Ingestions: Assessment and Management of Acute Oral Poisonings

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“All things are poison and nothing is without poison; only the dose makes a thing a poison.”

Theophrastus Phillipus Auroleus Bombastus von Hohenheim (1493 - 1541)
“ Paracelsus”

Christopher P. Holstege, MD

Disclosure

No relevant financial relationships

Case Example
The Toxic Time Bomb

- 16 y/o f ingested ? quantity of an antidepressant one hour ago
- awake, drowsy & mumbling speech
- P 110, R32, BP 128/84
- pupils are 8mm
- lungs clear
- heart tachycardic
- axilla dry
- abdomen soft, no bowel sounds
- monitor: sinus tach, QRS 80 msec

The Toxic Time Bomb

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- monitor: sinus tach, QRS 80 msec

Anticholinergic

- Hot as a hare
- Dry as bone
- Red as a beet
- Blind as a bat
- Mad as a hatter

  - Also see: tachycardia, seizures, urinary retention, hypoactive bowel sounds, slurred speech

The Toxic Time Bomb

What did she take?

(single pill – question of identification)

The Toxic Time Bomb

In many case, it is not a single agent but numerous

The Toxic Timebomb

What did she take?

Imipramine

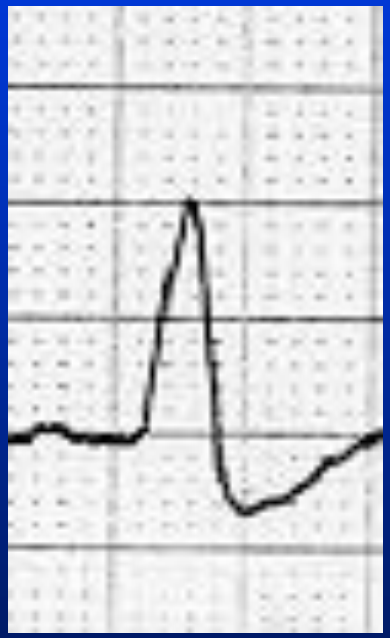
The Toxic Timebomb

Presentation

- P 122, R 8, BP 90 by palp
- Gag reflex is diminished
- snoring resp after she drifts to sleep
- without stimulation she is apneic

The Toxic Timebomb

Presentation



Monitor: sinus tach, QRS 160 msec

The Toxic Timebomb

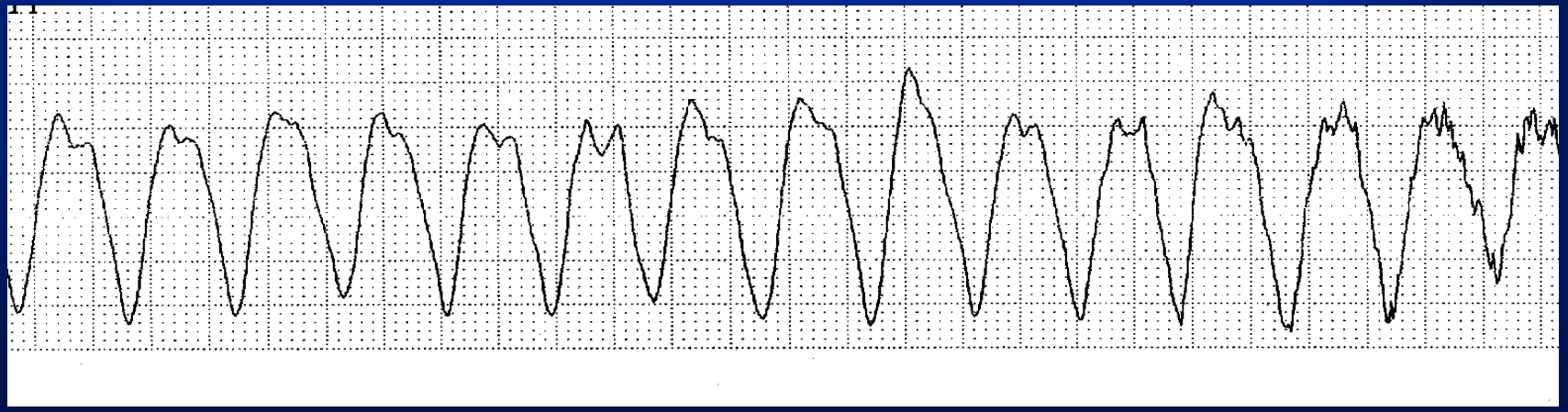
Presentation

- Difficult intubation
- Sats begin to drop

The Toxic Timebomb

Presentation

- Difficult intubation
- Sats begin to drop
- **Suddenly:**



The Toxic Timebomb

Now what?

