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NEWSLETTER

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Hazards of Sedation for Interventional Pain Procedures

by Steven E. Abram, MD, and Michael C. Francis, MD

The ASA Committee on Pain Medicine, in their 2010 Statement on Anesthetic Care During Interventional Pain Procedures for Adults, wrote: "It is the opinion of the Committee that the majority of minor pain procedures, under most routine circumstances, do not require anesthesia care other than local anesthesia." They also stated: "The use of sedation and anesthesia must be balanced with the potential risk of harm from doing pain procedures in a sedated patient, especially those undergoing cervical spine procedures." Despite these policy statements, an increasing number of patients receive sedation for interventional pain procedures. Patients increasingly expect to be sedated, particularly since moderate to deep sedation has become the norm for all GI endoscopies. As physicians' reputations and even reimbursement can be tied to patient satisfaction scores, it may be difficult to turn down patients' requests for sedation.

The general perception is that sedative and analgesic agents, when used properly, are safe and improve patient satisfaction, reduce procedure times, and stabilize hemodynamic status,[1] but there are significant risks, particularly when administered to patients in the prone position by personnel who are not trained to administer anesthetic agents. This article will present some of the adverse consequences associated with sedation for pain management interventions. Some suggestions for minimizing risk are provided by the authors based on literature review plus academic and private practice clinical experience.

Definitions[2]

The ASA House of Delegates approved the following definitions for the levels of sedation on October 13, 1999 (and amended them on October 21, 2009):

"Minimal sedation (anxiolysis)
A drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.

Moderate sedation ("conscious sedation")
A drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.

Deep sedation
A drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully after repeated or painful stimulation. The ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained."

Airway Compromise

Moderate to deep sedation poses a risk for airway obstruction and hypoventilation. When administered by non-anesthesia personnel with limited airway management experience, the risks are compounded. The prone position severely compromises one's ability to

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Anesthesia Patient Safety Foundation

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Annual Meeting of the
American Society of Anesthesiologists

Saturday, October 13, 2012 (1400-1600)

Convention Center, Washington, D.C.
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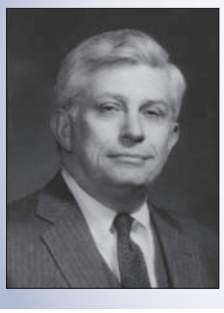
Ellison C. Pierce, Jr., MD, Patient Safety Memorial Lecture



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Donald M. Berwick, MD

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NEWSLETTER
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Sedation May Block Response to Needle Induced Paresthesia

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regain airway control during periods of obstruction or hypoventilation, and may require cessation of the procedure and repositioning the patient supine. Even short periods of airway obstruction during prone sedation can cause negative pressure pulmonary edema.[3]

Minimal to moderate sedation is usually administered by non-anesthesia personnel under the direction of a physician, often the individual performing the procedure. By definition, the patient should remain verbally responsive and cooperative throughout. The supervising physician as well as the individual administering medications and monitoring the patient should maintain verbal contact with the patient. Midazolam is the most commonly used sedative/anxiolytic. It should be given in small incremental doses, allowing adequate time between doses to observe the effect of that dose. Small doses of opioid, used to reduce positional or procedural pain, can be effective, but increase the risk of hypoventilation.

The use of propofol to achieve moderate sedation is becoming more widespread because it permits more rapid recovery. However, its use increases the risk of hypotension, hypoventilation, and airway obstruction. Patients sedated with propofol may rapidly progress from a state of moderate sedation to deep sedation or general anesthesia. The 2002 ASA Guidelines for Sedation and Analgesia by Non-Anesthesiologists states, "Even if moderate sedation is intended, patients receiving propofol or methohexital by any route should receive care consistent with that required for deep sedation. Accordingly, practitioners administering these drugs should be qualified to rescue patients from any level of sedation, including general anesthesia." Small miscalculations in the incremental dose can lead to rapid desaturation and hypotension. In the prone position, airway compromise is more likely and is difficult to manage. The manufacturer's recommendation for the administration of propofol for MAC sedation is that it "should be administered only by persons trained in the administration of general anesthesia and not involved in the conduct of the surgical/diagnostic procedure." There are no manufacturer's recommendations for its use in minimal or moderate sedation. In 2004, the ASA and AANA issued a joint statement supporting the package insert warning label quoted above. A group of 21 European national societies of anesthesia have adopted a consensus statement that bans the use of propofol by non-anesthesiologists.[4] The ASA Closed Claims Project, investigating reports of out-of-operating-room events, determined that the majority of claims involved respiratory compromise during MAC. A third of these involved the use of propofol combined with other sedatives or analgesics.[5] Use of capnography in moderate to deep sedation, now an ASA standard, should provide earlier detection of bradypnea or apnea, and guide titration of anesthetic agents.

Even when trained anesthesia personnel are administering sedation or MAC anesthesia, circumstances compromising patient safety can occur. One such condition can occur if the operating physician requests that the anesthesia professional administer propofol or deepen the level of sedation. The operating physician may be unaware of the risks involved with deeper levels of sedation in the prone position, and the anesthesia professional may feel compelled to do so even if it is deemed unsafe, because concern regarding job security may trump safety concerns.

One final concern regarding propofol is the unusual but serious complication of seizure-like phenomena, which are associated with apnea and rapid desaturation.[6] Prompt control of the airway is essential and could be delayed for the patient in the prone position. The presence of personnel skilled in airway management is critical.

Disinhibition and Agitation

Paradoxical agitation and hyperactivity can occur following the administration of sedative agents. It is most likely to occur during deep sedation,[7] and is probably rare during minimal sedation (no case reports found). If agitation occurs during needle placement for a neuraxial procedure, injuries may result. Uncontrolled movements can aggravate pre-existing cervical spine pathology. When it is associated with the use of benzodiazepines, administration of flumazenil is likely to reverse the agitation.[8] When caused by propofol, the only options are to allow spontaneous recovery, or to induce general anesthesia.

Predisposition to Neural Injury

When performing epidural injections in the cervical, thoracic, or high lumbar segments of the spine, direct needle injury to the spinal cord is a potential risk. Needle contact with the cord is likely to elicit a strong paresthesia. The use of moderate or deep sedation may block the patient's perception of a needle induced paresthesia, increasing the likelihood of accidental injection of material directly into the cord.[9] Needle penetration of the cord is not likely to produce widespread injury unless significant bleeding occurs. On the other hand, injection into the cord will most likely produce a substantial neurological injury.

Patients with severe spinal stenosis are at risk of neurological injury when epidural pressure is increased, particularly in the cervical spine. In the awake, non-sedated state, injection of small volumes of drug may produce significant discomfort or paresthesia, prompting the physician to limit the volume used. If sedation and analgesics blunt these sensations substantially, larger volumes may be injected, increasing the chance for injury.

When performing radiofrequency denervation procedures, electrical stimulation is often used to minimize the chances of injury to adjacent nerves. Stimulation prior to medial branch RFA will produce both sensory and motor effects on nerve roots supplying the upper or lower extremities if the needle position is incorrect. While motor effects of stimulation are preserved, the sensory effects may be lost during moderate to deep sedation.

