**Educational Objectives**

The goal of this program is to improve patient recovery and the management of postoperative pain. After hearing and assimilating this program, the clinician will be better able to:

1. Implement strategies shown to speed patient recovery and increase comfort throughout the postoperative period.
2. Introduce adjunctive analgesic drugs that reduce reliance on opioids.
3. Consider therapies shown to reduce the duration of postoperative ileus.
4. Reduce postoperative pain in the patient with high opioid tolerance.

5. Cite evidence on the association between opiates and postoperative hyperalgesia.

**Faculty Disclosure**

In adherence to ACCME Standards of Commercial Support, Audio-Digest requires all faculty and members of the planning committee to disclose relevant financial relationships within the past 12 months that might create any personal conflicts of interest. Any identified conflicts were resolved to ensure that this educational activity promotes quality in health care and not a proprietary business or commercial interest. For this program, Dr. Viscomi and the planning committee reported nothing to disclose. In his lecture, Dr. Viscomi presents information that is related to the off-label or investigational use of a therapy, product, or device.
Unknowns: 1) whether benefits specific to esmolol, or whether other β1-blockers (eg, metoprolol, which might extend duration) or noncardioselective β-blockers would have similar effect (metabolites of esmolol may contribute analgesic properties); 2) whether analgesia result of direct action of drug or β-blockade (drugs that block central nervous system [eg, clonidine, dexamethomidine, esmolol, lidocaine] broadly analgesic); 3) optimal dose and infusion rate

Lidocaine: perioperative use successful in major abdominal surgery; general protocol—1 to 1.5 mg/kg bolus, with 2 to 3 mg/min infusion ending in operating room or early in recovery; US black box warning requires continuous electrocardiographic monitoring during administration; no black box warning in European Union (infusions continued for 24 hr postoperatively); in addition to better pain control with decreased opioid side effects, greatest advantage faster recovery from ileus; bowel recovery occurs ≈1 day faster; also associated with 1 day decrease in total length of stay; has analgesic and anti-inflammatory properties; benefit greatest for cases in which recovery from ileus critical limiting factor in patient length of stay (eg, after colectomy); studies show benefit in outpatient setting, with decreased pain through first 24 hr postoperatively, less opioid consumption, faster discharge, decreased PONV, and improved quality scores (for, eg, physical comfort, physical independence, emotional state, isolated pain)

Ketamine: beneficial for opioid-tolerant patients, and improves postoperative management during first days after surgery; studies show mixed results on level of benefit, but none show harm; associated with globally decreased opiate requirements and side effects and reduction of opioid-induced hyperalgesia; opioid-tolerant patients—limited data available; one randomized controlled study found intraoperative ketamine decreased immediate postoperative opioid requirements, with 26% lower pain scores and 71% less opiate use 6 wk after surgery; additional data show improved resting pain scores 6 mo after total hip arthroplasty; pretreatment with ketamine—shown to attenuate or ablate opioid-induced hyperalgesia

Clinical use of ketamine: speaker administers if opioids used during surgical case, with doses and infusions increased for patients with high opioid tolerance; majority of monitored anesthesia care cases receive combined propofol and ketamine infusions if pain expected during procedure; opioid-tolerant patients on acute pain service receive 5 to 10 mg/hr ketamine infusion (may continue for weeks)

Steroids: dexamethasone potent steroid with no mineralocorticoid effects; decreases PONV when given before induction (efficacy decreased if given later during operation); increases blood glucose after surgery, with maximal effect 8 to 17 hr postoperatively; data show no correlation of single dose with postoperative wound infection; decreases pain scores and PONV for ≥24 hr after surgery; administer preinduction for pain and PONV; women report altered perineal sensations (burning and warmth), and benefit from midazolam or ketamine before administration of dexamethasone; optimal dose 0.1 to 0.2 mg/kg (speaker administers 8 mg for normal-size patients; 4-mg dose has antiemetic effect but no analgesic efficacy)

Intraoperative opioids: bolus dose of fentanyl before intubation attenuates hypertension and tachycardia; “opioid cardiac anesthesia” standard practice in 1980s; fentanyl commonly used intraoperatively for treatment of elevated blood pressure and heart rate attributed to pain; speaker raises question of whether physical response to pain (sensory and emotional experience) possible in unconscious patient (represents autonomic response to surgical stimulation); although fentanyl normalizes vital signs, it may not benefit patient in long term

Studies: high- vs low-dose fentanyl—patients who received high-dose fentanyl during surgery consistently required higher dose of opioids postoperatively (with higher reported pain scores) than patients who received low-dose fentanyl; severe pain in postanesthesia care unit (PACU)—study shows direct correlation between amount of intraoperative sufentanil and chance of uncontrolled pain; esmolol study (revisited)—fentanyl group consumed 250% more opioids than esmolol group; speaker’s conclusions—patients emerging from narcotic anesthesia generally appear comfortable and report little pain (conventionally desired outcome); however, anesthesiologist has limited perception of hyperalgesia during postoperative period (1-4 days later)

