

[Episode 126: Key Words with Gillian Isaac Part 2: Ketamine and Laryngospasm](#)

On this episode: Dr. Jed Wolpaw and Dr Gillian Isaac

In this 126th episode I welcome back Dr. Gillian Isaac to discuss 2 more ABA key words: Ketamine and Laryngospasm.

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Ketamine: mechanism of action

- Dose dependent CNS depression → dissociative anesthetic state characterized by profound analgesia** and amnesia
 - o Low dose = adjunct
 - o high dose = dissociative
- Context-sensitive half-time
- NMDA receptor antagonist
- “Which induction drug exerts main CNS action as NMDA antagonist?”
 - o Nitrous oxide, magnesium, and methadone does as well, but not induction agents
- Proposed mechanism of dissociation = inhibit thalamocortical pathway and stimulation of limbic system

Ketamine: pharmacodynamics

- P450 system: nor-ketamine metabolite has one third to one fifth potency, which is excreted by kidney

Ketamine: side effects

- Psychomimetic reactions: hallucinations, nightmares, changes in short term memory / cognition
- Dose dependent
- Mitigated by other drugs like midazolam or propofol
- “Incidence of unpleasant dreams associated with ketamine can be reduced with:”
 - o A) caffeine; b) droperidol; c) physostigmine; d) **midazolam**”
- “Emergence delirium occurs most often with:”
 - o A) **sevoflurane**; b) des; c) ketamine; d) propofol” particularly in children

Ketamine: systemic effects

- CNS
 - o Contraindicated in pts with elevated ICP because ↑ CMRO₂, cerebral blood flow, ICP
 - o Controversial, but assume still contraindicated
- Resp
 - o Bronchodilatory (helpful in active bronchospasm, emergence)
 - o Minimal respiratory depression
- Cardiovascular
 - o Hypertension, tachycardia via catecholamine release
 - o In catecholamine-deplete state, uncovers intrinsic myocardial depression effect → hypotension
- “Ketamine decreases:”
 - o A) bronchomotor tone; b) intracranial pressure; c) IOP; d) salivation; e) seizure threshold
 - o Seizure threshold is controversial . a is correct
- “Which of the following is most likely effect of IM ketamine used for induction on 2yo child undergoing elective surgery?”
 - o A) bronchoconstriction; b) ↓ HR; c) ↓ ICP; d) ↑ **salivation**; e) respiratory depression
- “Each of the following will alter slope of CO₂ ventilator response curve except?”
 - o A) hypoxemia; fentanyl; N₂O; **Ketamine**”
- “Respiratory depression is least after induction dose of which of the following drug?”
 - o Etomidate, **ketamine**, fentanyl, propofol”

- “Ketamine:”
 - o ↓ CBF; augment CO₂ responsiveness of cerebral vasculature; reduce CMRO₂; ↑ Cerebral blood volume” (D) because ↑ cerebral blood flow

Ketamine: common indications

- Common:
 - o OB – In setting of neuraxial technique not working and not want to complicate difficult airway
 - o Peds – premed
 - o Bronchospasm
 - o Cardiac tamponade
 - o Awake intubations
- Contraindications
 - o Coronary artery disease because ↑ myocardial oxygen demand
 - o Seriously ill patients with depleted catecholamines
 - o Relative in hypertensive, tachycardic
 - o Elevated intracranial pressure
- “32 yo parturient w spinal fusion, severe asthma, and BP 180/110 brought to OR wheezing. Brought in for emergent c-section for prolapsed cord. Which of following agents most appropriate for induction?”
 - o A) sevoflurane; b) midazolam; c) ketamine; d) propofol
 - o Fusion → neuraxial off the table
 - o Good for bronchospasm but not for hypertensive
 - o Midazolam not typically used..
 - o Sevo not typically used for awake inhaled induction in adults, don’t want to prolong induction for aspiration risk.
 - o Propofol brings down BP and has some bronchodilatory properties
- “38 yo primiparous patient w placenta previa and active vaginal bleed with systolic 85. C-section planned. Patient is light headed and scared. Which induction agent most appropriate?”
 - o A) spinal w 12-15mg bupivacaine; b) GA w 2 mg/kg propofol and paralysis w succinylcholine (sux); c) GA w 1mg/kg ketamine w paralysis w sux; d) replace lost blood vol first then use any that patient wishes
 - o Hypotensive, active bleed. Emergency so can’t wait around (d);
 - o Spinal → risk of dropping pressure
 - o Propofol maybe appropriate if with pressors but not option
- “Parturient receives ketamine for induction of GA prior to c/s w sux. Which of following most likely present in new born?”
 - o A) normal muscle tone; b) brady; c) opisthotonos; d) resp depression; e) seizures
 - o Sampling cords – of newborn –ketamine shows up in minutes but doesn’t affect muscle tone (unlike sux)
 - o What does **not** cross placenta: paralytics, glycopyrrolate, insulin, heparin
- Quick recap: MOA on NMDA; organ effects, indication/contra