Confounding of Diagnostic Information

The use of opioid analgesics as adjuncts to minimal or moderate sedation can compromise information gathered during diagnostic procedures. Opioids will change the threshold pressure at which pain occurs during discography. During diagnostic selective nerve root injection, it is important to determine if the paresthesia elicited during needle positioning or anesthetic injection reproduces the distribution of the patient's pain. Likewise, during facet or sacroiliac joint injection, it is useful to know if the patient's clinical pain is reproduced during injection. The use of moderate to deep sedation, particularly when opioids are administered, can significantly blunt these sensations. Continued post-procedure opioid effects will limit the patient's ability to assess the pain relieving effect of the diagnostic procedure.

Cost

The use of sedation can significantly increase patient care costs. Added facility charges and drug costs are incurred, and the additional recovery time will be billed.

Summary of Authors' Suggestions

- Avoid sedation for relatively short, uncomplicated procedures unless there is significant anxiety or pain with positioning.
- Avoid deep sedation in the prone position. Maintain continuous verbal contact with prone patients.
- Provide minimal to no sedation for neuraxial procedures at or above the L-2 level.
- Avoid propofol sedation for pain interventions.
- Avoid or minimize the use of opioids for patients undergoing diagnostic interventions.
- Avoid deep sedation for patients undergoing neuroablative procedures that employ electrical stimulation to localize needle position.

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Communicating and Managing the Difficult Airway:
One Health Care System's Story

by Jennifer Kadis, MSN, RN, and Joseph Loskove, MD

The Patient

A middle-aged male was scheduled to undergo neurosurgery, but the procedure was aborted following an unrecognized difficult intubation with minor airway trauma. It was decided to postpone the surgery and upon his return to the OR to electively intubate him via an awake, sedated fiberoptic approach. When he returned for the rescheduled surgery, the anesthesia team was fully prepared and the patient was successfully intubated as planned. Surgery went well, and the patient was uneventfully extubated in the OR and taken to the PACU.

Approximately 24 hours later, the patient had acute neurological deterioration while recovering on the nursing unit. After a stat head CT, he was taken directly to the ICU in preparation for a return to the OR. Due to progressive deterioration, the ICU team decided to intubate the patient; however, they were unaware of his previous airway difficulties. Multiple unsuccessful attempts were made to intubate him by the ICU team. The anesthesia team was then summoned, also without any prior knowledge of the patient's airway, and was unable to intubate him with the equipment provided in the ICU. The trauma surgeons responded to the crisis and eventually a bedside tracheostomy was performed. The patient was returned to the OR for a clot evacuation but did not recover brain function and expired 2 days later with a presumed diagnosis of anoxic encephalopathy.

The Problems

Two problems were encountered in caring for this patient:

1. Although the anesthesiologist caring for the patient at the time of surgery knew of the patient's difficult airway status, neither the ICU team nor the anesthesia team called upon to help emergently was aware of the patient's difficult airway.
2. The advanced airway equipment that would have enabled the anesthesia team to assist in the ICU was not readily available.

The Challenges

How to communicate a patient's difficult airway status such that it is readily available to any health care provider in a health care system with 6 facilities, each of which provide varying levels of service, but in aggregate care for over 40,000 surgical cases/year? The traditional method of notification of a patient's difficult airway focused on informing only the patient and (perhaps) the anesthesia team (i.e., via a letter to the patient's home); there was a lack of an organized method to communicate the information to other providers.

To further complicate matters, primary responsibility for intubation of patients outside of the OR rests with non-anesthesia providers such as ED physicians, intensivists, and trauma surgeons.

Additionally, the health care system (at the time of this event) utilized a combination of electronic and paper documentation.

Advanced airway equipment (e.g., videolaryngoscopes, bronchoscopes, surgical airway equipment, LMAs) is found inconsistently in the ICUs and ERs throughout the health care system.

The Solution

A multi-disciplinary team was assembled to address the problem, chaired by the chief of Anesthesia and including members from nursing, IT, purchasing, respiratory therapy, and physicians from the ED, ICU, and trauma surgery.

The primary goal was to communicate a patient's difficult airway status to the entire health care team across all 6 hospitals and to ensure that the team has all the necessary equipment readily available in all 6 hospitals.

A nationwide search for best practices was not fruitful. As such, the task force undertook to create the system as described below that focused on **identification, communication, and equipment**:

Identification

A difficult to intubate patient (DTI) is defined as: a patient for whom a conventionally trained laryngoscopist experiences difficulty with mask ventilation, difficulty with tracheal intubation, or both.

Using the above definition, any physician from the departments of Anesthesia, Emergency Medicine, ENT, ICU, and Trauma Surgery may deem a patient a DTI. The physicians do so by writing an order in the chart deeming the patient a DTI.

Upon identification, the focus shifted to the communication method.

Communication

Typically, specific information for patients is communicated by placing a sign over the bed or on the whiteboard in each room, such as "NPO for test" or "do not use Right arm for venipuncture." However, since patients travel throughout the facility for tests and procedures, that would not be sufficient; we needed a method that would remain with the patient constantly. We also wanted this information to be available each and every time the patient was admitted to any of our facilities, without having to search through prior charts.

Our ultimate solution:

Sample arm band identifying patient as having a difficult airway

Upon designation, a blue bracelet, with the verbiage "DIFFICULT TO INTUBATE," is placed on the patient and remains in place for the duration of the hospitalization.

A notation "DIFFICULT TO INTUBATE" is placed in the allergy section of the electronic health record—this ensures the information is available for subsequent visits to any facility in our system. The DTI designation is treated as an allergy—just as a patient is banded with an allergy bracelet upon admission to the ED or hospital, so too a DTI patient is banded upon their entrance into the health care system.

A letter is sent from the health care system, written in 5th grade language, to the patient for education.

Education about the new process was provided to all staff and physicians in the targeted areas

Equipment

The health care system committed itself, at significant expense, to standardize the difficult airway carts throughout all 6 hospitals including the ORs, EDs, and ICUs. The new standardized DTI carts all have a status identical to a "code" cart—that is the carts at all facilities are stocked identically and when opened are returned to a centralized location to be cleaned or sterilized, restocked, and resealed.

The DTI carts are all stocked with the following (along with other miscellaneous items):

- Fiberoptic bronchoscopes
- Retrograde wire intubation kits
- Jet ventilators
- Percutaneous cricothyrotomy kits

Example of a difficult airway cart with a locker for fiberoptic scopes.

An example of the denotation of a difficult airway in a fictitious patient's electronic medical record.

See "Difficult Airways," Next Page

I.D. Bracelet and Allergy List Useful Tools to Identify Difficult Airway Patients

"Difficult Airways," From Preceding Page

- LMAs
- Surgical airway equipment and multiple sizes of Shiley tracheostomies
- Intubation catheters/Bougies

Each of the 6 hospitals, depending on their particular needs, has stocked their facilities with an appropriate number of adult and pediatric DTI carts.

There was significant debate as to whether to also stock the DTI carts with a videolaryngoscope. The physicians on the committee felt that videolaryngoscopy is becoming a primary technique for airway management, particularly outside the OR. Recognizing this new reality, the health care system also committed itself to insuring that all of the facilities have appropriate numbers of videolaryngoscopes, standardized by brand.