Spinal fentanyl: also associated with hyperalgesia, but benefits outweigh risks (lowers required local anesthetic dose and reduces associated hypotension, but associated with increased postoperative pain experience); British study—patients receiving spinal fentanyl reported increased pain beginning ≈3 hr after surgery and consumed >50% more morphine per hour, compared to patients who had spinal infusion of saline; Stanford study—lowest pain scores reported in patients who received no spinal fentanyl for cesarean delivery

Clinical use of opioids: opioid analgesics increasingly becoming rescue analgesics, which places PACU nurses in pivotal role of deciding when initiation of opioid therapy warranted; speaker’s approach—for minor procedures (eg, breast biopsy, arthroscopic knee surgery) for which opioids possibly unnecessary, speaker uses nonopioid adjuvants, and counsels patients on risks and side
effects of opioids (creates motivation to remain opioid free); for major procedures (eg, exploratory laparotomy), long-acting opiates (eg, hydromorphone, morphine) administered at emergence only; hyperalgesia greatest with short-acting, lipophilic opiates (eg, fentanyl, sufentanil, remifentanil); all opioids, with exception of methadone, cause hyperalgesia in ≈33% of patients (possibly because methadone simultaneously binds NMDA receptors)

Suggested Reading

Acknowledgements
Dr. Viscomi was recorded at the 18th Annual Vermont Perspectives in Anesthesia, held March 6-10, 2013, in Stowe, VT, and sponsored by the University of Vermont College of Medicine. For information on upcoming meetings sponsored by the University of Vermont College of Medicine, please visit cme.uvm.edu, or check our website, Audio-Digest.org, under “Upcoming Meetings.” The Audio-Digest Foundation thanks Dr. Viscomi and the University of Vermont College of Medicine for their cooperation in the production of this program.

Additional drugs: gabapentinoids — not effective in caesarian delivery; reduce opioid consumption by ≈33%, but cause drowsiness and loss of coordination for 12 to 24 hr; IV acetaminophen — administer before emergence or in PACU; nonsteroidal anti-inflammatory drugs — also worthy of consideration

Conclusions: extend interpretation of recovery to beyond PACU; use of knowledge and techniques brings value to hospital by reducing length of stay
POSTOPERATIVE ANALGESIA: ELEMENTS OF SUCCESSFUL RECOVERY

To test online, go to www.audiodigest.org and sign in to online services.
To submit a test form by mail or fax, complete Pretest section before listening and Posttest section after listening.

1. Which of the following statements about \( \alpha \)-agonists is true?
   (A) Synergistic activity with opiates improves pain control  
   (B) Postoperative analgesia continues after serum levels are undetectable  
   (C) Associated with increased mean alveolar concentration  
   (D) Tachycardia is a common side effect

2. Which of the following is a characteristic of magnesium sulfate?
   (A) Associated with increased postoperative nausea and vomiting (PONV)  
   (B) Has no effect on tachycardia associated with intubation  
   (C) Should be used with caution in patients who have renal impairment  
   (D) Requires increased doses of muscle relaxants

3. Benefits of esmolol include all the following, except:
   (A) Faster time to discharge  
   (B) Faster emergence from anesthesia  
   (C) Decreased PONV  
   (D) Decreased requirements for postoperative analgesia

4. The black box warning on lidocaine requires:
   (A) Continuous electrocardiographic monitoring during administration  
   (B) Limiting infusions to 2 hr  
   (C) Neurologic assessment every 2 hr during infusion  
   (D) Continuous pulse oximetry during infusion

5. Which of the following agents is associated with reduced duration of postoperative ileus?
   (A) Dexmedetomidine  
   (B) Esmolol  
   (C) Lidocaine  
   (D) Ketamine

   (A) True  
   (B) False

7. Data show that patients who receive intraoperative ketamine have improved resting pain scores 6 mo after total hip arthroplasty.
   (A) True  
   (B) False

8. Which of the following side effects is associated with a perioperative dose of dexamethasone?
   (A) Increased incidence of wound infection  
   (B) Hypoglycemia  
   (C) Sedation  
   (D) Altered perineal sensations in female patients

9. Hyperalgesia is greatest with _______ and _______ opiates.
   (A) Short-acting; lipophilic  
   (B) Short-acting; hydrophilic  
   (C) Long-acting; lipophilic  
   (D) Long-acting; hydrophilic

10. Which of the following opiates does not cause hyperalgesia?
    (A) Morphine  
    (B) Fentanyl  
    (C) Hydromorphone  
    (D) Methadone

Answers to Audio-Digest Anesthesiology Volume 55, Issue 23: 1-A, 2-B, 3-D, 4-C, 5-A, 6-C, 7-A, 8-C, 9-D, 10-B