Procedural Sedation in Patients with CKD

Lewis P. Singer, MD FCCM
Chief, Division of Pediatric Critical Care Medicine
Professor of Clinical Pediatrics

The Children’s Hospital at Montefiore

Einstein
Albert Einstein College of Medicine
OF YEDVA UNIVERSITY
Sedation

• From the Latin: *sedare*, meaning to calm

• Balancing patient comfort and drug-related side effects

• Lowest doses of anesthetic agents will result in the fewest side effects.
Guidelines for Monitoring and Management of Pediatric Patients During and After Sedation for Diagnostic and Therapeutic Procedures: An Update

- American Academy of Pediatrics, American Academy of Pediatric Dentistry
- Charles J. Coté, Steven Wilson, the Work group on Sedation
- *Pediatrics* 2006; 118, 2587-2602
Level of Sedation Required

- Depends on the goal
  - Procedure
    - Length
    - Difficulty
    - Procedural needs (need to stay totally still, need to be interactive during procedure)

- In general, the younger the child and/or the lower their cognitive abilities, the more deeply sedated they will need to be
- Enough to safely accomplish goal while minimizing the side effects
Continuum of Sedation

- Awake, baseline
- Conscious sedation
- Drowsy
- Deep sedation
- General anesthesia
Deep Sedation

- A medically controlled state of depressed consciousness from which the patient is not easily aroused
- May be accompanied by partial or complete loss of protective reflexes
- Inability to maintain a patent airway independently
- Inability to respond to stimuli
Pre-sedation History and Physical

- General health (ASA class)
- Risk factors for sedation
  - Respiratory illness (Acute or Chronic)
  - Cardiovascular disease
  - Neurologic status
  - Liver/Renal disease
- Current medications, Allergies
- Previous anesthetic reactions
  - Patient / patient’s family
- NPO status
Appropriate Intake of Food and Liquids before Elective Sedation

- Clear liquids: 2 hours
- Breast milk: 4 hours
- Infant formula: 6 hours
- Nonhuman milk: 6 hours
- Light meal: 6 hours
- Heavy meal: longer

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Procedural Monitoring

- ECG
- RR
- $O_2$ saturation
- End-tidal $CO_2$
- Blood Pressure
- Documentation of vital signs every 5 minutes
Support Personnel

- To assist in any supportive or resuscitative measures
- Trained in BLS
- Specific assignments in case of emergency
- Current knowledge of the emergency cart inventory
Local Anesthetics

• EMLA
  > Lidocaine and Prilocaine
    • Oil in water mixture
    • High concentration
    • Topical anesthesia to a depth of 5 mm
    • Not sufficient for deep procedures

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Local Anesthetics

- **Lidocaine**
  - Metabolized primarily in the liver
  - 60 – 80% absorbed in the lung
  - Side effects due to vascular infusion
    - Tinnitus, light-headedness, restlessness
    - Muscle twitching, auditory or visual disturbances
    - Seizures, arrhythmias, coma respiratory arrest
    - CNS effects at serum levels > 5µg/ml
  - Tissue infiltrated from skin to renal capsule
Lidocaine

- Lidocaine hurts during injection

- Study comparing 1% lidocaine, 1% lidocaine diluted with saline and 1% lidocaine buffered with 8.4% sodium bicarbonate

- Buffered lidocaine statistically lowered the pain score (p=.0018)
Propofol – Milk of Amnesia

- Alkyl phenol, probably a GABA agonist
- 1% propofol, 10% soybean oil, 2.25% glycerol, 12% purified egg phosphatide
- No alteration of pharmacokinetics in renal or hepatic impairment
- 88% excreted in the urine
- Anti-emetic properties
Propofol

• Side effects
  > Pain on injection
  > Hypotension
  > Hypoventilation
  > Anaphylactic reactions
  > Involuntary motor movements
  > Tolerance
Ketamine

- **Dissociative anesthetic** – PCP derivative (acts at cortex and limbic system)
  - Patients may remain ‘awake’
  - provides both analgesia and amnesia
  - preserves upper airway tone and reflexes
  - causes bronchodilation
  - No cardiovascular depression (sort of)

- 1 mg/kg IV; 4-6 mg/kg IM; 6 mg/kg PO.
- Continuous infusion 1mg/kg/hour
- Use in conjunction with benzodiazepine to blunt emergence reaction
Ketamine Adverse Reactions

Sympathetic activation
  • Elevates HR, BP, Cardiac Output
  • Coronary artery disease
  > Paradoxical myocardial depressant
    • β - blockade
  > Respiratory depression
    • Large dose/ rapid infusion
  > Laryngospasm, hypersecretory response
    • Attenuated by atropine

> Increases intracranial and intraocular pressure
> Emergence reaction
  • Hallucinations (Special K)
Conclusion

- Sedation is relatively safe with the correct personnel available
- Local anesthetic is very important
- Consider using only a local anesthetic in the older patient
Division of Pediatric Critical Care Medicine
(at least most of us)