Does the protocol work?

The protocol went live on February 1, 2012. Shortly thereafter a patient was admitted to the ER of one of the Memorial hospitals with an acute MI. The patient decompensated and required intubation. The ER physician encountered difficulty and the anesthesia team was asked to assist. Using a videolaryngoscope, they were able to intubate the patient successfully. The ER physician then wrote an order in the chart deeming the patient a "difficult to intubate."

The patient was emergently transferred to another Memorial hospital for urgent cardiac catheterization. Upon admission, the admitting nurse noted the DTI designation in the allergy section of the patients EMR and placed the blue wristband on the patient (the patient should have had the wristband placed in the ER of the primary institution, but was missed due to the newness of the protocol and urgency of the patient's condition). The patient underwent cardiac catheterization and was stabilized. After stabilization, the health care team decided that the patient would benefit from surgical revascularization. The patient was subsequently transferred to another Memorial hospital for CABG surgery.

Upon admission to the preop holding area, the anesthesiologist noted the blue wristband and brought the new DTI cart into the OR in preparation for the induction of anesthesia (the anesthesiologist admitted that based upon his standard exam he would not have expected the patient to have a difficult airway). Upon the induction of anesthesia, the patient's airway was challenging, and the anesthesiologist was able to use the equipment available on the DTI cart to successfully and atraumatically intubate the patient. The patient underwent successful bypass surgery and was eventually discharged home in good condition.

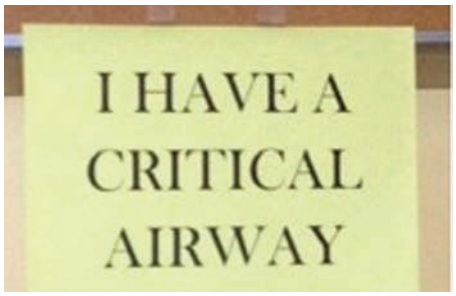
Tracking this patient's course through our health care system revealed that, on the whole, the protocol works (although we recognize and admit that the patient should have been banded at the initial hospital). In particular:

- The DTI designation in the allergy section tracks across multiple hospitals
- The blue wristband alerts other members of the health care team to the patients DTI status
- The advanced airway equipment facilitates the safe care of patients who require intubation.

Positive Unintended Benefit

The multiple discussions among the Medical Staff about the protocol and the extensive educational efforts with the nursing staff have raised the level of awareness within the health care system of the risk to patients who may have tenuous airways.

Just recently an infant in the PICU with significant medical conditions and a challenging airway was on mechanical ventilation for respiratory support. In addition to the blue wristband, the ICU nurses undertook to place a sign above the patient's bed with the verbiage "I have a critical airway" and placed the dedicated pediatric DTI cart outside the patient's room.



Sign outside of patient room indicating that the patient has a critical airway.

Conclusion

It is our hope that the commitment of the physicians, nurses, and administration of the Memorial health care system to do everything possible to prevent a recurrence of the case that began this protocol will lead to a culture where patient safety in airway management is an important focus of every health care provider.

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Letter to the Editor

Swab All Vials With Alcohol

To the Editor:

The recent Letter to the Editor titled "Reader Raises Two Propofol Concerns" suggests that providers routinely swab propofol and Diprivan® vials prior to administration. A table was provided comparing manufacturer recommendations for alcohol disinfection of the vial stopper prior to drawing the medication. There have been several articles on this topic, with some defining the practice as unnecessary,[1,2] and others reporting contamination risks.[3]

However, the American Society of Anesthesiologists recommends that an alcohol swab be used for vial rubber septums as well as for the outside of glass ampules.[4] The Center for Disease Control also recommends that all rubber septums be disinfected with alcohol prior to drawing medication.[5,6] Thus for patient safety, we believe that providers should routinely swab all rubber septums on medication vials as well as the outside of non-sterile glass ampules prior to accessing them.

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In My Opinion:

Direct vs. Videolarnygoscopy: Prioritization in Training

by Allen D. Miranda, MD, and Richard C. Prielipp, MD, FCCM

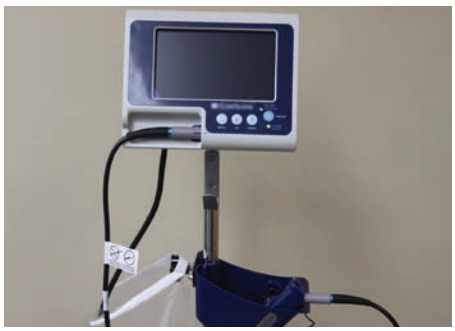
While attending a national anesthesiology conference 2 years ago, a colleague and his spouse strolled through the exhibit area and stopped at the booth sponsored by a major manufacturer of videolaryngoscopes. Within minutes, his wife—a travel agent by trade—successfully understood and used the videolaryngoscope to intubate the trachea in a mannequin at the booth. In essence, her success rate using a videolaryngoscope was 100%! Indeed, this is the Siren song of the videolaryngoscope—a device so intuitive and powerful that it creates the impression for many medical personnel that tracheal intubation is a straight-forward and easy technical exercise. Perhaps more alarming is that the conclusion of many anesthesia professionals that using a videolaryngoscope is the ultimate "failsafe" intubation technique and that it markedly increases the likelihood of successful endotracheal intubation. However, a careful review of current literature does not fully support this conclusion.

The term "videolaryngoscope" generates 150 Medline citations over the last decade. Only a small number of these publications truly evaluate the efficacy of videolaryngoscopy to improve the ability to successfully intubate the trachea. Many of these studies are performed only on mannequins; whereas, a minority are done in real-life clinical situations in operating theaters, emergency rooms, and other critical care areas. In one of the largest reviews, Aziz et al. evaluated videolaryngoscope use in over 2,000 patients.[1] The 2 institutions that participated in this study used the Glidescope® and the primary outcome was "successful intubation." They also attempted to define factors that may contribute to failure of the use of the Glidescope®. In their study, the Glidescope® could be used either as the primary method or as rescue for a failed laryngoscopy or fiberoptic intubation. As expected, the use of the Glidescope® was highly successful as a primary method for intubating the trachea and was also very successful, but not quite as frequently as primary use, for rescue of a failed direct laryngoscopy or fiberoptic intubation. **In neither the failed direct laryngoscopy group nor the fiberoptic group was the Glidescope® 100% successful in rescuing the airway.** Interestingly, when the Glidescope® was used as the primary device and failed, almost 50% of the time the successful rescue method was direct laryngoscopy. Predictors of failure of the Glidescope® included abnormal neck anatomy from surgery, a mass, or history of radiation therapy.[1]

In a study by Piepho and colleagues, the performance of the Karl Storz C-MAC® videolaryngoscope was assessed after laryngoscopy with a standard American-type MacIntosh adult blade provided only a limited glottic view.[2] As predicted, the C-MAC improved the view in the vast majority but not all patients. Indeed in a minority of patients the glottic view was still inadequate and intubation attempts were not successful with the C-MAC scope. In this study, one patient was rescued using a different blade on the C-MAC scope and the other 2 failures were rescued by direct laryngoscopy using a Miller blade.[2]

