Pediatric Procedural Sedation

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Case 1: 2 year old complex facial laceration

Objectives:
- The ideal agent
- Risks and benefits
- Monitoring/equipment
- Choosing an agent
- Options
- Cases and pitfalls

The ideal agent
- Perfect depth
- Immediate onset
- Lasts only for length of procedure
- Safe

Benefits of procedural sedation
- Pain relief
- Immobility
- Amnesia
- Anxiolysis
- Muscle relaxation

Risks of procedural sedation
- Respiratory compromise
  - Depression
  - Obstruction
  - Aspiration
- Hypotension/arrhythmias
- Allergic reaction
Procedural paraphernalia

- Preoxygenation
- Monitors
  - O₂, HR, BP
  - End tidal CO₂
- Airway equipment
  - O₂, suction, BVM, NP/OP airway
  - Intubation stuff?
- Pediatric crash cart
- Reversal/anaphylaxis agents

Choosing an agent: the procedure

- Painful?
- Immobility required?
- Duration?
  - <10-15 minutes
  - Longer

Overview: types of agents

- Sedatives
- Analgesics
- Dissociative
- Inhalational
- Alternative techniques
- Reversal agents

Sedatives

- Barbiturates
  - Pentobarbital
  - Methohexital
- Ultrashort:
  - Etomidate
  - Propofol
  - Dexmedetomidine (DXM)
- Benzodiazepines

Analgesics

- Topical:
  - EMLA, liposomal lido
  - LET
- Local:
  - Lidocaine
  - Bupivacaine
- Oral:
  - NSAID, APAP
  - Narcotics
  - Sucrose water
- IV:
  - Morphine
  - Fentanyl (IN)

Dissociative and Inhalational

- Dissociative:
  - Ketamine
- Inhalational:
  - N₂O
Alternatives: be good to your kids

- Cut the doctor talk
- Parental roles
  - Imagery
- Music/audiobooks
- Comfort items
- Let them help
- Give them a choice
- Hypnosis

Reversal agents: keep them handy

- Narcan: opiates
  - Give any route
  - 0.1 mg/kg up to 2 mg
- Flumazenil: BDZ
  - 0.02 mg/kg to 1 mg
- Atipamezole: DXM
  - Not studied in kids

Case 1: 2 year old complex facial laceration

- Patient: healthy, eye normal, airway normal
- Procedure:
  - Painful
  - Immobility key!
  - >15 minutes
- Just say Ketamine

Let’s talk ketamine…

- Trifecta: sedation, analgesia, amnesia
- Safe and effective
- Minimal cardiac/respiratory effects
- Airway reflexes preserved
- Minimum dissociative dose
  - IV (1-1.5 mg/kg): lasts 15 min or
  - IM (3-4 mg/kg): lasts 45 to 60 min

Ketamine contraindications

- Increased ICP?
  - 82 ketamine administrations in ICU with ICP monitor: ICP*
- Secretions?
  - Avoid if serious URI
  - 1090 kids: No evidence that premeds work#
- Psychiatric history
- Under 3 months

* Bar Joseph, J Acute Med 2003
#Brown, Acad EM 2003
More talk on ketamine

- Emergence reaction?
  - Versed doesn’t work
  - Quiet room better
- IV vs. IM?
  - IV “just in case”?
  - IV shorter recovery but...
  - IM more vomiting (>5 yrs)*
- Vomiting?:
  - Just say zofran (NNT 9-13)*

*Deasy, Ped Anesth 2010. #Langston, Annals EM 2008

Case 2: 8 year old distal radius fracture needs reduction

Oooowwwwieeee!

- The patient:
  - Vomiting
- The procedure
  - Very painful
  - Some mobility OK
  - Short (<15 min)
- The drug:
  - Ketamine
  - Propofol + fentanyl
  - Ketofol?

