**ETOMIDATE/MOBILE COMPUTING**

From the 68th Annual Postgraduate Assembly in Anesthesiology, presented by the New York State Society of Anesthesiologists

**Etomidate for Induction in the Hemodynamically Unstable Patient: Pro**

Avery Tung, MD, Professor of Anesthesia and Critical Care, Director of Critical Care Services, Burn Unit, and Quality Chief, Anesthesia and Critical Care, University of Chicago Medicine, Chicago, IL

**Hemodynamic stability with etomidate:** greater than that seen with propofol; early reports of use demonstrated no effect on pulse rate, slight decrease in blood pressure, and low frequency of apnea; early study of use in cardiac surgery demontrated greater margin of safety, compared with ultrashort-acting barbiturates, during induction of anesthesia; _study of use in hemodynamically unstable patients_ (1992) — compared etomidate to propofol in patients with aortic insufficiency or coronary artery disease (CAD); significant hypotention developed in 2 patients with CAD who received propofol; _study of patients with aortic stenosis_ (2007) — randomized controlled trial of 66 patients undergoing aortic valve replacement and receiving propofol or etomidate; found propofol twice as likely to evoke hypotension; propofol group showed greater decreases in blood pressure and need for phenylephrine (Neofrin, NeoSynephrine)

**Hypotension and mortality:** Monk and colleagues (2005) demonstrated that, when systolic blood pressure <80 mm Hg for 1 min, odds ratio for mortality 1.036 (P value 0.01 [statistically significant]), which translates into increase in mortality of 3.6%/min; propofol often chosen despite anticipated depression of blood pressure because phenylephrine can be given; however, delay of 2 min in raising blood pressure increases mortality by 7%; _surgical Apgar score_ — assessment of blood loss, blood pressure, and heart rate; low scores associated with increased mortality; reference standard 10; score of 3 or 4 associated with odds ratios of 10 for major complications and 115 for death; score of 2 (reflection of low blood pressure) associated with odds ratio for death of 315

**Troponin leak study:** prospective evaluation of 350 patients; multivariate analysis showed that risk for elevation of troponin increased with orthopedic surgery (odds ratio 2.46) or intraoperative hypotension (ie, systolic pressure <100 mm Hg; odds ratio 3.6); increasing duration of hypotension strongly predictive of myocardial necrosis

Carotid endarterectomy study: among 7600 elective procedures, need to treat hypotension associated with increased risk for myocardial infarction (odds ratio 3.3), stroke (odds ratio 2.8), and combination of death, myocardial infarction, or stroke (odds ratio 2.6)

**Educational Objectives**

The goal of this program is to improve patient outcomes by presenting data on the effects of etomidate, and through the appropriate clinical use of mobile computing devices. After hearing and assimilating this program, the clinician will be better able to:

1. Explain the physiologic consequences of etomidate.
2. Identify patients who may benefit from the use of etomidate.
3. Cite potential complications of administration of etomidate.
4. Choose a system for communicating electronically with colleagues and residents that is both efficient and compliant with privacy regulations.
5. Take advantage of mobile device apps that have the potential to enhance anesthetic care and clinical knowledge.

**Faculty Disclosure**

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and cerebrovascular complications, malabsorption of nutrients, and delayed convalescence (suppression of stress response considered one goal of anesthesia)

Conclusions: because of new standards for statistical significance, proof of effects of etomidate unlikely to be forthcoming; abundant data from emergency medicine suggest little effect on outcomes; surgical data mixed, and multiple confounding variables (eg, severity of disease, type of surgery, adrenal dysfunction due to sepsis) complicate conclusions; hemodynamic stability must be weighed against transient adrenal suppression

Etidamide for Induction in the Hemodynamically Unstable Patient: Con

Michael F. O’Connor, MD, Professor of Anesthesiology and Critical Care, and Chief, Section of Critical Care Medicine, University of Chicago Medicine, Chicago, IL

Studies comparing etidamie to other agents: all studies showing no difference in clinical outcomes underpowered (eg, N = 50-100); most studies cited compared etidamie to ketamine (drug not often used for induction of anesthesia); no studies available comparing etidamie to propofol, except in patients undergoing cardiac surgery (whose outcomes depend on factors other than induction agents)

Complications associated with etidamie: thrombophlebitis — incidence 7% to 80% (=7% when etidamie injected into antecubital vein, >80% when injected into small vein in hand); during period of propofol shortage (2010-2011), incidence of thrombophlebitis with administration of etidamie 24% to 30%; nausea and vomiting — incidence 30% to 40% (which explains limited use in cases for which timely discharge desired)