What is the role of ACLS/PALS in toxic resuscitations?

2015 Annual Report of the American Association of Poison Control Centers' National Poison Data System.

Clin Toxicol 2016;55(10):924-1109

- Total of 55 U.S. Poison Centers
- Data uploaded every 8 minutes
- 2,792,130 calls to U.S. PCs in 2015
  - 2,168,371 human exposure calls to U.S. PCs
  - 55,516 animal exposures
  - 560,467 information calls

2015 Annual Report of the American Association of Poison Control Centers' National Poison Data System.

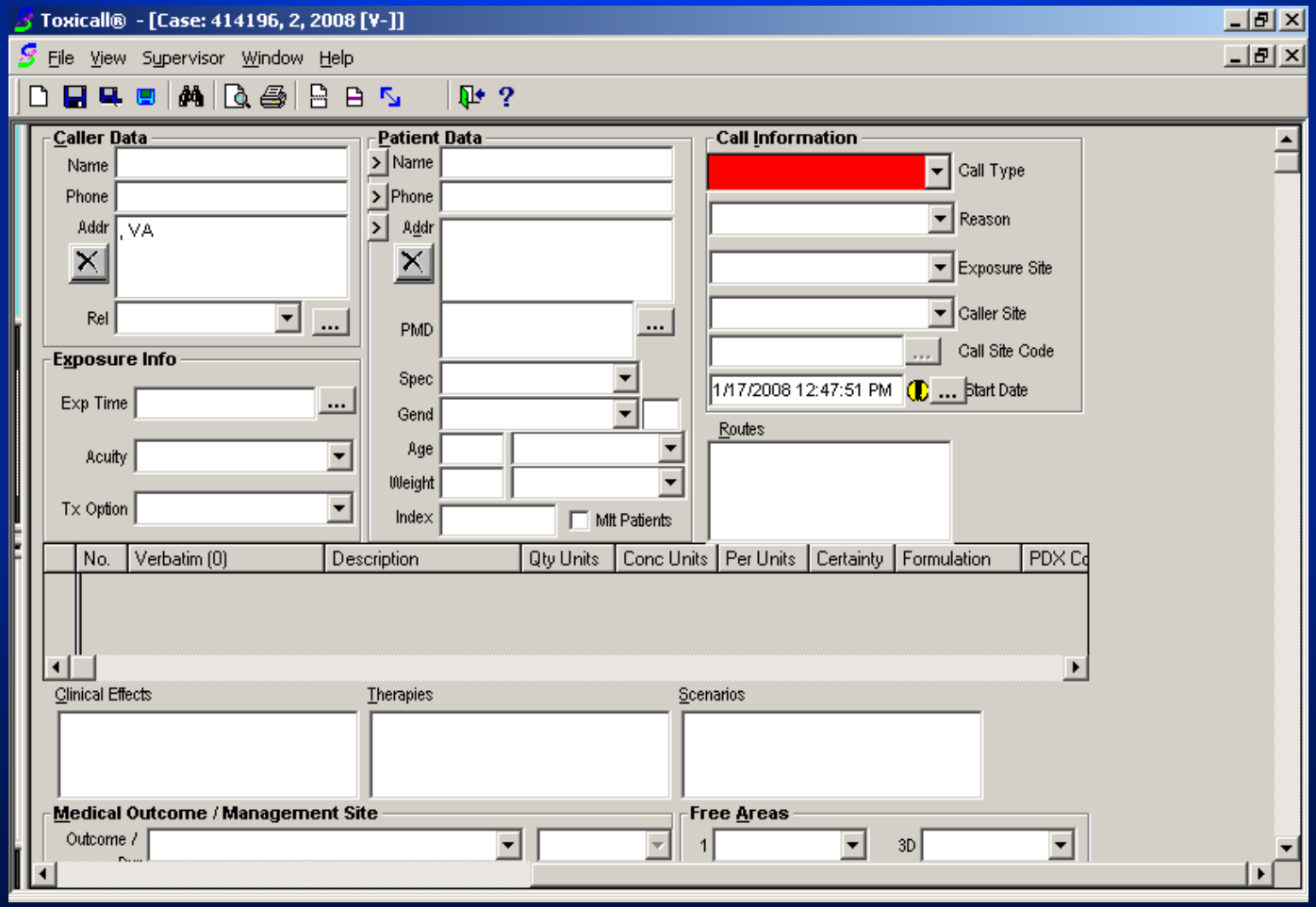


Table 6(A). Reason for Human Exposure Cases

Reason	N	% Human exposures
Unintentional		
Unintentional - General	1,137,838	52.5
Unintentional - Therapeutic error	275,979	12.7
Unintentional - Misuse	130,847	6.0
Unintentional - Environmental	56,798	2.6
Unintentional - Bite / sting	46,604	2.1
Unintentional - Occupational	27,565	1.3
Unintentional - Food poisoning	21,423	1.0
Unintentional - Unknown	3708	0.2
Subtotal	**1,700,762**	**78.4**
Intentional		
Intentional - Suspected suicide	252,959	11.7
Intentional - Misuse	56,820	2.6
Intentional - Abuse	51,673	2.4
Intentional - Unknown	20,050	0.9
Subtotal	**381,502**	**17.6**
Adverse Reaction		
Adverse reaction - Drug	37,074	1.7
Adverse reaction - Other	10,517	0.5
Adverse reaction - Food	5121	0.2
Subtotal	**52,712**	**2.4**
Unknown		
Unknown reason	16,931	0.8
Subtotal	**16,931**	**0.8**
Other		
Other - Malidous	7440	0.3
Other - Contamination / tampering	7432	0.3
Other - Withdrawal	1592	0.1
Subtotal	**16,464**	**0.8**
Total	**2,168,371**	**100.0**

Table 10. Management Site of Human Exposures

Site of management	N	%
Managed on site, nonhealth care facility	1,459,251	67.3
Managed in healthcare facility		