A meta-analysis and review of the Glidescope® was published earlier this year by Griesdale et al.[3] In this review, the authors evaluated 17 trials with almost 2,000 patients. They concluded the Glidescope® improved glottic visualization (compared to direct laryngoscopy) in both easy and difficult airways, with a greater relative benefit in the patient with a difficult airway. This review also concludes that there was no difference between the Glidescope® and direct laryngoscopy in terms of successful first attempt intubation or time to intubation except if the laryngoscopist was not an expert.[3]

Many other publications describe this same pattern of results using videolaryngoscopes. There is usually an improvement of one or more grades in the Cormack-Lehane view of the glottis with videolaryngoscopes, and this often translates into an improvement in the rate of successful oral tracheal intubation. However, no publication documents 100% success with the new videolaryngoscope in terms of improving the glottic view or securing the airway. Thus, it seems prudent—even critical—that anesthesia training programs still prioritize the critical skill of direct laryngoscopy using standard Miller and MacIntosh blades. Moreover, the 2011 edition of the ASA difficult airway algorithm does not use the term videolaryngoscope directly. While there is no doubt that these devices have a vital place in our quiver of airway tools, it is imprudent (or perhaps even counterproductive) to teach and prioritize videoscopy to anesthesiology trainees prior to mastery of standard direct laryngoscopy. Otherwise, we risk endorsing the erroneous concept that the use a videolaryngoscope for every endotracheal intubation is the preferred methodology and a sure pathway to the rescue after one or more failed attempts to secure the airway.



Examples of commercially available videolaryngoscope handle and monitor.

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to express your opinions and contribute to development of the template.

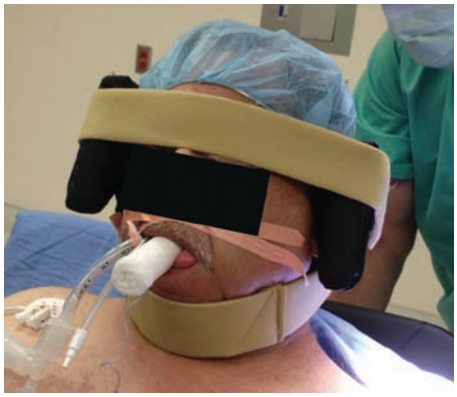
Letters to the Editor

The "Beach Chair" Position: *Jugular Compression and Cerebral Perfusion Pressure*

To the Editor:

While the incidence is unknown, and probably low, it seems likely that cerebral ischemic injuries occur sporadically in association with shoulder surgery performed in the beach chair position. This sporadic, seemingly idiosyncratic, pattern of occurrence has prompted speculation about mechanisms that might make individual patients especially vulnerable. Might unrecognized hypertension, with attendant right shifting of the autoregulatory curve, or variations of intracranial vascular anatomy render individual patients unexpectedly more vulnerable? As a third possibility, I had also speculated that inadvertent compression of the jugular veins, by the head fixation device, might increase intracranial pressure and effectively reduce cerebral perfusion pressure (cerebral perfusion pressure = mean arterial pressure—intracranial pressure), thereby rendering a mean arterial pressure that would normally be adequate, insufficient. Some time ago, in connection with that latter speculation, I consulted local orthopedic surgeons and closely observed the head holder devices that were then in use at my institutions. My conclusion at that time was that that they appeared to have no potential whatsoever to compress the jugular veins. I put that speculation aside. However, I very recently entered an operating room at our institution and observed a newly acquired head positioning device (SchureMed Linear Motion Shoulder Chair, SchureMed, Braintree, MA) in use. The photograph depicts my observations. Before the surgical procedure began, I loosened the inferior strap (and adjusted the upper strap away from the eyes). After the procedure (a 12-minute skin-to-skin Mumford procedure) I expressed my concern to the orthopedic surgeon, who told me that it was well understood that the inferior strap is to be placed around the chin and not around the neck. That is, in fact, precisely how the device is depicted in the company's promotional materials (http://schuremed.com/wordpress/wordpress-content/uploads/2012/04/2012-Schuremed-Patient-Positioning-Catalog.pdf; accessed 7/18/2012). Nonetheless, there is some potential for malpositioning of the chin restraint, which might be exaggerated by certain body habitus.

I draw this issue to the attention of all practitioners, in particular those who allow permissive hypotension during shoulder procedures, in the hope that clinicians will make every effort to avoid jugular compression, be it by head fixation devices or circumferential ties. My



concern is based entirely on speculation as I am unaware of a single instance in which it can be asserted that injury has occurred by this mechanism. However, avoiding jugular compression should entail no physiologic hazard to the patient and should in no way compromise the effectiveness of the beach chair position in achieving the exposure needs of our colleagues in orthopedic surgery.

John C. Drummond, MD, FRCPC
San Diego, CA

It Could Happen to You! *Construction Contaminates Oxygen Pipeline*

To the Editor:

I want to remind colleagues about the possibility of an "adulterated" oxygen supply during construction when it involves main oxygen supplies to a facility. I think it is important to get the word out.

The facility in which I work has been undergoing major renovation and construction. There have been projects off and on nearly every year. One day last week around noon time several MDs and CRNAs noted a drop in the oxygen concentration during their cases. It happened rapidly within minutes, in 8-9 operating rooms. The inspired oxygen concentration dropped to 2-3%. The reactions of personnel varied and no one knew immediately that it was happening in any other room except their room. Most turned on the oxygen tank on the back of the machine. Some placed the patient on an Ambu bag and tank oxygen, and some, on an Ambu and wall oxygen.

The oxygen line pressure coming in was normal. It was soon evident that this oxygen inflow concentration problem was system wide. There were no patient's adversely affected although oxygen saturations fell into the 70s for 1-2 minutes in some instances.

The root of the problem was discovered as the day progressed. The construction project had the possibility of interfering with the main oxygen line from the large storage tank. In anticipation of that problem, a new line was run to work around the construction. As is the case with any such line, after it is completed and before it is turned on, it is tested with nitrogen for leaks. After this, it is purged with the gas that is supposed to run in that line. This was done, but obviously not satisfactorily.

What we learned/relearned was the best reaction by the anesthesia personnel (when line pressure was normal and oxygen inflow concentration was not normal) was to take the patient off of machine oxygen and use independent tank oxygen.

In addition since oxygen line pressure never dropped because it was pressurized with nitrogen gas, turning the oxygen tanks on that are attached to the machine did not solve the problem. The normal line pressure did not allow the tank oxygen to flow adequately.

A great note of thanks to the many anesthesiologists (scientists) that came before us, mandating safety alarms for inspired oxygen concentration and line pressure monitoring. These alarms saved our patients from significant harm.

One final thought, as is done most of the time, whenever construction might interfere with operating room functions, all personnel are notified to be alert. When possible, any potential interference should be done outside of OR operating times although this would not have solved this problem.

If this can be of use, please pass it on.

Thank you.
Name and state withheld by request.

