

Project: Ghana Emergency Medicine Collaborative

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Procedural Sedation in the Emergency Department

University of Utah

Division of Emergency Medicine

Zach Sturges

Scientists sedate giant whale at sea

Boston Globe, 3.11.09

- Alcohol is the anesthesia by which we endure the operation of life.

» George Bernard Shaw

- Dawn: When men of reason go to bed.

» Ambrose Bierce

Objectives

- Review ACEP clinical policy on procedural sedation
- Understand pharmacology of different agents used for ED sedation
- Discuss the literature supporting different agents and monitoring requirements
- Discuss unique aspects of procedural sedation in community EDs
- See a sweet picture of Joey

Overview

- Definitions
 - ASA classification
 - Levels of sedation
- Case Discussion
 - Agent selection and pharmacology
 - Preparation
 - Monitoring
 - Complication management
- Literature Review and Research Questions
- Wrap-up

Definitions

- Procedural Sedation
 - What is it?

Definitions

- Procedural Sedation
 - Administration of sedatives or dissociative agents with or without analgesia
 - to induce a state that allows patient to tolerate unpleasant procedures while maintaining cardio-respiratory function

Definitions of Sedation Dissociation

- Ketamine, agent used for moderate sedation. Disconnection between thalamoneocortical system and limbic system preventing processing of sensory stimuli. Airway, respiratory and cardiovascular system intact.
- Now, please draw the neural connections disrupted in this process.

Levels of Sedation

	Minimal	Moderate	Deep	General
Responsiveness	Normal response to verbal stim	Purposeful response to verbal stim	Purposeful response to <i>repeated</i> verbal or painful stim	Unarousable
Airway	Normal	No intervention req' d	Intervention may be req' d	Intervention usually required
Ventilation	Normal	Adequate	May be inadequate	Usually inadequate
CV fxn	Normal	Usually maintained	Usually maintained	May be impaired

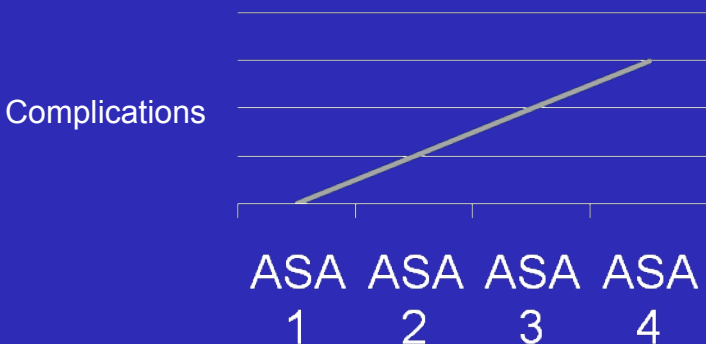
Does targeting level of sedation matter?

- JEM 2007 RCT assigned pts to target of mod vs deep sedation for reduction
 - No sig differences between groups in outcome or comp
 - Only about 50% in each group were actually sedated to the planned level
- Annals Jan 07 Editorial by S Green
 - Notes that studies show recurrent overshoot into general anesthesia briefly with no adverse outcome
 - Unknown whether levels of sedation are actually a reasonable surrogate for aspiration risk

ASA Risk Index Assessment

- Dawson (I)
- Mallin (II)
- Zach (III)
- Carl (IV)
- The Zarl (V)

- Normal, healthy
- Discrete systemic illness
- Serious, non-incapacitating, systemic illness
- Life threatening, incapacitating systemic disease
- Death expected within 24 hrs regardless of procedure



Cases

- Groups of 2 or 3
- Hand out for your case
- Take 5 minutes, write down how you would approach this patient-
 - Agents and rationale, preparation/evaluation, monitoring, anticipated complications

Case 1

- 77 y/o male
- History of CAD and stent placement and px CVA within the last 5 years
- Home oxygen for COPD
- Presents in new onset a-fib for 14 hrs
- He is mentating well, has good cap refill and moderately strong pulses.
- SBP 100/40 HR 150 RR 12 Sats 92% on his home 2 L NC oxygen. Slows to 100 on Dilt, BP 102/49
- You decide to electrically cardiovert this patient.

Case 2

- 3 y/o female who was toddling around and fell and hit her lip on a coffee table
- No LOC, cooperative until you touch her lip, she then transforms into an out of control, screaming, fighting child.
- Lip lac thru vermilion border, fairly significant
- No PMH

Case 3

- 39 y/o ped struck
- Bilat hip dislocations
- Pt is obese, in c-collar. Has been given moderate amount of dilaudid, is slightly somnolent but screams whenever you move his legs.
- Ortho wants to reduce him right now

Pharmacology

- Propofol
- Ketamine
- Etomidate
- Fentanyl
- Morphine
- Remifentanyl
- Midazolam

Propofol

- Onset: 60secs
- Duration of action: 10-30 minutes
 - No alteration in renal/hepatic dz
- Dose: 0.5-1mg/kg bolus followed by 0.5mg/kg repeat boluses q 3-10min
 - GTT protocols (10-20mg/min)
- Acute ARs
 - Anaphylaxis (egg/soy), hypotension, resp. depression, bradycardia
- Time to full reorientation: 10-20 minutes

Ketamine

- Onset: 60secs IV, 3-4 min IM
- Duration of action: 10-15 min IV, 10-25 min IM
- Dose: 1-1.5mg/kg IV, 3-4mg/kg IM
 - 0.25-0.75mg/kg for anesthetic properties alone
 - Redose IV after 5-10min prn
- Acute ARs (greater w/ IM route):
 - Emergence phenomenon (10-20%), salivation (atropine), bronchospasm, autonomic sx, vomiting (ondansetron)
- Time to reorientation: 20-30 min IV, >60 min IM

