

Rational Opioid Use

Basic Opioid Pharmacology

- Analgesia produced by mu (μ) opioid receptor agonism in the brain (periaqueductal gray matter) and spinal cord (substantia gelatinosa).
- Well-known side effect profile:
 - Sedation, respiratory depression
 - Itching, nausea, ileus, urinary retention
 - Bradycardia, hypotension
 - Miosis, chest wall rigidity
- Opioids are hemodynamically stable when given alone, but cause \downarrow CO, SV, and BP in combination with other anesthetics.
- Reduces MAC of volatile anesthetics.

Opioids

Morphine

- Slow peak time (~80% effect at 15 minutes, but peak analgesic effect is at ~90 minutes).
- Active metabolite, morphine-6-glucuronide, has analgesic properties and is renally excreted (not clinically relevant unless patient has renal failure)
- Can cause histamine release.

Hydromorphone (Dilaudid)

- “A rapid onset morphine.” Peak effect in 5-10 minutes.
- About 8-fold more potent than morphine (i.e. 1 mg Dilaudid = 8 mg morphine)
- No active metabolites, no histamine release.
- Good choice for postop analgesia and PCA.

Opioids

Fentanyl

- Fast onset & short duration of action (peak effect at 3-5 minutes; effect site half-life ~30 minutes).
- ~100-fold more potent than morphine.
- Very cheap.

Sufentanil

- Fast onset, but slightly slower than fentanyl
- 10-fold more potent than fentanyl (i.e. 5 mcg sufentanil = 50 mcg fentanyl).
- More rapid recovery than fentanyl.

Opioids

Alfentanil

- Fastest onset time of all opioids (~90 seconds); pKa = 6.5, so it crosses the blood-brain barrier rapidly.
- Also causes more N/V, chest wall rigidity, and respiratory depression.
- Brief duration of action due to redistribution.

Remifentanil

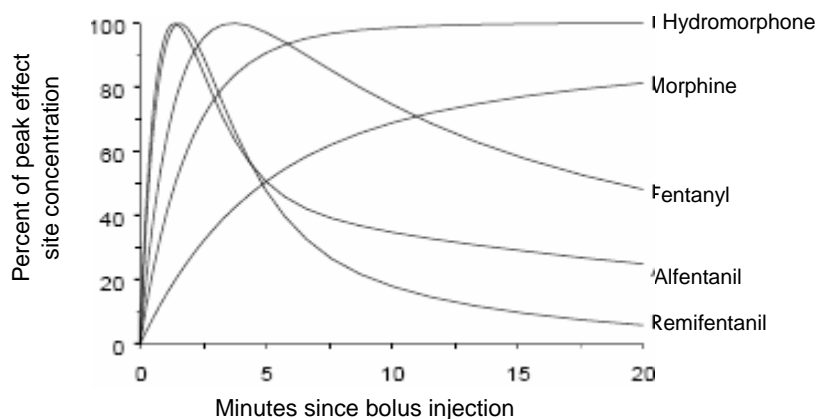
- Peak effect time ~90 seconds
- Unique pharmacokinetics - metabolized by plasma esterases.
- Short context-sensitive half-time after termination of infusion with predictable offset in ~5-10 minutes.

Opioids

Meperidine (Demerol)

- Originally discovered as a local anesthetic (“pethidine”)
- Peak effect in 15 minutes, lasts 2-4 hours.
- Active metabolite (normeperidine) lowers the seizure threshold; renally excreted.
- Useful for treating shivering.
- Anticholinergic side effects: tachycardia
- Avoid using with MAOIs; can cause CNS excitation (agitation, hyperpyrexia, rigidity) and/or CNS depression (hypotension, hypoventilation, coma)
- Causes histamine release.
- Has a euphoric effect with less respiratory depression than other opioids.

Comparison of Peak Effect Times



Rational Opioid Use

Note: All anesthesiologists (attending & residents alike) have different theories and opinions on the optimal choice and dose of opioids in different situations. The strategies presented here are simply suggestions, something to get you thinking rationally about how and when you use opioids for analgesia. Discuss the merits of these strategies with your attending before or during each case, but do not take these suggestions as firm guidelines for how all anesthetics should be done!

With that disclaimer in mind, continue reading...

Strategies for Opioid Use

- For a standard GETA induction, use fentanyl to blunt the stimulation caused by DL and intubation.
- For brief, intense stimulation (e.g. retrobulbar block, Mayfield head pins, rigid bronchoscopy), consider a bolus of short-acting opioid like remifentanyl or alfentanil.
- For intraop analgesia:
 - Fentanyl is rapidly titratable, but requires frequent redosing; it may be more “forgiving” if overdosed.
 - Morphine has a long onset time to peak effect, but gives prolonged analgesia during the case and into the postop period.
 - Hydromorphone is rapidly titratable (like fentanyl) with prolonged analgesia (like morphine).

Strategies for Opioid Use

- For ENT cases, consider an opioid infusion (e.g. remifentanyl, alfentanil, sufentanyl, or fentanyl):
 - Stable level of analgesia
 - Induced hypotension
 - “Narcotic wakeup” reduces bucking on ETT
 - Smooth transition to postop analgesia
- For chronic opioid users (e.g. methadone, MS Contin, OxyContin, etc.), continue the patient’s chronic opioid dose intraop PLUS expect higher opioid requirements for their acute pain.
- Use morphine and meperidine cautiously in renal patients (renal excretion of active metabolites)!

Strategies for Opioid Use

- Meperidine is usually reserved for treatment/prevention of postoperative shivering.
- For postop pain control (i.e. PACU):
 - Consider fentanyl (rapid onset, easily titratable, cheap, and the nurses are familiar with its use).
 - Consider hydromorphone (rapid onset, easily titratable, prolonged effect, nurses are familiar with its use, and it is a good transition to PCA).
 - If surgery is ambulatory and/or patient is tolerating POs, give Vicodin.

References

- Fukuda K. Intravenous opioid anesthetics. In Miller RD (ed), *Miller’s Anesthesia, 6th ed.* Philadelphia: Elsevier Churchill Livingstone, 2005.
- Gustein HB and Akil H. Opioid analgesics. In Hardmann JG, Limbird LE, and Goodman Gilman A (eds), *Goodman & Gilman’s The Pharmacological Basis of Therapeutics, 10th ed.* New York: McGraw-Hill, 2001.
- Saidman L and Shafer S. 2005. “Rational Use of Opioids: Intraoperative and Postoperative,” presented at Stanford University Department of Anesthesia Grand Rounds, July 18, 2005.