Emerging Trends in Procedural Sedation

Krista Preisberga, MD
Assistant Professor of Pediatrics
Baylor College of Medicine
Texas Children's Hospital
Department of Hospital Medicine and Anesthesia

Disclosure of Information

We have no relevant financial relationships with the manufacturer(s) of any commercial product(s) and/or provider of commercial services discussed in this CME activity.

We will be discussing the off label use of Dexmedetomidine for use in pediatric sedation in my presentation.

Goal: Explore and expand the scope of sedation procedures and patient selection.

Objectives

- Review the state of current research on neurotoxicity of sedatives and anesthetics
- Formulate a plan for sedation based on type of procedure
- Choose the appropriate patient group for hospitalist based sedation
- Review the presentation of common adverse events encountered in sedated patients

Neurotoxicity questions?

•Is it ok to sedate a small child for an elective procedure? How young is too young?

•How many IQ points is this going to cost?

•Is it better to have one long sedation event versus several brief ones?

•Are there any safe agents?

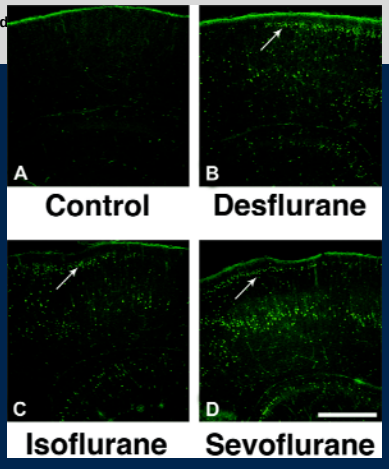
What we DO know

- Neurotoxicity is thought to occur via the action on the N-methyl-D-aspartate (NMDA) and gamma Aminobutyric acid (GABA) receptors (animals).

- Several groups have demonstrated significant increase in neuroapoptosis after exposure to anesthetic agents. (animals, includes primates)

From: Comparison of the Neuroapoptotic Properties of Equipotent Anesthetic Concentrations of Desflurane, Isoflurane, or Sevoflurane in Neonatal Mice

Anesthesiology. 2011;114(3):578-587. d



What we DO know

- PANDA (Pediatric Anesthesia Neurodevelopment Assessment) assessing the neurodevelopmental effects of a single anesthetic exposure for inguinal hernia surgery at less than 36 months of age. These patients returned at age 8 to 15 years for a battery of neuropsychological tests assessing multiple domains. The control group was an age-matched sibling who did not have anesthesia exposure, to minimize genetic and socioeconomic effects.

- The main finding is that there was **no difference in the primary outcome, global cognitive function as measured by IQ testing**. There were also no differences among essentially all the secondary outcomes. The major limitation of the study is that 90% of exposed patients were male vs. 56% of unexposed siblings.

What we DO know

- Dexmedetomidine acts as an alpha 2 agonist in the locus coeruleus.

- Dexmedetomidine does not cause neurotoxicity in in animal models.

- It exhibits neuroprotective effects and attenuates the neuronal apoptosis seen with other agents in vitro.

What we don't know

Case #1

- John Cash is a one year old boy who has a history of small VSD and mild sensineuronal hearing loss who is presenting today for screening MRI. He snores sometimes, but no pauses in breathing. He has no allergies and takes no medications.
- Would you sedate this patient?
- If yes, what would be your drug of choice?

Balancing act… assessing the risk

- *Respiratory event*
- *Greater depth of sedation*
- *Rule violation or insufficient education/skill of the practitioner*
- *Not associated with either a specific sedative drug or route of administration*

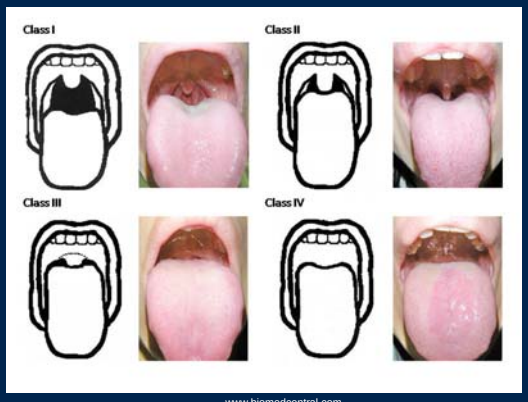
ASA class	Description	Examples
I	Normal, healthy patient	
II	Patient with mild systemic disease	Controlled asthma Controlled seizures Anemia Mild obesity Age < 1 year
III	Patient with severe systemic disease	Poorly controlled asthma Poorly controlled seizures Moderate obesity
IV	Patients with severe systemic disease that is a constant threat to life	
V	Moribund patients who are not expected to survive without the operation	
VI	A declared brain-dead patient who organs are being removed for donor purposes	