Treated/evaluated and released	299,870	13.8
Admitted to critical care unit	101,785	4.7
Patient lost to follow-up / left AMA	86,067	4.0
Admitted to psychiatric facility	73,579	3.4
Admitted to noncritical care unit	73,460	3.4
Subtotal (managed in HCF)	634,761	29.3
Other	20,530	1.0
Refused referral	29,861	1.4
Unknown	23,968	1.1
Total	2,168,371	100.0

Table 17(A). Substance Categories Most Frequently Involved in Human Exposures (Top 25)

Substance (Major Generic Category)	All substances	%[a]	Single substance exposures	%[b]
Analgesics	287,843	11.11	183,390	9.55
Cleaning Substances (Household)	195,974	7.56	177,667	9.25
Cosmetics/Personal Care Products	192,596	7.43	185,584	9.66
Sedative/Hypnotics/Antipsychotics	151,433	5.84	55,443	2.89
Antidepressants	118,812	4.58	49,452	2.57
Antihistamines	105,457	4.07	74,278	3.87
Cardiovascular Drugs	103,339	3.99	46,131	2.40
Foreign Bodies/Toys/Miscellaneous	94,820	3.66	91,725	4.77
Pesticides	84,129	3.25	78,568	4.09
Topical Preparations	76,101	2.94	74,283	3.87
Alcohols	70,218	2.71	21,763	1.13
Stimulants and Street Drugs	67,879	2.62	39,171	2.04
Vitamins	66,661	2.57	57,169	2.98
Cold and Cough Preparations	60,281	2.33	42,266	2.20
Anticonvulsants	60,210	2.32	24,763	1.29
Antimicrobials	57,839	2.23	47,329	2.46
Hormones and Hormone Antagonists	57,721	2.23	38,906	2.03
Bites and Envenomations	51,409	1.98	50,721	2.64
Gastrointestinal Preparations	48,565	1.87	36,121	1.88
Dietary Supplements/Herbals/Homeopathic	47,995	1.85	39,544	2.06
Plants	46,597	1.80	44,021	2.29
Chemicals	40,614	1.57	34,111	1.78
Fumes/Gases/Vapors	34,261	1.32	31,590	1.64
Other/Unknown Non-drug Substances	31,157	1.20	27,322	1.42
Hydrocarbons	30,445	1.17	28,578	1.49

