



Learning From Others:

Anesthesia
Quality Institute
ANESTHESIA INCIDENT
REPORTING SYSTEM (AIRS)

A Case Report From the Anesthesia Incident Reporting System

Detailed review of unusual cases is a cornerstone of anesthesiology education. Each month, the AQI-AIRS Steering Committee will abstract a case and provide a detailed discussion based on a submission to the national Anesthesia Incident Reporting System. Feedback regarding this item can be sent by email to r.dutton@asahq.org. Report incidents to www.aqiairs.org.

Case 2012-12: Snatching Defeat From the Jaws of Victory

A 23-year-old woman was admitted after a side-impact motor vehicle collision. Thoracic aortic injury was discovered by multi-detector CT scan, and the patient was brought to the O.R. for open repair. The patient was hemodynamically stable and neurologically intact. Following uneventful induction of general anesthesia, placement of a left-sided double-lumen endotracheal tube (ETT) was attempted. The laryngoscopic view was grade 3, and the first attempt resulted in esophageal intubation. The tube was removed and correctly placed by a more experienced operator. The case proceeded uneventfully. The anesthesia team elected to keep the patient anesthetized during transport to the intensive care unit, in deference to the patient's other injuries, the 6-hour length of surgery, and a transfusion requirement of 7 units of red blood cells and 4 units of plasma.

The double-lumen tube was removed, and replacement was attempted with a 7.0 mm single-lumen ETT. Visualization of the larynx was again difficult, and the ETT was again placed in the esophagus. Assistance and back-up equipment were requested. Successful endotracheal placement was finally achieved after multiple attempts over 15 minutes, punctuated by intermittent – and difficult – mask ventilation. During this period, the patient's oxygen saturation ranged from 66 to 90 percent and blood pressure from 90/50 to 185/102 mmHg. Following confirmation of successful intubation with end-tidal capnography the patient was re-anesthetized and transferred to the ICU. The patient was extubated one day later, and the subsequent course of care was unremarkable. The case was reported to AIRS as a “near miss.”

Discussion: Tube change-over at the end of a long surgical procedure is a landmine for the anesthesia team. It can be

a no-win situation in which success is routinely expected and difficulty or failure is regarded as a sign of technical incompetence. After all, the patient had a perfectly good airway when the procedure started.

There are many variables that conspire to make reintubation a dangerous procedure. Some of these are unavoidable. Double-lumen tube placement is more difficult than conventional intubation and may require alterations in technique.¹ The original intubation attempt and ongoing irritation from the ETT itself may cause laryngeal edema and distorted airway anatomy. Head-down positioning, I.V. fluids and postsurgical inflammation can cause unexpected tissue edema. And the course of surgery and the state of resuscitation may make the patient less tolerant of physiologic stress. But these are not the variables that usually create a bad outcome. Rather, the most common risks are those that result from correctable human and systems failings, especially the hazardous attitude (an aviation term) of the providers involved.²

After a long and intricate surgical procedure there is a strong desire to wrap things up and get out of the O.R. This may be accompanied by a sense of relief that the work is done and a corresponding decrease in vigilance. Tube change-over is often attempted without adequate foresight or preparation, especially if the initial intubation was easy and uneventful. Nursing and support personnel who were attentive to the anesthesia team at the beginning of the case are distracted by other responsibilities. Less care is taken with positioning the patient and the bed to optimize airway visualization. Back-up equipment may have been removed from the room for cleaning or storage. The airway itself may be contaminated with blood or saliva. The depth of anesthesia is often lighter than during induction, and muscle relaxation may have worn off. The patient may be receiving a low fraction of inspired oxygen, reducing the time available

to cope with difficulties. Even the presence of an existing endotracheal tube can contribute to overconfidence, as it creates the laryngoscopic appearance of normal anatomy. Unfortunately this is not an accurate predictor of how the airway will look when the ETT is removed.

Avoiding complications during reintubation requires the same systematic approach that anesthesiologists learn to observe at the beginning of a case, or during a potentially dicey extubation.³ A checklist can help: an example is shown to the right. First, the need for a change must be discussed. If the patient is unstable or the risk high, it is acceptable to deflate the bronchial tube cuff and pull back the double-lumen tube a short distance. Although ICU care will be more difficult, deferring the procedure might allow for a safer change-over at a later time. Sometimes discretion is the better part of valor.