Levels of sedation

Factor	Minimal sedation	Moderate sedation	Deep sedation	General anesthesia
Consciousness	Relaxed, awake, +/- impaired cognition	Sleepy, drowsy	Asleep	Unconscious
Responsiveness	Verbally responsive to tactile stimuli	Verbally awakens, purposeful movement to stimuli, may be amnestic	Verbally unresponsive, responsive to deep stimuli	Unresponsive
Airway	Unaffected	Patent	+/- impaired	Impaired
Ventilation	Unaffected	Adequate	Inadequate, O_2 supplement	Impaired
Cardiovascular	Unaffected	Stable	Stable	+/- Impaired

Physical exam

- Vital signs
- Habitus
- Airway evaluation
  - Head and neck
  - Mouth/teeth
  - Jaw
  - Mallampati classification
- Lungs
- Heart
- Neurologic status



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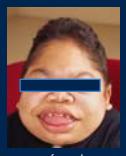
Potential difficult airway…

- Macroglossia
  - Trisomy 21
  - Mucopolysaccharidosis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- Mandibular hypoplasia
  - Pierre-Robin syndrome
  - Crouzon disease
  - Goldenhar syndrome
  - Treacher-Collins


stjoeslitreview.blogspot.com

- Limited atlanto-occipital motion
  - Goldenhar syndrome
  - Klippel-Feil syndrome
  - JIA
  - Scoliosis


chyntiayuliza.blogspot.com

- Unstable atlanto-occipital motion
  - Trisomy 21


wiusd.org

- External/internal compression
  - Hemangiomas
  - Tumors
  - Abscesses
  - Vascular rings
  - Cysts


archderm.jamanetwork.com

- Tonsillar and adenoid hypertrophy
- Obesity
- Facial trauma


intelligentdental.com

Case #2

- Sue Damonas is an 18 month old girl with Down's syndrome who presents today for Auditory Brainstem Response test. She has small VSD but otherwise no medical problems at this time. She does not snore and has not had any recent MRIs. Mom states it is hard to place an IV in her. What options would you have for this test?

Case #3

- You receive a request to sedate a 2 year old patient for a bedside ECHO. She is here with typical Kawasaki disease and is irritable and will not cooperate with the test. She has received IVIG once but still not back to baseline.

- What would you choose in this situation?

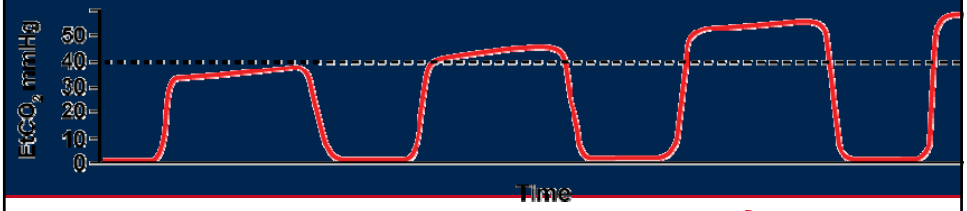
Case #4

- Belle is a 10 year old with history of VUR who is here for yet another VCUG. She has previously been traumatized by the catheter placement and will not take oral Versed because it tastes aweful. She also will not let you put in an IV catheter.

- What other choices do you have?

Case #5

•Berry Flash is a 6 year old boy with cryptogenic localization related epilepsy who presents for MRI brain. He is currently on three different antiepileptic medications and has complex partial seizures once every two – three weeks. He is sedated with propofol with induction dose of 2 mg/kg and now an infusion of 150 mcg/kg/min. You notice the following pattern on the capnography:



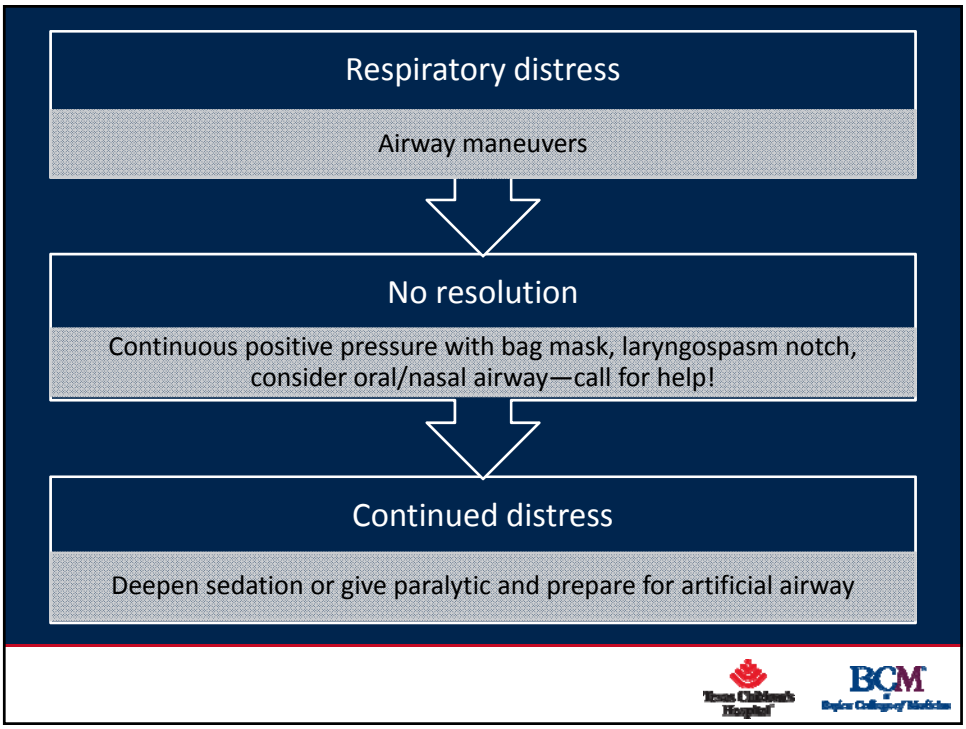
Case #6

•Tony Stark is a 8 year male with idopathic abdominal pain who is undergoing a diagnostic endoscopy. He was slightly congested prior to the procedure, but parents state he has allergies and he is always “stuffed up”. There are no other co morbidities and no allergies to medication.

•Induction with propofol 2 mg/kg and fentanyl 1 mcg/kg with infusion of propofol started at 150 mgc/kg/min. At the insertion of the scope patient starts coughing and there is abrupt rise in HR.

- Saturations are normal, you administer additional 1 mg/kg of propofol but heart rate continues to rise and you note loss of end tidal CO2 reading followed by rapid decline in saturations to 80s.

- What just happened?

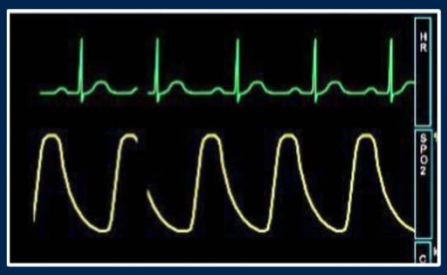


Case #7

- Cinder Ella is a 15 year old girl who presents for schedule endoscopy and colonoscopy for Crohn's surveillance. The disease is under control with Remicade infusions and she clinically doing well. She is an athletic girl. BMI is at 15th percentile.

- You start the case with infusion of Precedex 60 mcg (1 mcg/kg over 5 minutes) followed by propofol 1 mg/kg and fentanyl at 1 mcg/kg. Infusion of propofol is started at 100 mcg/kg/min.

Vital signs



HR = 48

RR = 12

Pulse Ox = 99% on 2L NC

BP = 123/78

EtCO = 44

Case #8

- ABCDE is a 3 year old girl presenting for a joint injection recent diagnosis of JIA. She does not appear to have other medical issues and takes only Naproxen. No drug allergies. Mom misunderstood the instructions and the child has been NPO for 14 hours. You administer a bolus of 3 mg/kg propofol and 1 mcg/kg of fentanyl for induction. You notice her BP reading 64/39 5 minutes into the case, HR 123, saturations 100%. What would you do next?

Case #9

Shri Lanka is a 2 year old girl with history of breath holding spells who is sent by her PCP to obtain a brain MRI. She is sedated with dexmedetomidine and propofol for the case. Things are going well. Contrast is administered 35 minutes into the case. You notice a rapid rise in HR to 150 – 160s and BP reading 46/10 on the LL leg. What's going on?

Case #10

- Ed Scisors is 16 year old 6 feet tall 79 lb male with autism who is presenting for a lab draw. He is very agitated and will not let anyone approach him, becoming more aggressive with providers. You are called for help to sedate him.

- Options?

References

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