Table 18. Categories Associated with Largest Number of Fatalities (Top 25)[a]

Substance (Minor Generic Category)	All substances	%[b]	Single substance exposures	%[c]
Miscellaneous Sedative/Hypnotics/Antipsychotics	406	13.34	20	3.85
Miscellaneous Cardiovascular Drugs	379	12.45	51	9.83
Opioids	257	8.45	28	5.39
Miscellaneous Stimulants and Street Drugs	225	7.39	54	10.40
Miscellaneous Alcohols	203	6.67	26	5.01
Acetaminophen Alone	143	4.70	52	10.02
Acetaminophen Combinations	135	4.44	28	5.39
Miscellaneous Antidepressants	111	3.65	11	2.12
Selective Serotonin Reuptake Inhibitors (SSRI)	96	3.15	0	0.00
Miscellaneous Fumes/Gases/Vapors	72	2.37	44	8.48
Tricyclic Antidepressants (TCA)	64	2.10	11	2.12
Miscellaneous Antihistamines	61	2.00	7	1.35
Miscellaneous Unknown Drug	61	2.00	21	4.05
Anticonvulsants: Gamma Aminobutyric Acid and Analogs	59	1.94	1	0.19
Nonsteroidal Antiinflammatory Drugs	58	1.91	8	1.54
Serotonin Norepinephrine Reuptake Inhibitors (SNRI)	57	1.87	3	0.58
Miscellaneous Muscle Relaxants	54	1.77	1	0.19
Acetylsalicylic Acid Alone	49	1.61	18	3.47
Oral Hypoglycemic	46	1.51	5	0.96
Miscellaneous Anticonvulsants	45	1.48	4	0.77
Miscellaneous Chemicals	40	1.31	18	3.47
Cannabinoids and Analogs	34	1.12	4	0.77
Miscellaneous Hormones and Hormone Antagonists	32	1.05	1	0.19
Miscellaneous Diuretics	27	0.89	0	0.00
Miscellaneous Anticoagulants	26	0.85	5	0.96

History

- The history in the overdose patient is notoriously poor.
- If they are truly suicidal, they will not tell you the truth.
- If they are attention seeking, they will exaggerate what they have taken.
- If the history does not correlate with the physical examination and ancillary tests, believe the latter.

Physical Examination

- Complex and not as simple as many books make it appear.
- Findings vary depending on the phase and degree of toxicity.
- Pre-existing medical disease must be taken into consideration.
- Complications (e.g., hypoxic brain injury) can further confuse the picture.

Vital Signs: Temperature

- Uncouplers of Oxidative Phosphorylation
- Anticholinergics
- Malignant Hyperthermia
- Serotonin Syndrome
- Neuroleptic Malignant Syndrome

Neurologic

- Frequent Mental Status Checks
  - Monitoring for agitation or somnolence
- Gag Reflex
- Seizures
  - Non-convulsive status epilepticus
- Movement Disorders
  - Dystonic, dyskinesias
- Don’t be mislead by empty pill bottles
- Rule-out structural & infectious etiologies

Eyes

Miosis

Antipsychotics
Cholinergics
Clonidine
Nicotine (timing)
Opioids (some)

Mydriasis

Anticholinergics
Meperidine
Withdrawal
Sympathomimetics
Phencyclidine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Pulmonary