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Dear SIRS

Reader Questions Why Some Anesthesia Machines Allow O_2 Flow Below Basal Metabolic Needs

S AFETY
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Dear SIRS refers to the Safety Information Response System. The purpose of this column is to allow expeditious communication of technology-related safety concerns raised by our readers, with input and responses from manufacturers and industry representatives. This process was developed by Dr. Michael Olympio, former chair of the Committee on Technology, and Dr. Robert Morell, co-editor of this newsletter. **Dear SIRS** made its debut in the Spring 2004 issue. Dr. A. William Paulsen, current chair of the Committee on Technology, is overseeing the column and coordinating the readers' inquiries and the responses from industry.

Dear SIRS:

I am very curious why new machines have a flow that is below "basal metabolic needs." Here are specifications for a number of different anesthesia machines to make the point:

Sincerely,
Kyle Jones, MD
Huntsville, AL

Spacelabs Blease Sirius	150 mL
GE Aestiva	50 mL ± 25 mL
GE Aespire	50 mL ± 25 mL (unless it is a single flow tube then it is 200 mL ± 25 mL)
GE Avance	150 mL
Dräger Fabius & Apollo	0.00 mL (there is an alarm that sounds if you start a case and there is no flow)
Older Machines	
Dräger NM GS	150 mL to 200 mL
Dräger NM 2C	100 mL to 200 mL
Dräger NM 2B	100 mL to 200 mL
Dräger 6000	150 mL to 200 mL
Datex Ohmeda Excel and Modulus machines	175 mL to 225 mL

Response:

The comments below reflect different manufacturers' rationale for minimum oxygen flows from the early development of hypoxic mixture guard systems to the currently available anesthesia machines. The goal was to contact those individuals who represented the expertise in this subject from the major anesthesia machine manufacturers starting at the time of the introduction of systems for the prevention of delivery of hypoxic mixtures. Recognize that the experts who contributed these opinions may have moved from one company to another blurring the rationale as presented by each manufacturer.

As indicated below, metabolic oxygen requirements have little to do with a manufacturers' choice of minimum oxygen flow. Basal oxygen requirements vary over an extraordinary range. For example, *Smith's Anesthesia for Infants and Children*[1] claims that a neonate's oxygen consumption may vary from 6 to 10 mL kg^{-1} min^{-1} and up to 20 mL kg^{-1} min^{-1} during heat stress. An adult typically requires 3 mL kg^{-1} min^{-1}. The average maximum oxygen consumption during labor was measured to be 6.7 mL kg^{-1} min^{-1} with one parturient achieving a maximum oxygen consumption of 10.7 mL kg^{-1} min^{-1} during the first stage of labor.[2] The maximum oxygen consumption in this study could be higher if coupled with other disease states. Generalizing, oxygen consumption for any given patient may vary from approximately 6-10 mL of O_2 per minute to more than 800 mL O_2/minute. Meeting metabolic oxygen needs of an individual patient was never the primary goal of basal oxygen flow.

Manufacturers' Replies:

Response from Dräger

(http://www.draeger.us/sites/enus_US/Pages/Hospital/ProductSelector.aspx?navID=264)

1. The nature of the minimal oxygen flow features in anesthesia machines originates from the demand to avoid hypoxic mixtures. Taking the typical metabolic rate of an adult, this was translated to a minimum oxygen flow of ~250 mL/minute.
2. With the emergence of Workstations optimized for low flow anesthesia techniques, the minimum oxygen flow feature was sometimes met with pushback by neonatal anesthesia clinicians because of concerns about the resulting higher then desired inspired oxygen concentrations.
3. The Narkomed machines included an "Air only mode" that disabled the minimum oxygen flow. Also, a minimum oxygen flow elimination kit was available.
4. The Fabius GS, Fabius GS Premium, Fabius MRI, Fabius Tiro and Apollo machines use a Sensitive Oxygen Ratio Controller (S-ORC). The fail-safe component shuts off nitrous oxide if the oxygen flow is less than 200 mL/min (Apollo) and 250 mL/min (Fabius), or if the oxygen fresh gas valve is closed.
5. The S-ORC is not active when Air is selected as the carrier gas and 100% Air can be metered throughout the entire flow range, in order to be able to meet the FiO_2 requirements of pediatrics and neonates.
6. The standards, ASTM F1850-00 (clause 51.13.1) and EN60601-2-13 (clause 51.102.2), require avoiding oxygen concentrations below 21% (V/V) in the fresh gas measured at the common gas outlet in cases when nitrous oxide is used as carrier gas. A certain minimum oxygen flow is not required by these standards.

See "Dear SIRS," Next Page

Manufacturers Respond to Concern About Low O_2 Flow

"Dear SIRS," From Preceding Page

Reply from GE Healthcare

(http://www.gehealthcare.com/euen/anesthesia/index.html)

1. From our GE perspective the history of minimum O_2 flows started when we implemented the Link-25 hypoxic guard (U.S. Patent 4,266,573 filed Oct 1979). Originally it was implemented with a 200 mL/min minimum O_2 flow rate simply because it was believed at that time that nobody would want to go below that flow rate.
2. Gradually we began to receive requests to lower this minimum flow, primarily because of the issue of having this constant flow going whenever the machine was turned on.
3. In a few cases lower flows were also requested by clinicians who wanted to practice with a true closed circuit and with very small patients, but this was not common.
4. Initially an option was offered to allow 50 mL/min minimum O_2 flows, and this option became popular enough that when the Aestiva and later the Aespire were designed they provided this 50 mL/min minimum flow limit as a standard feature.
5. Eventually we moved on to electronic gas mixing with the introduction of the Avance product. This allows us to automatically turn the O_2 flow off when a case ends, and back on again at the start of the next case. Therefore the minimum O_2 flow during a case was raised to 150 mL/min, and we found that there were minimal if any complaints that this was too high.
6. When the Aisys product was introduced, the minimum O_2 flow rate during a case was raised further to the original limit of 200 mL/min, again with good acceptance.

Reply from Oricare

(http://www.oricaremed.com/products/anesthesia/)

1. Minimum O_2 Flow (Basal O_2 Flow) was added to anesthesia systems as a safety feature given that some users would make the error of turning off the oxygen flow by mistake.
2. As time went on some customers asked for finer control to allow lower O_2 concentration levels to be reached for certain special cases. In Europe it was undesirable to have a minimum oxygen flow in a typical configuration of an anesthesia machine.
3. The No Minimum O_2 Flow configuration also saved on O_2 gas supply use when the anesthesia machine sits idle but at the ready.
4. This led to interest in removing the Minimum O_2 Flow feature so the user could totally control the O_2 level—sometimes using Air only, or allowing rebreathing on Air to reach a lower O_2 level for specialized cardiac infant surgery and for other special cases.
5. With a major focus on cost of use, avoiding absorbent desiccation, and to allow for machine use flexibility when machines offer reliable oxygen monitoring systems and alarms, many feel the best current machine design is without minimum O_2 flow.