Let’s talk propofol

- Sedative/no analgesia
- Rapid onset/set
- IV: boluses (short) or bolus plus drip (longer)
- Dosing:
  - 1 mg/kg bolus
  - 0.5 mg/kg repeat bolus q 2-3 minutes
  - 0.05-0.2 mg/kg/min drip
- Pro:
  - Anti-emetic
  - Short duration
- Con:
  - A/B/C problems
  - Sulffites (beware with asthma)
  - Egg/soy allergies
  - Bolus hurts (use lidocaine)

Too much of a good thing

- 1st dose IV push → no effect
- 30 seconds later 2nd
dose IVP → no effect
- Then 2 doses fentanyl
- RR 6, 94%, ET CO2:
sorous breathing
- What now?

Rescue preparedness

- Reposition
- Suction
- Oxygen
- BVM/NP airway
- Pitfalls:
  - Avoid rapid med administration
  - Avoid stacking meds
  - Avoid alternating opiate and propofol;
give opiate pre procedure

2/1/2013
What about ketofol?

<table>
<thead>
<tr>
<th>KETAMINE</th>
<th>PROPOFOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>emetogenic</td>
<td>anti-emetic</td>
</tr>
<tr>
<td>emergence rxn</td>
<td>anxiolytic</td>
</tr>
<tr>
<td>hypertension</td>
<td>hypotension</td>
</tr>
<tr>
<td>preserves airway reflexes</td>
<td>airway obstruction</td>
</tr>
<tr>
<td>analgesic properties</td>
<td>painful to inject</td>
</tr>
</tbody>
</table>

More on ketofol...

- 193 pt RCT: ketofol v propofol
  - Less propofol used
  - More consistent sedation
  - Same rate of respiratory depression
- 136 pt RCT: ketofol v ketamine
  - Less vomiting
  - More MD satisfaction

Ketofol: 2 great tastes that taste great together??

- Dosing options:
  - Propofol 0.5 mg/kg + ketamine 0.5 mg/kg as boluses
  - Ketamine 0.5 first then propofol 0.5 boluses prn
- Ketamine an analgesic at these doses
- Is it really better?

Did you have your Wheaties today?

- The patient:
  - Dehydrated (BP)
  - Neck flexed
- The procedure:
  - Painful
  - Reduced mobility
  - <15 minutes
- The drug:
  - Ketamine (ICP data)
  - Etomidate +/- fentanyl + EMLA/lidocaine

Case 3: 12 month old febrile, irritable, dehydrated LP

Let’s talk etomidate…

- Sedative
- Minimal cardiac effects
- Myoclonus common: up to 20%
- On/off: 1 min/10-15 min
- IV dose: 0.15 mg/kg, titrate with 0.05 mg/kg q 1-2 minutes
Mixed cocktails…
- Etomidate/fentanyl given
- Still moving around
- "Not working" → add midazolam
- RR to 6
- BVM/flumazenil

**Pitfall:**
- Avoid polypharmacy

Should I use anything for an LP on a neonate?
- YES YES YES
- Sucrose water
- EMLA/lidocaine

Case 4: 15 mo old fall/vomiting → head CT scan

You want him to stay still?
- The patient:
  - Vomiting
- The procedure:
  - Painless
  - Immobility important
- The location:
  - "Death begins in CT…"
- The drugs:
  - Ketamine
  - Propofol
  - Dexmedetomidine (DXM)
  - Rectal methohexital

Why not versed?
- Large doses required
- Up to 50% failure rate with imaging
- Paradoxical agitation

DXM: new kid on the block
- Alpha 2 agonist
  - Rapid onset
  - Sedative and analgesic
  - Less resp depression but more arrhythmias
- Dosing:
  - 1 mcg/kg IV bolus then 0.2-1 mcg/kg/hr
  - IM: 2-4 mcg/kg
- Autistic kids
- No real studies in ED
- Reversal agent available
No IV? Let’s talk rectal methohexital...

- Rapid transmucosal absorption
- Minimal resp depression
- Dose:
  - 25 mg/kg
  - Use IV solution: tape the butt cheeks
  - Lasts 60-90 min
- Contraindication: seizure disorder

Take home points

- Patient and procedure characteristics
- Choose medications you know
- Monitor monitor monitor
- Sedate where you can rescue
- Avoid polypharmacy and stacking medications
- Be patient
- Be kind to your patients