EMC 370 Introduction to Medical Emergencies

Overdoses

Lecture 14

RED BOOK [5th ed.] p. 534-549

Outcomes

At this lecture's completion, the learner will be able to:

- Integrate pathophysiological principles with the clinical presentations of ODs with sedatives, alcohol, and other drugs of abuse
- Discuss the Treatment of of ODs with sedatives, alcohol, and other drugs of abuse
- Discuss the latest drugs of abuse, sometimes promoted at dances known as ***raves*** and on the internet

Barbiturates

- Mechanism of action
  - CNS depression (GABA inhibition)
  - complications: shock, pulmonary edema, cerebral edema, aspiration, dysrhythmias
  - Respiratory depression (the most common cause of death)
- Treatment
  - A/B: Secure A / Support B
  - C: Treat hypotension
  - D: Charcoal 1 gram/kg (after airway secured)

Benzodiazepine

Generic names	Brand name
Triazolam	Halcion
Midazolam	Versed
Alprazolam	Xanax
Oxazepam	Setrax
Lorazepam	Ativan
Chlordiazepoxide	Librium
Clonazepam	Klonopin
Clorazepate	Tranxene
Diazepam	Valium
Flurazepam	Dalmane

Benzodiazepines (cont.)

- Mechanism:
  - potentiate gamma-aminobutyric acid (GABA)
- Clinical uses
  - Sedative/hypnotics
  - Anti anxiety
  - Muscle relaxants

Benzodiazepines (cont.)

- Clinical **presentation :**
  - The usual neurologic
    - Drowsiness
    - Slurred speech
    - Lethargy
    - Occas. : - ataxia
      - visual and auditory hallucinations
- Coma
  - Uncommon
  - Should prompt a search for other cause (e.g., trauma, other agents, etc.)
- Respiratory depression + hypotension: uncommon

Benzodiazepines (cont.)

- Toxicity
  - Generally low
    - ***Unless*** co-ingested with other CNS depressants
  - Ingestion of up to 1500 mg of diazepam has been reported with mild toxicity

Anticholinergics

- OTC sleeping medication
- Antihistamines
- Phenothiazines

Anticholinergic life threatening events

- Hyperthermia
- Ventricular arrhythmias
- Seizures
- Treatment
  - A/B - secure
  - C - arrhythmias [avoid I As]
  - D - diazepam

MDMA

MethyleneDioxyMethAmphetamine

- Source
  - How-to books (readily available by mail)
  - MDMA tablets ~ $20 at raves
- Incidence
  - 24% of undergraduates : exceeding cocaine usage
  - 7% of high school seniors
- Setting : *Raves*
  - dancing vigorously in marathon dancing,
  - in a hot environment
  - to synthesized rock music, known as *techno*

MDMA

Mechanisms of Action

- ↑ in sympathomimetic activity
  - release of serotonin, dopamine, and NE from presynaptic neurons
  - inhibits reuptake
- large doses of MDMA :
  - long-term damage to
    - – serotonin and dopamine neurons in the brain.
  - ? permanent neural injury
- neuropsychiatric disorders
  - may be related to long-term neurotransmission changes

MDMA - Clinical Presentation

Initial effects generally begin at 30 to 60 minutes

- Serotonergic stimulation
  - Hallucinations (visual and tactile)
  - Dysphoria, confusion, altered time perception, delirium, paranoia
- Sympathetic nervous system stimulation:
  - Diaphoresis, mydriasis, hyperthermia
  - Cardiovascular over stimulation (complications):
    - hypertension, tachycardia, arrhythmias, AV block, cardiogenic shock and pulmonary edema

MDMA
Clinical Presentation , cont.

- Neurological
  - Headaches, hyperreflexia, ataxia, dizziness, blurred vision, nystagmus, anorexia, depression, insomnia, restlessness, irritability, and lethargy
  - Psychosis
  - Coma, seizures and status epilepticus
  - Stroke (hemorrhage and infarction)
  - Respiratory failure can occur as a secondary complication of neurologic effects

MDMA - Clinical Presentation

- Muscular effects :
  - Muscle tension or spasms, rigidity, trismus, muscle aches, motor tics, and
  - rhabdomyolysis, which could precipitate renal failure
- Hyperthermia can also produce or contribute to end-organ damage, including acute hepatic and renal failure, disseminated intravascular coagulation (DIC) complicated by bleeding, and adult respiratory distress syndrome (ARDS)
- Metabolic effects: metabolic acidosis, hyperkalemia

MDMA - Treatment

- ABCs
- Often, tachycardia and hypertension
- If hypertension is severe and does need to be treated
  - AVOID pure beta-adrenergic stimulation.
  - Instead use alpha agent (phentolamine)or vasodilators (NTG)
- Core temperatures : Rapid cooling
- Rehydration

Prognosis

MDMA - associated deaths

- most occur early
- secondary to :
  - arrhythmias
  - hyperthermia
  - seizures, or
  - intracerebral hemorrhage.