Reply from Spacelabs Healthcare

(http://www.spacelabshealthcare.com/en/products-services/anesthesia-delivery-ventilation/)

1. Older anesthesia systems did not have hypoxic protection built in. There used to be no link between N_2O and O_2, and the clinician could easily deliver hypoxic mixtures. Oxygen could also be turned completely off.
2. In order to maintain a hypoxic link properly with a fully pneumatic system (needle valves), setting a minimum O_2 flow is necessary. Otherwise the link at low flows becomes impossibly difficult to maintain due to error stack-up within components.
3. Regarding safety, it makes sense that there would be a minimum O_2 flow of about 250 mL/min. However, as closed system anesthesia has been used by some clinicians, low flow has become a competitive issue and manufacturers have gradually lowered their specifications.
4. One disadvantage of a constant O_2 flow when the machine is powered up is that the CO_2 absorbent can become desiccated. Some institutions leave their machines on all the time; this can become a problem with carbon monoxide production.[3] Again, this has pushed manufacturers to lower their specification for the lowest O_2 flow.
5. Newer electronic mixers permit the O_2 flow to be turned off. This could potentially present a problem. Most manufacturers are still enforcing a minimum flow while the system is in clinical use.
6. The new Spacelabs anesthesia machine has an electronic mixer as offered by other manufacturers. This new machine has a low limit of 100 mL/min for oxygen similar to other manufacturers. In the standby state, the flows may be turned to zero to prevent desiccation of the absorbent.

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The APSF Committee on Technology

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A Statement by the Executive Committee of the APSF

From time to time, the Anesthesia Patient Safety Foundation reconfirms its commitment of working with all who devote their energies to making anesthesia as safe as humanly possible. Thus, the Foundation invites collaboration from all who administer anesthesia, all who supply the tools of anesthesia, and all who provide the settings in which anesthesia is practiced, all individuals and all organizations who, through their work, affect the safety of patients receiving anesthesia. All will find us eager to listen to their suggestions and to work with them toward the common goal of safe anesthesia for all patients.

Q&A

MRI-Compatible Handle and Blades

Q **Dear Q&A,**

Would you consider having an MRI-compatible laryngoscope handle and blades necessary, or merely desirable, for safe administration of LMA anesthesia to children aged 2 to 12 years? Are MRI-compatible handle and blades necessary for administering deep propofol sedation to children aged 2 to 12 with natural airways?

Edward D. Hon, MD
Kamuela, Hawaii

A **Dear Dr. Hon,**

As is well known, a satisfactory airway may transition to a failed airway for any number of reasons at any time. Every anesthesia professional should have the ability to intubate with a laryngoscope when planning LMA anesthesia. While there may be concern over the expense of purchasing equipment that may be used infrequently, if at all, it is insurance that an unusual event may be handled with a high degree of patient safety.

A complete set of MRI-compatible laryngoscopes in a box including handle, blades, and batteries is available for purchase from several manufactures of laryngoscopes and MRI-compatible accessories. MRI Non-Magnetic Lithium Laryngoscope Batteries are an equally important consideration. Traditional batteries inside the magnetic field may become depleted quickly and can be drawn into the magnet.

Another useful addition to your MRI suite would be a policy for how to handle a failed airway or a cardiac arrest in the MRI suite. The basis for a policy may be constructed considering the following:

The area where the MR scanner is housed is divided into 4 safety zones in accordance with the *ACR Guidance for Safe MR Practices: 2007*.

- ***Zone 1*** includes all areas freely accessible to the general public, which may be an anesthesia induction room or simply the corridor outside the MRI Suite. Conventional equipment can be used in Zone 1.
- ***Zone 2*** indicates the interface between publicly-accessible uncontrolled Zone 1 and the restricted Zones 3 and 4. The MRI screening room where participants are greeted and screened before entering the scanner room is Zone 2.
- ***Zone 3*** is the region in which free access by unscreened non-MR personnel or ferromagnetic objects or equipment can result in serious injury or death. Zone 3 is highly restricted. The MRI Console Room and MRI Equipment Room are Zones 3a and 3b, respectively.
- ***Zone 4*** is synonymous with the MR scanner itself, that is, the physical confines of the room within which the MR scanner is located. Zone 4, by definition, will always be located within Zone 3 as it is the MR magnet and its associated magnetic field that generates the existence of Zone 3.

In the event of a respiratory or cardiac arrest, or other emergency within Zone IV for which medical intervention or resuscitation is required, the patient should be emergently removed from Zone IV to a predetermined magnetically safe location. This is in consideration of the chaos that can accompany a rescue effort and could easily lead to someone bringing a metal object into Zone 4 inadvertently. An appropriate patient stretcher can be placed in the MRI scanner room to facilitate rapid transport of the patient to a lower zone for resuscitation if needed.

MRI-compatible laryngoscope handle and blades can be kept in the MRI control room for emergencies where a patient would need to be intubated in the scanner. MRI-compatible laryngoscopes, blades, and batteries can be used in Zone 4. There is real value to having an MRI-compatible laryngoscope available, because it creates a comfort level for the anesthesia providers who feel they have an option for managing an airway in Zone IV if needed. It also creates a comfort level for the MRI techs who are responsible for insuring that safety of the MRI environment. If establishing an airway must be done in either Zone 4 or Zone 3, the compatible laryngoscope provides a greater measure of patient safety and comfort for all involved.

Reference

1. Kanal E, BarkovichAJ, Bel C, et al. ACR guidance document for safe MR practices: 2007. *Am J Roentgenol* 2007;188:1447-74.

Numerous questions to the Committee on Technology are individually and quickly answered each quarter by knowledgeable committee members. Many of those responses would be of value to the general readership, but are not suitable for the Dear SIRS column. Therefore, we have created this simple column to address the needs of our readership.

Letter to the Editor With Reply

Risk of Fires With Eye Surgery Under MAC

I have been a part-time cardiac anesthesiologist for many years and also practice in a couple of ambulatory surgery centers providing anesthesia for eye surgeries in a large city. I have been very lucky to be able to do both academic cardiac anesthesia and maintain a busy private practice over all these years.

The APSF has done a very good job in calling attention to the risk of fires in the OR and defining the necessary requirements. I am afraid that the recommendations may lead anesthesiologists to avoid insufflation under the drapes for cataract surgery patients, and I think this would be a mistake.

There is a debate in our practice, for which I am seeking your input. The question is if you consider a cataract patient (conscious sedation and peribulbar block) with a drape system that seals around the eye, Betadine prep solution (ample time to dry), and no use of electrocautery, at risk for a surgical fire? If the surgeon uses bipolar cautery or "pencil point" disposable cautery in one out of 20 cases, does that case qualify as a risk for fire? We use a combination drape support and gas delivery device (a long metal malleable arm that has a central conduit to deliver gases to its distal end), which can deliver oxygen or air or any combination we connect to it.

Some of our partners interpret your Fire Prevention Algorithm to mean that we should not insufflate anything under the drapes, thus allowing the patient to breathe only the "room air." Some believe that, at the very least, we should be insufflating air in order to decrease the rebreathing of carbon dioxide. Others believe that we can safely insufflate oxygen since we have a closed draping system and very rarely use any cautery—and never any type other than bipolar or "pencil point" disposable cautery.

I cannot help but think of the existing safety record my practice has had insufflating oxygen. In the last 27 years we have done more than 500,000 cases without a fire. That is certainly an impressive safety record. There are well over 2 million cataract operations performed in the US annually. My one concern in the existing recommendations, again, is that if nothing is insufflated under the drapes (which cover the nose and mouth) there will be significant rebreathing and hypercarbia. Will we have enough hypercarbia on a very rare occasion (at least 1 in 500,000 would be worse than my existing fire safety record) that we increase cerebral blood flow enough to have a bleed in the head, or enough to produce significant acidosis causing a serious arrhythmia or adverse event?