Harmful effects of etidamie: Ledingham et al reported 70% to 100% mortality associated with use of etidamie for sedation in critically ill trauma patients (attributed to adrenal suppression); inhibits almost all products of cortisol synthesis and results in only 3 products, pregnenolone, progesterone, and deoxycorticosterone; meta-analysis (Chan et al) — all studies demonstrated harm associated with etidamie; combined data show increased risk for mortality with etidamie; concluded that use as single-dose agent for induction in septic patients produced measurable deflection in 28-day mortality

Effects of etidamie vs those of other factors: triple low — defined as low bispectral index score, minimal alveolar concentration, and mean arterial blood pressure; increases 30-day mortality; occurs in only 6% of patients; quadruples 30-day mortality (from 0.8% to 3.2%); etidamie — Komatsu and colleagues demonstrated that use of etidamie for induction associated with 4% absolute increase in death, compared with propofol and other agents, despite its apparent beneficial effects on hemodynamics and weaker hypotensive effect; speaker concludes that avoidance of etidamie would have far greater influence on outcomes than addressing triple low; cyclooxygenase (COX)-2 inhibitors — increase risk for myocardial event or death from 100/1000 patient-yr to 160/1000 patient-yr, which translates to >0.3% increase in risk for death (ie, much smaller than 4% increase cited above with etidamie)

Conclusions: data suggest that etidamie should probably not be used as induction agent for patients with ASA classification 3 or 4 (exactly those patients believed by anesthesiologists to most benefit from its use); no randomized prospective trial demonstrates any benefit of etidamie, and several databases demonstrate association with excess mortality

Mobile Computing for the Anesthesiologist

Keith J. Ruskin, MD, Professor of Anesthesiology and Neurosurgery, Yale University School of Medicine, New Haven, CT

Communication: smartphones now used predominantly for purposes other than making calls; use of pagers found to delay critical decision making and have negative impact on patient care; study of paging (Epstein and colleagues) — studied latency period between time page initiated and time received for internal vs external networks, with cellular phone texting used as control; results showed that external networking unreliable, with 1% to 33% of pages taking >100 sec; some services guarantee delivery within 1 hr (unacceptable for anesthesiology practice); internal network had latency of only 8 sec; lack of confirmation that message received disadvantage of texting on cellular phones; internal system used by speaker allows confirmation that message delivered and read

Problems with text messaging: privacy — standard text messaging services not compliant with guidelines of Health Insurance Portability and Accounting Act (HIPAA) or Health Information Technology for Economic and Clinical Health (HITECH); therefore, texts sent should be generic and free of identifying information; HIPAA compliant text messaging systems — eg, TigerText, HipaaChat, miSecureMessages; users enter into business associate agreement which enables sharing of information with system provider; secure text messaging systems — eg, Silent Circle; used by journalists and security organizations; use encrypted text messaging and videoconferencing; technically not HIPAA-compliant because business associate agreement not required; when message sent through Silent Circle, encrypted “from end to end”; sender of message has control over status of message on receiver’s phone (eg, sender has ability to erase message from record on receiver’s phone)

Latency and reliability of networks: 3G — “old” technology that many cellular phones use as default if no other system available; speeds vary by carrier, but, on average, slower than cable modem; capacity usually 384,000 to 2 million bits/sec; good for text messaging and sending photographs; video resolution low for videoconferencing; for voice calls, cellular services mimic traditional circuit switch telephone systems; dedicates virtual channel within system; newer technologies — 4G; enhanced LTE (“LTE plus” even faster); not all telephones compatible with all systems; LTE much faster (6 times faster than home cable modem); LTE and 4G optimized for data (voice added as overlay), and excellent for videoconferencing

Wi-Fi in hospital: 80211N latest standard and most prevalent 80211AC: newest standard; theoretically allows transmission at speed of 1 gigabyte/sec (as fast as most wired networks); fewer people using it, so interference less likely; however, signal does not penetrate walls well, especially those of heavy plaster or metal (repeaters may be needed); “beam forming” technology — computes location of receiving device relative to access point and sends directional signal; however, if technology used in crowded area (ie, requiring formation of multiple beams), range and performance may be diminished; this disadvantage may limit use in hospitals; designed to stream multimedia to television, computer, and smartphone simultaneously

