

## Emergency Department Procedural Sedation (EDPS)

新光急診 張志華醫師



## Objectives

- ACEP clinical policy on procedural sedation
- Pharmacology of different agents
- Literature review
- Unique aspects in EDs

## Definitions

- What is Procedural Sedation?

## 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

## Sedation / Dissociation

- Ketamine
  - Disconnection between thalamoneocortical system and limbic system preventing processing of sensory stimuli.
  - Airway, respiratory and cardiovascular system intact

## Levels of Sedation

	Minimal	Moderate	Deep	General
<b>Response</b>	Normal response to verbal stim.	Purposeful response to verbal stim.	Purposeful response to <b>repeated</b> verbal or painful stim	<b>Unarousable</b>
<b>Airway</b>	Normal	No intervention required	<b>Intervention</b> may be required	Intervention usually required
<b>Ventilation</b>	Normal	Adequate	May be <b>inadequate</b>	Usually inadequate
<b>CV function</b>	Normal	Usually maintained	Usually maintained	May be <b>impaired</b>

American Society of Anesthesiologists. Continuum of depth of sedation definition of general anesthesia and levels of sedation/analgesia. October 27, 2004

**Table. American Society of Anesthesiologists Classification\***

**ASA Class      Class Definition**

I	A normally healthy patient
II	A patient with mild systemic disease
III	A patient with systemic disease that is not incapacitating
IV	A patient with an incapacitating systemic disease that is a constant threat to life
V	A moribund patient who is not expected to survive for 24 hours with or without operation

**Table. American Society of Anesthesiologists Classification\***

ASA I	A normal healthy patient	Healthy; no smoking, no or very minimal drinking.
ASA II	A patient with mild systemic disease	Smoker; more than minimal drinking; pregnancy; obesity; well controlled diabetes, well controlled hypertension; mild lung disease.
ASA III	A patient with severe systemic disease, not incapacitating	Diabetes, poorly controlled hypertension; distant history of MI, CVA, TIA, cardiac stent; COPD, ESRD; dialysis; active hepatitis; implanted pacemaker; ejection fraction below 40%; congenital metabolic abnormalities.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Recent history of MI, CVA, TIA, cardiac stent; Ongoing cardiac ischemia or severe valve dysfunction; implanted ICD; ejection fraction below 25%.
ASA V	A moribund patient who is not expected to survive without the operation	Ruptured abdominal or thoracic aneurysm; intracranial bleed with mass effect; ischemic bowel in the face of significant cardiac pathology.

**Cases**

- How you would approach this patient
  - Agents and rationale
  - Preparation/evaluation
  - Monitoring
  - Anticipated complications

**Case 1**

- 77 y/o male
- Hx: CAD + stent; CVA 5 yr ago
- Home oxygen for COPD
- CC: new onset A-fib for 14 hrs
- Cons alert, has good cap refill
- SBP 100/40, HR 180, RR 22, Sats 92%
- 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 laceration need to be sutured

**Case 3**

- 39 y/o pedestrian struck
- R't hip dislocation
- P't is obese, in neck collar
- Has been given 15 mg of morphine, is slightly somnolent but screams whenever you move his R't leg
- Ortho wants to reduce him right now

## Pharmacology

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

## Propofol

- Onset: 60secs; duration: 10-30 minutes
  - No alteration in renal/hepatic dz
- Dose (Diprivan 200mg/20mL):
  - 0.5-1mg/kg bolus followed by 0.5mg/kg repeat boluses q 3-10 min... or
  - <55 years:  
40 mg IVP q 10sec until onset (2-2.5 mg/kg)
  - >55 years or debilitated or ASA III/IV:  
20 mg IVP q 10sec until onset (1-1.5 mg/kg)

## Propofol

- Acute ARs
  - Anaphylaxis (egg/soy),
  - hypotension,
  - resp. depression,
  - bradycardia
- Time to full reorientation: 10-20 minutes

## Ketamine

- Onset: 60 secs IV, 3-4 min IM
- Duration: 10-15 min IV, 10-25 min IM
- Dose: 1-1.5 mg/kg IV, 3-4 mg/kg IM
  - 0.25-0.75 mg/kg for anesthetic properties alone
  - Redose IV after 5-10 min prn
- Acute ARs (greater w/ IM route):
  - Emergence phenomenon (10-20%), salivation (atropine), laryngospasm, vomiting (ondansetron)
- 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 med over 60 s to reduce myoclonus
- Acute ARs
  - Hypotension, myoclonus, emetogenicity
- Time to full reorientation: 20 minutes

## Fentanyl

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

## Morphine

- Onset: 3-5 minutes, peak 30-40 minutes
- Duration of action: ~4 hours
- Dose: 5-10mg, 0.1-0.2mg/kg
- ARs: bradycardia, apnea

## Midazolam

- Onset: 3-5 minutes IV/IN, 5-7min IM, peak effects 5-7 min IV/IN
- 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

## EDPS: ACEP Clinical policy (I)

- Does preprocedural fasting demonstrate a reduction in the risk of emesis or aspiration?