Perhaps you can all discuss whether or not you want to specifically say that air or an oxygen concentration of 30% or less should be insufflated when a patient's nose and mouth are covered by an impermeable drape to decrease the incidence and possible complications of rebreathing and hypercarbia?

Please let us know your opinion.

Thanks very much.

Sincerely,
Name withheld by request.
New York, NY

Experts Respond: Occlusive Drapes Unreliable as O_2 Barrier: Insufflate With Air or <30% FiO_2 for Patient Comfort

Assessing the risk of fire is all about the combination of the elements of the fire triad: *oxygen, heat source, and fuel.*

A systematic approach can be helpful in assessing the fire risk in your specific circumstance:

#1 Oxygen: Using occlusive drapes may lead to a false sense of security of isolating the oxygen from the surgical field since small gaps or creases may exist in the drapes and allow oxygen to enter the field and enrich the local oxygen concentration thereby increasing the fire risk.

Regarding the use of the conduit you describe to insufflate under the drapes, is the insufflation for patient comfort or for oxygen supplementation? If used solely for patient comfort and to eliminate rebreathing of carbon dioxide, then medical air should work well. The intention of the algorithm was not to preclude people from insufflating air under the drapes, which can be useful both for CO_2 elimination and patient comfort. If oxygen supplementation is needed to maintain adequate saturation then blended mixtures of air and up to 30% oxygen pose no acceleration of combustion. Insufflation with pure oxygen is hazardous and creates a high-risk situation with respect to surgical fires.

An important message from both the APSF and ECRI work on fire prevention is that there is an increased risk of a fire when providing 100% oxygen, especially for procedures above the xiphoid. Exposing the patient to that increased fire risk is generally not clinically warranted. Most patients will tolerate careful sedation while breathing room air or air that is slightly enriched with oxygen to no more than 30% concentration. Even well-trained anesthesia professionals find it challenging to break the habit of providing 100% oxygen by open delivery during sedation cases. Oxygen given in concentrations greater than 30% should be for clear patient benefit, with an understanding of the increased risk for fire, and not solely because it is a long-standing practice and is simpler than alternatives such as using an oxygen blender or securing the airway with an endotracheal tube or supraglottic airway device.

#2 Heat Source: If cautery is not used, then the heat source is not present and hence no fire risk is present. Bipolar tips are not usually considered ignition sources, but in an atmosphere which is oxygen enriched beyond 30%, the threshold of ignition of most fuels is decreased, so while "safer," we cannot completely exclude their capacity to start a fire. As for using a cautery device in only 1 of 20 cases, one should consider that surgical fires are rare occurrences; however, the combination of the elements of the fire triad always pose the risk for a fire. A pencil tip cautery was recently implicated in a fire in the emergency center in Delhi, CA at Emanuel Medical Center involving oxygen supplementation. http://www.modbee.com/2012/03/08/v-print/2104480cauterizing-tool-ignited-womans.html

#3 Fuel: Alcohol free prep solutions such as povidone-iodine are not flammable so drying time does not matter from a fire perspective, only from an antimicrobial one.

Thank you for taking the time to pursue this issue and contribute your extensive experience and thoughtful clinical expertise. The *APSF Newsletter* offers a very useful forum for vetting safety recommendations. One of the challenges to these recommendations is anticipating every clinical situation and how the recommendations should be best applied. That is of course why there are recommendations as there is no substitute for a thoughtful clinician making decisions about the best care for an individual patient. We are appreciative of the opportunity to publish the content of this dialogue in the *APSF Newsletter*.

As a final note, we are glad that surgical teams like yours are discussing surgical fires and are thinking of plausible ways to reduce to the risk. Kudos to your group for their safety concerns.

Jeff Feldman, MD
The Children's Hospital of Philadelphia
Philadelphia, PA

Charles Cowles, MD
The University of Texas MD Anderson Cancer Center
Houston, TX

Letter to the Editor

Novel Antibiotics and Anesthesia-Related Drug Interactions

To the Editor:

With the "rise" of super bugs and multi-drug resistant bacteria, our colleagues in infectious disease have had to resort to any number of strategies to treat patients infected with such organisms. One strategy involves multiple drug combinations including several different classes of antibiotics, many of which have independent, and often an additive, impact on QT interval prolongation, with all that entails. Another strategy has been to reach back into the historical archives and reintroduce antibiotics that were either very toxic, had a very limited clinical spectrum of activity, or just didn't work very well.

I would like to draw the anesthesia community's attention to one such drug. Colistin, otherwise known as Polymyxin E, is a drug seeing a resurgence in use against multi-drug-resistant Gram negative bacteria, in particular *Acinetobacter, E-coli, Klebsiella*, and *P. aeruginosa*. This drug, initially developed in the 1950s, was supplanted by the aminoglycosides because of the concern for significant nephrotoxicity and neurotoxicity associated with Polymyxin E.

Of particular concern to anesthesiologists is the neuromuscular blockade due to non-competitive blockade. This blockade is independent of that caused by our common clinical neuromuscular blocking agents, known to accentuate such blockade, and not reversed by neostigmine.

Recently I was made aware of a case where an individual receiving Colistin to treat a multi-drug-resistant *Acinetobacter* required surgery and intubation. Unaware of the implication of the antibiotic treatment, the anesthesiologist administered a small, 20-mg dose of rocuronium to facilitate intubation. This resulted in a very deep and prolonged period of neuromuscular blockade, requiring almost 24 hours before measurable evidence of spontaneous recovery of neuromuscular function, and 48 hours of ventilatory support. This patient had received surgical care prior to this without complication, and received surgical care subsequent to this episode without neuromuscular blockers and did well.

I believe it is imperative that members of the anesthesia community who care for patients receiving novel antibiotic drug combinations, particularly Colistin, be very aware of the implications of such therapy, and tailor our anesthetic techniques to account for the risks associated with such therapy.

Sincerely,
David Black, MD
Castro Valley, CA

Letter to the Editor

Veterinarian Has Similar Experience With Blocked Coaxial Circuit

To the Editor:

I am an affiliate member of the ASA. I am a veterinarian boarded in veterinary anesthesia and veterinary emergency and critical care. It was with interest that I read the letter to the editor in the Spring/Summer 2012 *APSF Newsletter* regarding the kinked inspiratory limb of the coaxial circuit. I had a similar experience with a case involving a coaxial system in a dog. I felt I had seen figure 4 before as it was eerily similar to figure 3 in my case report (*JAVMA* 2005; 227:1902-4). The system used in the dog also passed the pre-anesthesia pressure check and had been used on more than one patient prior to the discovery of the occlusion. This too was a partial occlusion that was not immediately apparent. The occlusion was detected in my case by the exaggerated abdominal efforts the dog made during spontaneous ventilation. Anesthesiologists share common anesthesia problems regardless of the species they are caring for.

I appreciate being an affiliate member of the ASA. It is an educational and worthwhile experience.

