 6-mm wire-reinforced endotracheal tube was placed and sutured in position (Figure 2).

The patient then underwent the planned procedure, which was completed in 22 hours. The patient achieved lip occlusion and a normal facial contour, and his tracheostomy was decannulated uneventfully. However, the patient was lost to follow-up as a result of his nomadic lifestyle.

Figure 1. Squamous cell carcinoma invasive to jaw.

Figure 2. Inhalational induction via nasal airway.
Biofilm in the luminal wall and adherence of secretions within the endotracheal tube have been implicated in the development of ventilator-associated pneumonia, increased work of breathing, delay in extubation, and worse. Total or near-total luminal occlusion can present a situation requiring urgent or emergent airway control.

A 63-year-old, morbidly obese man was admitted to the intensive care unit with multifocal ischemic strokes. The patient had a history of obstructive sleep apnea and difficult mask ventilation and intubation. Of note, the patient had bitten his tongue, which caused bleeding that required frequent oropharyngeal suctioning.

The patient was weaned off mechanical ventilation uneventfully over the next 4 days, at the end of which he underwent a trial with continuous positive airway pressure (CPAP). The patient immediately decompensated with hypertension, tachycardia, marked agitation, desaturation, and “gasp” respiration. Return to pressure-controlled mechanical ventilation revealed reduced tidal volumes (from 800 to 400 mL). Minimal secretions were removed by suctioning of the tube, yet some resistance was noted on passing the suction catheter. Fiber-optic bronchoscopy revealed significant luminal narrowing resulting from accumulation of biofilm; brown tenacious secretions in the distal lower lumen caused partial obstruction at various levels (Figure 1).

Because of potential difficulty in exchanging the tube, a CAM Rescue Cath (Omneotech) was passed...
twice to clear the obstructing secretions from the tube lumen (Figures 2 and 3). The procedure took less than 90 seconds, after which tidal volumes returned to the original 800 mL range and a subsequent trial with CPAP was uneventful.

A similar episode of severe agitation and “gasp-ing” respiration occurred 34 hours later during a trial of CPAP. Bronchoscopy revealed reaccumulation of biofilm and obstructing secretions in a different pattern (Figure 4). Because the CAM Rescue Cath was not available, bronchoscopy was used to clear the biofilm. During the 30-minute procedure, secretion manipulation led to 2 episodes of complete occlusion of the tube, as well as brief desaturation and multiple high-pressure alarms.

Build-up of biofilm and thick secretions obstructing a tracheostomy or endotracheal tube can dramatically decrease tidal volumes, increase airway resistance, and lead to catastrophic blockage. Incorporating traditional suction catheters may be ineffective, and bronchoscopy, extubation, tube exchange, and reintubation carry significant costs and hazards for patients.

Proper luminal hygiene is a patient safety concept that has received little attention yet may lead to catastrophic consequences if ignored. Technology such as the CAM Rescue Cath for improved luminal hygiene is a step in the right direction toward tackling the important clinical problem of excessive accumulation of biofilm and secretions.

References
An elderly woman presented to the operating room with progressive abdominal pain and marked distension. She had been admitted to the hospital and was found to have a small bowel obstruction that failed conservative management. A nasogastric tube was draining bile-stained gastric fluid. Intravenous and arterial catheters were placed, in addition to the standard monitors. The nasogastric tube was aspirated and subsequently allowed to drain freely. The staff anesthesiologist located the cricoid cartilage and an assistant’s fingers were positioned appropriately.

Pre-oxygenation was continued for approximately 3 minutes, followed by the cautious administration of fentanyl, propofol, and rocuronium (1 mg/kg); during this time, progressive force was applied to the cricoid cartilage. As the oxygen saturation began to fall, gentle bag mask ventilation was provided while cricoid pressure (CP) was maintained. An anesthesia resident with experience in using the GlideScope video laryngoscope (Verathon Medical) performed laryngoscopy. This provided a good laryngeal view; however, gastric contents that pooled in the oropharynx were suctioned with a Yankauer device, but quickly recurred. Eventually, endotracheal intubation was attempted, but the resident encountered minor difficulties when introducing and advancing the endotracheal tube.

A gastric volvulus was identified but resection was not required. Postoperatively, ventilation was continued for 2 hours to ensure that the patient’s condition did not deteriorate further. She was then extubated without complications.

Sellick was not the first to advocate CP, but since his published paper of 1961,1 the technique has been the cornerstone of “rapid sequence induction/intubation,” despite being based on relatively poor science. The amount of pressure required has been variously described as firm, painful, and 20 to 44 newtons. Most practitioners have no idea whether they are applying insufficient or excessive pressure, and the procedure is both difficult to teach and monitor. CP may provoke retching, relaxation of the lower esophageal sphincter, interference with insertion of the laryngoscope, or impairment of the laryngeal view, and may even obstruct the airway.2

Several fundamental faults of the practice can be identified, including the possibility that the cricoid cartilage may be insufficiently rigid to achieve esophageal occlusion3 and that it may not predictably overlie the esophagus.4

There is a growing body of literature questioning the efficacy of CP.2,5-7 However, it is unlikely that a controlled study would be sanctioned by a research ethics board. Effective or not, CP is likely to remain a standard of practice because we cannot completely disprove its value and there may not be a better option.