Etomidate

- Onset: 20-60secs
- Duration of action: 4-10 minutes
 - No alteration in renal/hepatic dz
- Dose: 0.1-0.2 mg/kg bolus followed by 0.05mg/kg q 3-10min
 - Give medication over 60 secs to reduce myoclonus
- Acute ARs
 - Hypotension, myoclonus, ? > emetigonecity
- Time to full reorientation: 20 minutes

Fentanyl

- Onset: 1-3 minutes, peak 20-30 min later
- Duration of action: 30-60 min (up to 100mcg in single dose)
- Dose: ~1mcg/kg
- Acute ARs: rigidity (high dose), bradycardia
- IV Equianalgesia: 100mcg=10mg morphine

Morphine

- Onset: 3-5 minutes, peak 30-40 minutes
- Duration of action: ~4 hours
- Dose: 5-10mg, 0.1-0.2mg/kg
- ARs: as above
- IV Equianalgesia: standard to which all others compared

Remifentanil

- Onset: 1-2 minutes
- Duration of action: 3-10 minutes
- Dose: 0.5-3mcg/kg
- ARs: as above
- IV Equianalgesia: not studied, slightly less potent than fentanyl
- Sufentanil>fentanyl>remi>alfentanil

Midazolam

- Onset: 3-5 minutes IV/IN, 5-7min IM, peak effects 5-7 min IV/
- Duration of action: 30-40 minutes
 - Rapidly dissipating efficacy
- Dose:
 - IV 1-2mg q3 minutes (0.025-0.1mg/kg)
 - IM: 0.1-0.15mg/kg
 - IN (anxiolysis only): ~0.4mg/kg, max 10mg
- Acute ARs: predictable
- Reduce dose in elderly, ARI/CRI

Safety

- Complication rates vary widely
 - 1-23% in various studies, mostly university settings
- Vary by drugs used
 - Propofol and ketamine felt to have lowest complication rate
 - Midazolam, hydromorphone and fentanyl typically higher

ACEP Clinical policy on Procedural Sedation

- During mod and deep sedation qualified support person should be present. Should be supervised by EDMD or other appropriate person. C
- NPO status not contraindication but should be considered. C
- Oxygen, suction, reversal agents, ACLS meds and equipment present C
- Pulse-ox if high doses or mult drugs. B
- Rapid sedative hypnotics Ketamine for kids A, Propofol B, Etomidate C

Monitoring

- Pulse-ox
- ETCO₂
 - Several studies of different designs
 - ETCO₂ changes generally but don't always precede resp depression. Many ETCO₂ changes are not clinically significant. Loss of waveform, inc of 10mm HG or over 50mm HG are most specific. Decrease to less than 30 with good waveform maybe more sensitive. Variable time preceding clinical manifestations. Basically may be an early warning but not clearly clinically significant.
- ECG

Supplemental Oxygen

- Preoxygenation
- Two studies with 2-3 L NC vs no O₂
 - Same authors, propofol in one, versed in other
 - No change in versed (low rate of resp dep)
 - Trend toward reduction of desats (10% difference) in other
 - Less recognition of increased ETCO₂ in supp oxygen group

Ketofol

- Review article of 8 clinical trials of fixed dose ketamine/propofol. No sig advantage to propofol monotherapy
- Ketofol in ED -Annals 2007. No control. Fairly low incidence of BVM 1%
- Sub-dissociative Ketamine vs Fent plus propofol. AEM Oct 2008. Low dose ketamine vs mod dose fent - fewer complications with ketamine despite higher propofol requirement
- Anyone want to do a propofol/fent vs ketofol trial?

Propofol vs Etomidate

- Both are fairly well documented to be safe, likely more cost effective and better sedation than fent/versed
- Annals Jan 07 - prospective trial RCT of propofol vs etomidate (plus morphine). No statistically sig difference in resp complications (4-5%) or hypotension. Sig diff in success (97 vs 88) favors propofol. Myoclonus in 20% Etomidate and 2% propofol
- Annals 03, RCT Etomidate vs Propofol vs Versed (with or without flumazenil). Propofol equal success/ complications but less myoclonus or re sedation or prolonged sedation

Fasting

- No real trials for fasting and ED sedation
- Likely different than GET since shorter duration
- AEM 2002 - Green and Kraus review of lit for ED sedation, GET, and GET for L and D pts- no evidence of correlation between fasting and aspiration, no reports of aspiration in medical lit for ED sedation
- Fasting duration should not preclude ED sedation when medically indicated
- In practice NPO status generally disregarded

Fasting

- ASA Preprocedure Fasting Guidelines
- Clear liquids: 2hrs
- Breast milk: 4hrs
- Light meal/"nonhuman milk"/etc.: 6hrs
- Corned beef and hash: 365 days

Can I do it all by myself?

- Sacchetti et al. *Pediatr Emerg Care.* 2007 Apr;23(4):218-22
- Prospective, observational database
- 252/1028 incidences of EP doing both sedation and procedure
- Overall 0.6% complication rate (apnea/hypoxia)
- Hogan et al. The safety of single-physician procedural sedation in the emergency department *Emerg Med J.* 2006 Dec;23(12):922-3.
- 885/1028 incidences
- 4% complication rate (equal amongst EP monitored and RN monitored pts)
- No changes in pt. disposition.

Conclusion? Thoughts? UUMC/IHC policy?

Summary

- Relax. Get a watch. Understand pharmacokinetics and don't be pressured by consultants.
- Literature overwhelmingly supports safety but politics may not.
- Aspiration and clinically significant ARs are rare
- Propofol, ketamine and fentanyl are the best studied agents
- IM agents are a valid option in kids