When the change-over does happen, the guiding principle is to approach it the way that primary intubation would be approached in a patient with a known difficult airway. This includes discussing the plan in advance, then checking equipment, personnel, positioning, anesthesia, muscle relaxation, oxygen and suctioning prior to beginning.

In almost all cases, a tube-exchange catheter should be used to facilitate the change-over, and exchange catheters are available that will work with double-lumen tubes. Use of a hollow catheter will permit insufflation of oxygen or jet ventilation as a temporizing measure if the procedure becomes difficult. Although helpful, the exchange catheter is not a panacea.^{4,5} The stylet can be dislodged from the airway during manipulations. Airway tissue edema or collapse can make it difficult to advance the replacement ETT over the stylet, even when the stylet remains in the right place. And the use of a stylet may also contribute to over-confidence in a successful outcome.

Once all personnel are in place – including the surgical team in high risk cases – and the patient is appropriately positioned, suctioned, anesthetized, relaxed and pre-oxygenated, the procedure can begin. The tube exchanger is placed, and the best possible view of the larynx is obtained using a direct or video laryngoscope.⁶ The ETT is removed under direct vision, and the new tube placed. Torquing or even a complete corkscrew of the tube may be needed to pass through an edematous larynx, assuming that the smallest feasible tube is already being used. Correct tube position should be confirmed with end-tidal capnometry or flexible bronchoscopy. With appropriate preparations, tube change-over will go well. If not, the providers should be prepared to follow the steps of the ASA Difficult Airway Algorithm through placement of a supraglottic airway – which can be done with the tube exchange catheter in place

and exiting through a bronchoscope adapter at the circuit connection – use of alternative visualization techniques,⁷ and cricothyrotomy or tracheostomy.

Conclusion: As the case presentation illustrates, ETT change-over at the end of a long case may be associated with substantial risk for adverse outcome. Embarrassment can be avoided by a systematic approach, while suppressing the urge to underestimate the procedure or take clinical shortcuts.

Checklist for Reintubation:

- Ask “Is this necessary?”
- Locate all needed equipment
- Round up needed personnel
- Confirm adequate anesthesia
- Confirm muscle relaxation
- Confirm optimal positioning
- Review the plan and contingencies
- Preoxygenate the patient
- Suction ETT, mouth and pharynx
- Place tube exchanger
- Obtain best laryngoscopic view (with direct or video laryngoscope)
- Remove old ETT
- Replace new ETT
- Confirm position with capnography and auscultation
- Secure new ETT

References:

1. Campos JH. Lung isolation techniques for patients with difficult airway. *Curr Opin Anaesthesiol*. 2010;23(1):12–17.
2. Aeronautical decision making. *Advis Circ*. 1991;60-22:i-vi, 1-29.
3. Popat M, Mitchell V, Dravid R, Patel A, Swampillai C, Higgs A.; Difficult Airway Society Extubation Guidelines Group. Difficult Airway Society guidelines for the management of tracheal extubation. *Anaesthesia*. 2012;67(3):318–340.
4. Mort TC, Meisterling EM, Waberski WM. Exchanging a tracheal tube in the ICU patient: a comparison of two exchangers with direct laryngoscopy. *Anesthesiology*. 1997; 87(3)(suppl): A240.
5. Duggan LV, Law JA, Murphy MF. Brief review: supplementing oxygen through an airway exchange catheter: efficacy, complications, and recommendations. *J Can Anesth*. 2011;58(6):560–568.
6. Peral D, Porcar E, Bellver J, Higuera J, Onrubia X, Barberá M. Glidescope video laryngoscope is useful in exchanging endotracheal tubes. *Anesth Analg*. 2006;103(4):1043-1044.
7. Stix MS, Borromeo CJ, Ata S, Teague PD. A modified intubating laryngeal mask for endotracheal tube exchange. *Anesth Analg*. 2000;91(4):1021–1023.