Use of high-speed data streaming: group in Japan using Face-Time for telemedicine; link created between teaching hospital and tiny hospital on remote island; study of still ultrasonographic images sent with images of atomic clock to determine latency of signal; 15 to 30 frames received per second (approximate quality of television); signal had half-second delay; “beam forming” technology — computes location of receiving device relative to access point and sends directional signal; however, if technology used in crowded area (ie, requiring formation of multiple beams), range and performance may be diminished; this disadvantage may limit use in hospitals; designed to stream multimedia to television, computer, and smartphone simultaneously

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oximetry not available); smartphone bronchoscopy — success rate and time to intubation analyzed in study of 63 anesthesia providers performing intubation on manikins using standard video bronchoscopy (eg, GlideScope), regular bronchoscopy, or bronchoscopy using smartphone as video display; smartphone bronchoscopy associated with slightly longer time to intubation and slightly higher failure rate, but considered acceptable substitute if video laryngoscopy not available

Use of cellular phone in operating room (OR): anesthesiologist will be asked for explanation of phone use in OR if complication occurs; distraction in OR — study of use of web browsers showed providers spend significant amount of time away from record, but no impact on patient care observed

Suggested Reading


Acknowledgments

Dr. Tung, Dr. O’Connor, and Dr. Ruskin spoke at the 68th Annual Postgraduate Assembly in Anesthesiology, held December 12-16, 2014, in New York, NY, and presented by the New York State Society of Anesthesiologists. For information on upcoming CME offerings from the New York State Society of Anesthesiologists, please visit nyssa-pga.org, or visit our website, Audio-Digest.org, and click on “Upcoming Meetings.” The Audio Digest Foundation thanks the speakers and the sponsors for their cooperation in the production of this program.

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Review Educational Objectives on page 1 5 minutes
Take pretest 10 minutes
Listen to audio program 60 minutes
Review written summary and suggested readings 35 minutes
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1. A randomized controlled trial of 66 patients with aortic stenosis who were undergoing aortic valve replacement found that, compared with etomidate, propofol was _______ as likely as etomidate to evoke hypotension.
   (A) Half  (B) Equally  (C) 1.5 times  (D) Twice  **

2. According to a study by Monk and colleagues, a 3-min delay in raising systolic blood pressure that has dropped below 80 mm Hg increases mortality by:
   (A) 10.8%  (B) 7.2%  (C) 3.6%  (D) 1.036%  **

3. Multivariate analysis of a prospective study of 350 patients found that the risk for elevation of troponin associated with intraoperative hypotension is:
   (A) Negligible  (B) Greater than that associated with orthopedic surgery  
   (C) Less than that associated with orthopedic surgery  (D) Equal to that associated with orthopedic surgery

4. A blinded study that compared etomidate to midazolam for endotracheal intubation showed which of the following outcomes with etomidate?
   (A) Longer lengths of hospital stay  (B) Greater number of days on mechanical ventilation  
   (C) Longer lengths of stay in the intensive care unit  (D) None of the above  **

5. Studies comparing etomidate to propofol for induction have been performed in patients undergoing which of the following procedures?
   1. Cardiac surgery  
   2. Orthopedic surgery  
   3. Gastrointestinal surgery  
   4. Neurosurgery
   (A) 1  (B) 1,3  (C) 2,3,4  (D) 1,4

6. The incidence of thrombophlebitis when etomidate is administered via a small vein in the hand is:
   (A) 20%  (B) 40%  (C) 60%  (D) 80%  **

7. The incidence of nausea and vomiting associated with the use of etomidate is which of the following?
   (A) 5%  (B) 10%  (C) 20%  (D) 40%  **

8. The study by Ledingham et al in critically ill trauma patients found a significant increase in mortality with the use of etomidate, which was attributed to:
   (A) Increased risk for myocardial infarction  (B) Hypotension  
   (C) Adrenal suppression  (D) High prevalence of renal insufficiency

9. The Health Insurance Portability and Accounting Act (HIPAA) requires which of the following for electronic messaging?
   1. Short latency times  
   2. Absence of identifying information in standard text messages  
   3. A business associate agreement between users and providers of secure systems  
   4. Use of enhanced LTE (or better) technology
   (A) 1,3,4  (B) 2,3  (C) 1,2,4  (D) 3,4

10. A high-speed data streaming application (FaceTime) was found to be capable of all the following, except:
   (A) Enabling remote diagnosis  (B) Facilitating performance of real-time procedures  
   (C) Providing instruction  (D) Transmitting 15 to 30 frames per second

Answers to Audio Digest Anesthesiology Volume 57, Issue 11: 1-B, 2-D, 3-C, 4-D, 5-B, 6-D, 7-C, 8-A, 9-B, 10-B

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