Assuming that CP will be performed, what is the safest way to proceed with endotracheal intubation when managing a patient with an indwelling nasogastric tube? The presence of a nasogastric tube in the esophagus may breach the integrity of the lower esophageal sphincter, and by acting as a capillary tube, encourage regurgitation. This is particularly likely in the event of upper gastrointestinal obstruction with raised intragastric pressure and/or the gastric tube is occluded proximally. It also may interfere with the application of an occlusive force to the esophagus.

If the tube is functioning, should it be sucked and removed, attached to continuous suction, left in situ but open to vent increased intra-abdominal pressure? Should the patient be positioned head down to reduce the risk for aspiration, or head up to reduce the...
risk for regurgitation? If CP interferes with insertion of the laryngoscope or the laryngeal view, should it be released? If intubation cannot be achieved and insertion of a supraglottic airway device is required, should the CP be released to facilitate placement and reapplied—with the risk for dislodging the airway? If gastric contents are viewed in the oropharynx, should this be suctioned, thereby delaying intubation? Should the endotracheal tube cuff be inflated with saline rather than air to achieve a more complete seal?

In this case, we used a GlideScope, which provided an excellent laryngeal view and allowed the image to be captured. Although it was not our intention, this enabled us to document the ineffectiveness of CP (which was apparently applied appropriately). Unfortunately, the difficulty that the resident encountered in delivering and advancing the endotracheal tube may have contributed to the magnitude of the aspiration. This case raises several interesting questions that should stimulate thought about how to best manage such a patient.

A video of this case can be viewed at www.AnesthesiologyNews.com.

References

Case 5

Hypopharyngeal Stenosis Related to Radiation Masquerading as the Larynx

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The authors have nothing to disclose.

A 66-year-old man presented for direct suspension laryngoscopy and laser excision of diagnosed hypopharyngeal stenosis. He complained of mild difficulty swallowing and dysphonia. The patient had undergone chemotherapy and cervical radiation for laryngeal cancer. The airway examination was within normal limits for all parameters.

After preoxygenation and induction, the ability to perform bag-mask ventilation was confirmed. Laryngoscopy was performed using a Macintosh 3 blade, revealing an aperture within midline pink tissue, and an anterosuperior tissue flap suggesting an edematous larynx and epiglottis. Because of concerns regarding the anatomic appearance, a tracheal tube was not passed. Bag-mask ventilation was re-initiated, followed by flexible fiber-optic laryngoscopy. An aperture was identified and the fibersonde was passed through this opening. Immediately after, a well-defined larynx was visualized and intubation successfully achieved.

Figure. Postradiation hypopharyngeal stenosis masquerading as the larynx.

A tracheal tube with its pilot balloon tube traverses the stenosis. A tissue flap above the tracheal tube resembles the epiglottis. Lateral and posterior tissues resemble edematous laryngeal mucosa.
A 4-year-old, 12-kg female patient with Pierre Robin Sequence presented for mandible reconstruction with distraction. Past medical and surgical history was significant for airway obstruction requiring an emergent tracheostomy on her first day of life. A gastrostomy tube was placed when the child was 1 week old. At 10 months, she underwent mandible reconstruction but remains severely micrognathic. Approximately 2 years ago, she was decannulated and the tracheostomy site was closed. Subsequently, she was scheduled for further mandible surgery but unsuccessful attempts at intubation at another institution required cancellation of the proposed procedure.

Examination revealed a Mallampati class IV airway with a mouth opening of less than 1 cm. A difficult airway was anticipated based on clinical features and past anesthesia history. The rest of her physical examination was unremarkable.

Preparation of the operating room included stocking various sizes of endotracheal tubes, airway devices, and equipment in the event they were needed. A tracheostomy set also was made available for use.

When the patient arrived in the operating room, standard monitors were placed, followed by insertion of an IV catheter and the administration of glycopyrrolate. Anesthesia was induced with 70% nitrous oxide in oxygen and 8% sevoflurane through a face mask. The patient was able to breathe spontaneously.

Once an adequate depth of anesthesia was obtained, the small mouth opening was appreciated. Direct laryngoscopy was attempted but produced no view of the airway. The next choice of airway device was a GlideScope (Verathon Medical) with the Cobalt blade No. 2. Advancing the blade revealed a narrow oropharynx surrounded by redundant soft tissue and tonsils. Visualization of the vocal cords proved challenging and required external laryngeal manipulation. The trachea was deviated to the left side.

The first choice of a 4.5 cuffed tube was too large; a size 3.5 cuffed tube ultimately was used and was sutured in place by the surgeon. Extubation of the trachea occurred the following day under the guidance of the anesthesia team.

The extremely challenging nature of this airway resulted from the small mouth opening, micrognathia, and limited area of the oropharynx secondary to the encroaching soft tissue. From the perspectives of both the anesthesiologist and the surgeon, a greater appreciation of this patient’s airway was obtained through the use of video laryngoscopy.