Laryngospasm

- Prevalent in children
- 23% of all critical postop respiratory events in adults due to laryngospasm
- Triggers: light anesthesia, irritants (saliva, blood, mucus, vomit), pain anywhere, pelvic or abdominal stimulation.
- Most common by experience: LMA when ‘not deep enough’

Laryngospasm: cause

- Contraction of lateral cricoarytenoids, thyroarytenoids, cricothyroid muscles
- True and false vocal cords

Laryngospasm: management

- Immediate removal of offending agent if known
- Positive pressure with 100% o₂
- Deepen sedation
- Paralytic

Laryngospasm: complications

- Negative pressure edema
- Negative intrathoracic pressures transmitted to alveoli, unable to expand due to more proximal obstruction → fluid entrained from pulm cap bed
- Treatment: like other non-cardiogenic pulmonary edema

Laryngospasm: prevention

- Deep extubation
- Wait until fully awake
- Qs:
- “↓ lung compliance and hypoxemia after 30 min ep of laryngospasm following extubation. What is most likely cause?” Negative pulmonary pressure edema or “interstitial hydrostatic pressure”
 - o Allergic reaction to anesthetic; altered alveolar cap membrane permeability; anesthetic induced lymphatic dysfunction; increased pulm cap pressure
- “28yo w severe laryngospasm after extubation of trachea after GA. Admin 100% o₂ with continuous CPAP doesn't improve. Now sat 75%. Which following is most appropriate immediate management?”
 - o First step done but desatting. What would you pick b/w deepen and paralytic??
 - o Laryngeal mask airway = just like CPAP = wrong
 - o Lidocaine won't help this scenario, same w racemic epi
 - o Sux – yes. Cricothyrotomy ([last podcast](#) – distracting!)
- “Child has tachypnea immediately after reintubation for intractable laryngospasm. Sat 78% at FiO₂ 1.0. CXR 15 min later most likely to show?”
 - o A) b/l pleural effusions (more like cardiac process, no). B) diffuse homogenous pulm infiltrates; c) patchy central infiltrates of upper lobe (aspiration); d) pneumothorax; e) segmental atelectasis at both lung bases (not likely to have extreme effect if just bases)
- “30 yo woman thyroidectomy w GETA. Has laryngospasm which resolves after 60s of CPAP via face mask. In PACU, develops tachypnea, hypoxia, rales...”
 - o A) gastric acid aspiration (possible). B) MI; c) pulm edema; d) PE; e) vocal cord paralysis?
 - o Bc brief (60 seconds) and fighting, probably pulm edema.
- “After tracheal extubation, healthy 31yo has 30 s of laryngospasm w marked intercostal retractions < corrected w CPAP via mask. Now has dyspnea and tachypnea. Xr shows diffuse b/l pulm edema. Most likely cause is increased...”
 - o A) airway reactivity; b) interpleural pressure; c) left ventricular afterload; d) RV preload; e) transpulmonary vascular pressure.

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- (E) makes most sense. marked intercostal retraction indicates intense neg pulm pressure. Seen on CXR. Q is asking what is process. As described – it's neg transpulmonary airway pressure
 - **High yield:** algorithm for treatment, and pathophysiology. These stems of young healthy strong common
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Notes by [Brian H Park, MD](#)