## EDPS: ACEP Clinical policy (I)

- Does preprocedural fasting demonstrate a reduction in the risk of emesis or aspiration?  
**Level B recommendations:**
  - Do not delay procedural sedation in adults or pediatrics in the ED based on fasting time
  - Preprocedural fasting for any duration has not demonstrated a reduction in the risk of emesis or aspiration when administering procedural sedation and analgesia

## Fasting

- ASA Preprocedure Fasting Guidelines
- Clear liquids: 2 hrs
  - Breast milk: 4 hrs
  - Light meal / nonhuman milk, etc.: 6 hrs

## Fasting

- No real trials for fasting and ED sedation
- 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

## EDPS:ACEP Clinical policy (2)

- Does the routine use of capnography reduce the incidence of adverse respiratory events?

## EDPS:ACEP Clinical policy (2)

- Does the routine use of capnography reduce the incidence of adverse respiratory events?  
**Level B recommendations:**
  - Capnography may be used as an *adjunct* to pulse oximetry and clinical assessment to detect hypoventilation and apnea earlier than pulse oximetry and/or clinical assessment alone
  - Capnography includes all forms of quantitative exhaled carbon dioxide analysis

## Monitoring

- Pulse-oximetry
- ECG
- ETCO<sub>2</sub>

## Supplemental Oxygen

- Preoxygenation
- 2-3 L N/C vs no O<sub>2</sub>
  - Propofol – less recognition of resp depression in supp oxygen group
  - Dormicum – insignificant resp depression

## ETCO<sub>2</sub>

- ETCO<sub>2</sub> changes generally but don't always precede resp depression
- Loss of waveform, increase of 10 mmHg or over 50 mmHg are most specific
- Decrease to less than 30 with good waveform maybe more sensitive

### EDPS:ACEP Clinical policy (3)

- What is the minimum number of personnel necessary to manage complications?

### EDPS:ACEP Clinical policy (3)

- What is the minimum number of personnel necessary to manage complications?  
**Level C recommendations:**
  - A nurse or other qualified individual should be present for continuous monitoring of the patient, in addition to the provider performing the procedure
  - Physicians who are working or consulting in the ED should coordinate procedures requiring procedural sedation and analgesia with the ED staff

### EDPS:ACEP Clinical policy (4)

- Can ketamine, propofol, etomidate, be safely administered?

### EDPS:ACEP Clinical policy (4)

- Can ketamine, propofol, etomidate, be safely administered?  
**Level A recommendations**
  - Ketamine for children
  - Propofol for children and adults**Level B recommendations**
  - Etomidate for adults
  - Ketofol (propofol+ketamine) for children and adults**Level C recommendations**
  - Ketamine for adults
  - Etomidate for children

### Ketofol

- Fixed dose ketamine/propofol
  - No sig advantage to propofol monotherapy
- Ketofol in ED - Annals 2007
  - Fairly low incidence of BVM 1%
- Sub-dissociative Ketamine vs Fent plus propofol - AEM Oct 2008
  - Fewer complications despite higher propofol requirement

### Propofol vs Etomidate

- Both safe, better than fentanyl/dormicum
- RCT of propofol vs etomidate
  - No sig difference in resp complications or hypotension
  - Propofol:
    - less myoclonus (2 vs 20%),
    - less re sedation
    - less prolonged sedation

## Summary

- Pharmacokinetics of Propofol, Ketamine, Etomidate, Fentanyl, Morphine, Midazolam
- Literature overwhelmingly supports safety but **politics** may not
- Aspiration and clinically significant adverse reactions are rare
- Propofol, ketamine and fentanyl are the best studied agents
- IM agents are a valid option in kids

### Pre-Sedation

#### 1. Should I do EDPS\*?

- emergent or
- ASA I/II (include table) and
- no concerns w/ airway

#### Hx

- PMHx, Previous GA/sedation, Meds/allergy(egg/soya)
- NPO

#### P/E

- VS, ASSESS airway
- Establish baseline LOC
- Cardio-respiratory exam

#### 2. Consent

- verbal or written

#### 3. Preparation

- Equipment, Personnel, monitors, IV, Rx/reversal agents, resuscitative equipment

#### 4. Documentation

### Sedation

#### 1. Pre-oxygenate (?)

- GCS
- BP, HR, RR, BT
- Pulse oximetry
- Capnography

#### 3. O2 during PS (?)

#### 4. Rx

- EDPS drugs

### Post-Sedation

#### 1. Monitor

#### 2. MBD criteria

#### 3. MBD instructions

\*EDPS: ED Procedural Sedation

° **THANK YOU**