Jane Quandt, DVM, MS
College of Veterinary Medicine
University of Georgia,
Athens, GA

Dental Emergencies Associated With Anesthesia Practice

by Brian K. Singletary, DMD, MS

Editor's Note: *The following is a summary of recommendations regarding the management of dental injuries during the perioperative period.*

Preoperative Evaluation, Consent, and Consultation

Inform patient of potential trauma to natural and/or prosthetic teeth during anesthesia practice before providing anesthesia services. Obtain dentist consult whenever appropriate and possible prior to anesthesia to address dental disease and potential risk for patients with special dental issues (such as loose teeth due to periodontal disease, prosthetic teeth, active dental caries).

Have the patient remove all removable appliances from the mouth prior to anesthesia.

Tooth enamel chipped

1. Locate enamel fragment(s).
2. Place fragments in available isotonic solution (saline, milk, or patient's own saliva).
3. Contact dentist for evaluation and indicated treatment once patient is medically stable.

Tooth enamel-dentin fracture

1. Locate enamel-dentin fragment(s)
2. Place fragments in available isotonic solution (saline, milk, or patient's own saliva)
3. Contact dentist for evaluation and indicated treatment once patient is medically stable

Tooth enamel-dentin fracture with pulp exposure

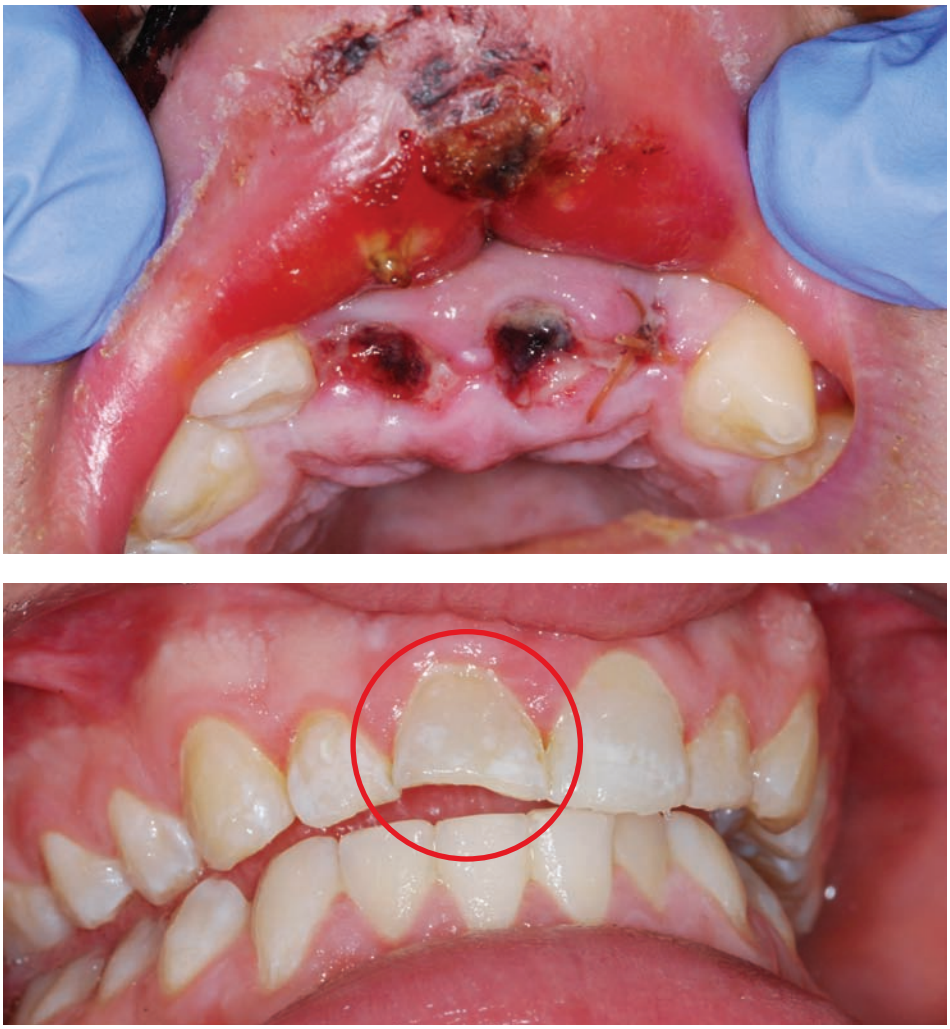
1. Locate enamel-dentin fragment(s).
2. Place in available isotonic solution (saline, milk, or patient's own saliva).
3. Apply digital pressure with saline-moistened gauze until bleeding stops.
4. Contact dentist for evaluation and indicated treatment once patient is medically stable.

Tooth crown-root fracture with pulp exposure

1. Locate crown-root fragment(s)
2. Place in available isotonic solution (saline, milk, or patient's own saliva)
3. If bleeding, apply digital pressure with saline-moistened gauze at the site until bleeding stops
4. Contact dentist for evaluation and indicated treatment once patient is medically stable

Tooth avulsion (tooth out of socket)

1. Time is of the essence
2. Locate tooth
3. If the patient's condition is such that the anesthesia provider concludes that replanting an avulsed tooth during or immediately after surgery creates a significant aspiration risk, do not replant the tooth. INSTEAD, place it in an available isotonic solution, and have patient seen by a qualified dentist as soon as the patient is medically stable. If the tooth cannot be replanted within 45 minutes (of the avulsion), the prognosis is quite poor.
4. Grasp the crown (white) portion using saline-moistened gauze. Do not touch the root portion. If visibly soiled, first rinse the root with saline, then replant the tooth in its socket immediately, pressing it into place with light digital pressure. If bleeding is present, address it by applying digital pressure with saline moistened gauze over the bleeding area after replanting the tooth.
5. Once active bleeding stops, contact dentist for evaluation and indicated treatment once patient is medically stable.



Top Panel, avulsed teeth from trauma and Bottom Panel, chipped tooth indicated inside red circle.

Tooth position change due to trauma from an instrument with or without fracture(s)

1. Grasp the crown (white) portion of the tooth using a saline-moistened gauze and attempt to reposition the tooth back to its original position.
2. Contact dentist for evaluation and indicated treatment once patient is medically stable.

NOTE: *If there is no dental service available to you at the time of a dental trauma event, place any teeth or tooth fragments in an isotonic solution (saline, milk, or the patient's own saliva) and send them with the patient to their private dentist or clinic as soon as the patient is medically stable.*

Brian K. Singletary, DMD, MS
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The Anesthesia Patient Safety Foundation (APSF) announces the availability of the 18-minute educational video:

Medication Safety in the Operating Room: Time for a New Paradigm

View the DVD on the APSF website (www.apsf.org)

Request a complimentary copy of the DVD on the APSF website (www.apsf.org)

In this issue:

Featured Article:

Hazards of Sedation for Pain Interventions

Also:

Communicating and Managing the Difficult Airway
Direct vs. Videolarnygoscopy: Prioritization in Training
Dental Emergencies Associated With Anesthesia Practice

Anesthesia Patient Safety Foundation

Board of Directors Workshop

When and How to Challenge the Hierarchy: Speaking Up for Patient Safety

Annual Meeting of the American Society of Anesthesiologists

Saturday, October 13, 2012 (1400-1600)

Convention Center, Washington, D.C.
Main Ballroom AB (3rd level)