Gamma hydroxybutyrate (GHB)

- " Date rape" drug
- Known on the streets variously as

  Grievous Bodily Harm, Georgia Home Boy, Liquid Ecstasy, Liquid X, *Liquid* E, *Soap, Easy Lay, G-riffick, Cherry Meth, Somatoma*
- FDA prohibiting sale of GHB led to

  production and sale of GHB *prodrugs,*

  such as gamma-butyrolactone (GBL) marketed to induce sleep, release growth hormone, burn fat, enhance sexual activity and athletic performance, and relieve depression

GHB - Mechanisms of Action

- thought to mediate CBF and glucose metabolism
- neuroprotective effects protect against both
  - hypoxia and
  - excessive metabolic demands
  - with full tissue recovery
- probably addictive

  with a withdrawal similar to ethanol withdrawal
- synergistic effect with ethanol, producing CNS and respiratory depression

GHB - Mechanisms of Action

Dose-dependent response - Oral dose:

- 10 mg/kg - induces sleep
- 30 mg/kg - induces memory loss
- 50 mg/kg or more - general anesthesia

GHB (cont.)

Clinical Presentation

- Confusion
- Alternating agitation and coma
- Amnesia
- Hypotonia
- Incontinence
- Ataxia
- Nystagmus
- Random clonic movements of face and extremities
- Seizures
- Bradycardia

GHB (cont.)

- Treatment
  - Supportive care is paramount
  - Low Glasgow Coma Scale scores-intubation
  - Atropine can be administered for bradycardia

GHB - Treatment

ABC s / COMEBIG

- Supportive care is paramount
  - AB
    - for low Glasgow Coma Scale scores / no gag
      - intubation
  - C
    - atropine can be adm. for bradycardia

KETAMINE

- a vial of liquid ketarnine (Ketaset)
- cost a veterinarian about $6,
- sells for about 10 times that on the street.
- administered IV or IM,
  but more commonly taken in powdered form :
  - either mixed into a drink, or
  - snorted, or
  - smoked

Ketamine - Mechanism of Action

- effects (intranasally)
  - come on abruptly
  - generally brief, approx. 30 to 45 minutes
- PCP - like
- Hyperadrenergic / sympathathetic
  - NE
  - Serotonin
  - Dopamine

Ketamine - Presentation

Signs and symptoms of neurologic toxicity :

- nystagmus, mydriasis, agitation
- slurred speech, delirium, floating sensations
- persistent repetition of acts or words; rarely, shouting
- anxiety, vivid dreams, hallucinations, and seizures
- hypertonus, rigidity, effects on movements, such as
  - bizarre facial expressions,
  - loss of coordination,
  - bizarre limb movements,
  - dystonic reactions
- rhabdomyolysis

Clinical Presentation (cont.)

- Behaviors and cognitive deficits
  - resemble endogenous psychoses, particularly schizophrenia and dissociative states
  - psychological dissociation
    - hallucinations, vivid dreams and illusions
    - subjective sensation of being out of the body or
    - similar to near-death experiences
- Cardiovascular toxicity
  - ↑ BP, ↑ HR
- Respiratory toxicity
  - ↓ RR and effort

Ketamine - Treatment

- ABCs / COMEBIG
- hydration
  - prevention of rhabdomyolysis complications
- if sedation required:
  - midazolam (versed) preferred
    - 1 mg IV or IM Q 3-5 min. (caution: ETOH)

Sympathomimetics

Sympathomimetics

- Cocaine
- Amphetamines
- PCP
- Ephedrine (Ma huang)
- diet aids, PPA - cold and preparations
  - readily absorbed from GI tract

Sympathomimetics

Clinical presentation:

- CC: chest pain
- PE :
  - restlessness, irritability, tremors, hyperreflexia, confusion, coma, seizures
  - dilated pupils, flushed skin, diaphoresis
  - fever, ↑BP, ↑HR, ↑RR
  - dysrhythmias, CV collapse
- Lab / complications
  - rhabdomyolysis
    - ↑ K^+, CPK, muscle protein
  - MI
  - SAH / CVA
  - Pulmo. Edema

Sympathomimetics

Management:

- ABCs / COMEBIG
  - treat hyperthermia
  - support CV status
    - treat hypertension
      - initial Tx of choice: benzo.s (Ativan,…)
      - caution / avoid beta blockers
      - ideally: use alpha blocker
        - phentolamine
    - treat dysrhythmias
      - avoid type 1As
- GI decontamination
- Treat agitation
  - Lorazepam 2 mg IV

Opioids

- Setting
  - abuse
  - common accidental ingestions due to
    - cough preparations
    - prescription pain meds
- Clinical presentation:

CNS:

  - pinpoint pupils are usually present (not always)
  - drowsiness, ataxia, coma,
  - respiratory depression
  - seizures (especially with meperidine + dextromethorophan)

CV:

  - dysrhythmias (especially with meperidine)
  - bradycardia, hypotension

Opioids

Management

- A : ET if no gag
- B/C: CV + resp. monitoring if symptomatic
- GI decontamination
- do NOT induce vomiting
  - rapid onset of CNS symptoms
- Naloxone

  < 20 kg: 0.1 mg/kg IV;

  > 20 kg 2.0 mg; repeat every 2-5 min. to max of 10 mg

Alcohols

Ethanol p. 540
Isopropanol p. 541
Methanol p. 542-45
Ethylene Glycol p. 542-45

- Ethanol
  - hypoglycemia (with or without seizures) is common
  - see notes (attachments) and study guide regarding the costs
    - financial
    - personal + medical
    - even in a "non-drinking" population of elderly

Toxic Alcohols

- Ethylene glycol
  - coolant and
  - in antifreeze solutions
  - lethal ingested dose is est. to be 1.0-1.5 ml/kg
- Pathophysiology
  - Hypocalcemia occurs secondary to
  - calcium oxalate crystal formation and deposition
- Elimination
  - *NOT* absorbed by charcoal
  - Antidote treatment:
    - ethanol
      - competitively inhibits metabolism to its harmful metabolite : Ca^{++} oxyalate crystals
    - new *Fomepazole* is now favored over ethanol

Toxic Alcohols (cont.)

- Methanol (wood alcohol)
  - In solvents, antifreeze, windshield washer fluid, sterno canned heat, paints, paint removers, and varnishes.
  - lethal ingested dose is approx.: 15-30 ml in adults
- Pathophysiology
  - Methanol is oxidized in the liver to formaldehyde
  - Metabolic Acidosis
- Elimination
  - *NOT* absorbed by charcoal
  - Antidote treatment:
    - Ethanol
      - competitively inhibits metabolism of ethylene glycol to its harmful metabolite : formaldehyde

Toxic Alcohols (cont.)

Isopropyl alcohol (isopropanol)

- Disinfectant and "rubbing" alcohol
- lethal ingested dose (70% solution)is approx.: 1 ml/kg

- Pathophysiology
  - Ketosis - but minimal acidosis
  - Die from : CNS depression +/or GI bleed
- Elimination
  - *NOT* absorbed by charcoal
  - Antidote treatment
    - None

Alcohol withdrawal syndromes

- Hyperactivity of **AUTONOMIC** function:
  - tachycardia, mydriasis, fever, diaphoresis
- Then
  - gross tremor,
  - agitation,
  - confusion,
  - delusions, hallucinations(usually visual)
- Prognosis: mortality 9-15%

Alcohol withdrawal syndromes

Sx. and Sign onset in hours post ethanol abstinence or ↓ amount of ethanol: day

- at 6-8 hr : "shakes" 1
- at 8-24 hr : autonomic hyperactivity
  - ↑ RR, HR, BP, T^0
  - AF, PVCs, VT, TdP
- at 12-48 hr : seizures (rum fits) 2
  - R/O infection
  - R/O subdural
- at 24-72 hr : AKA
- at 72 hr-10 days : Delirium tremens (DTs) 3^+
  - visual hallucinations
  - delusions:fearful/paranoid

DT treatment:

- Hyperthermia treatment
- Hemodynamic monitoring
- Fluids
- Benzodiazepines
  - Lorazepam 2-4 mg IV Q 15 min.
- Thiamine/glucose
- Correct electrolyte abnormalities
  - Mg^{++} 4 grams / in 1 hr
- Treat infection

Summary

We have discussed:

- ODs with sedatives, alcohol, and other drugs of abuse
- OD and drugs of abuse complications and their treatments
  - Alcoholic DTs
- Some public health and policy concerns regarding alcohol as a drug of abuse (attachments)
- Treatment of ODs with opiods, sedatives, alcohol, and other drugs of abuse
- Drugs of abuse, sometimes promoted at dances known as *raves* and on the internet