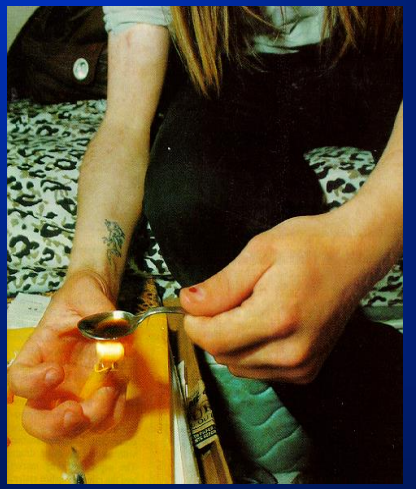
- **Pulmonary Edema**
  - e.g., opioids, salicylates
- **Toxic Pneumonitis**
  - e.g., hydrocarbons, smoke
- **Aspiration Pneumonitis**
  - #1 cause of morbidity in the poisoned patient

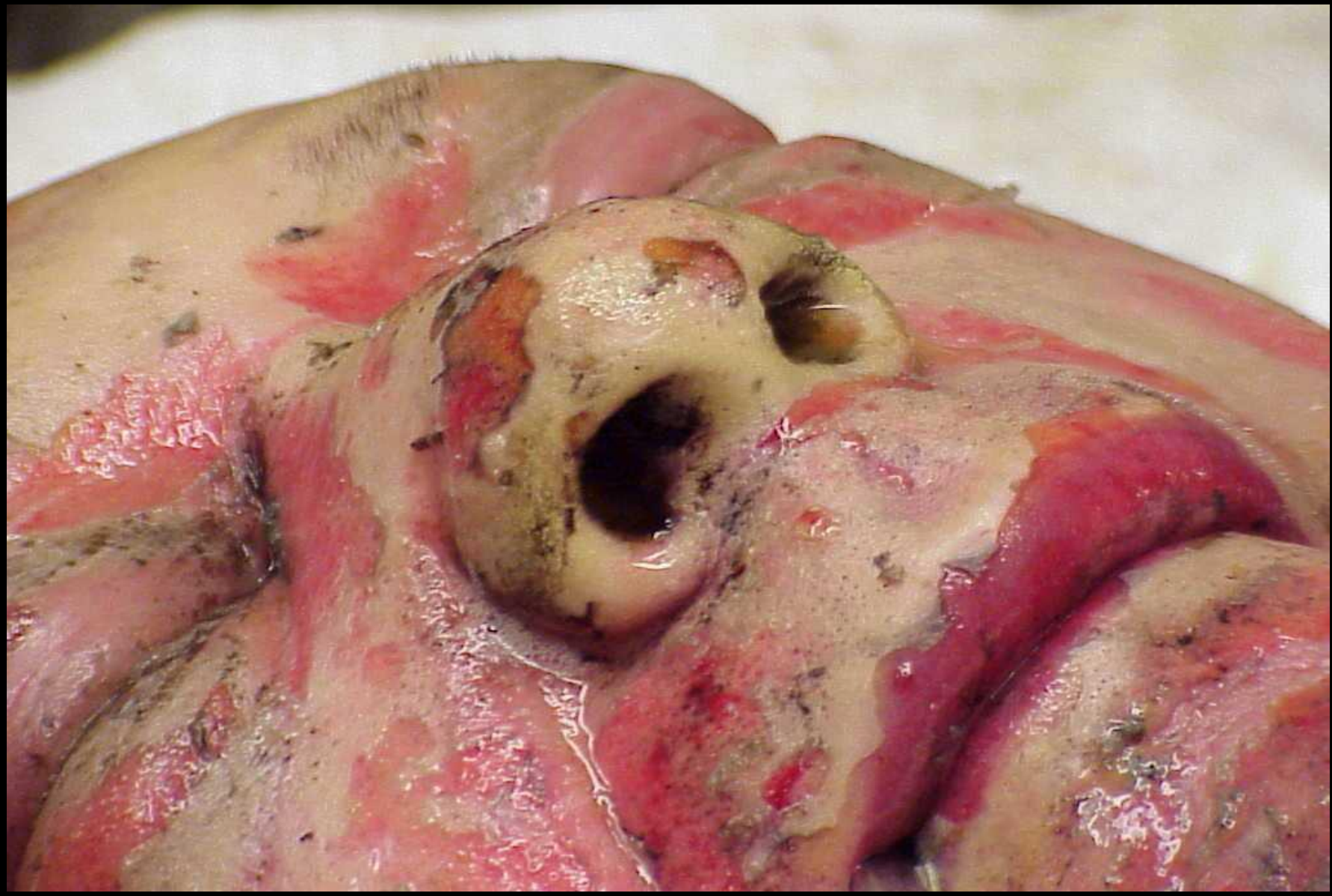
Gastrointestinal

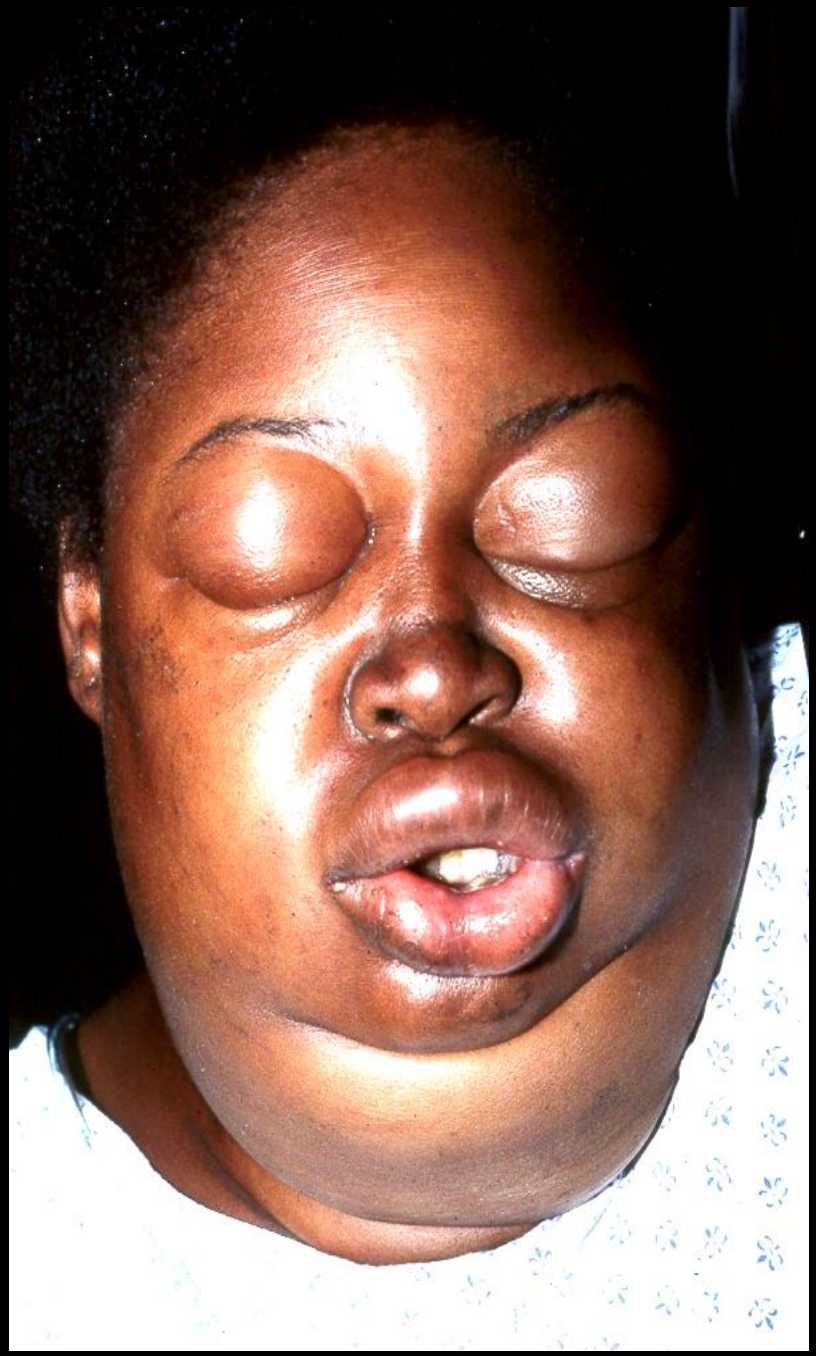
- Hyperactive Bowel Sounds
  - –Cholinergics
  - –Sympathomimetics
- Hypoactive Bowel Sounds
  - –Anticholinergics

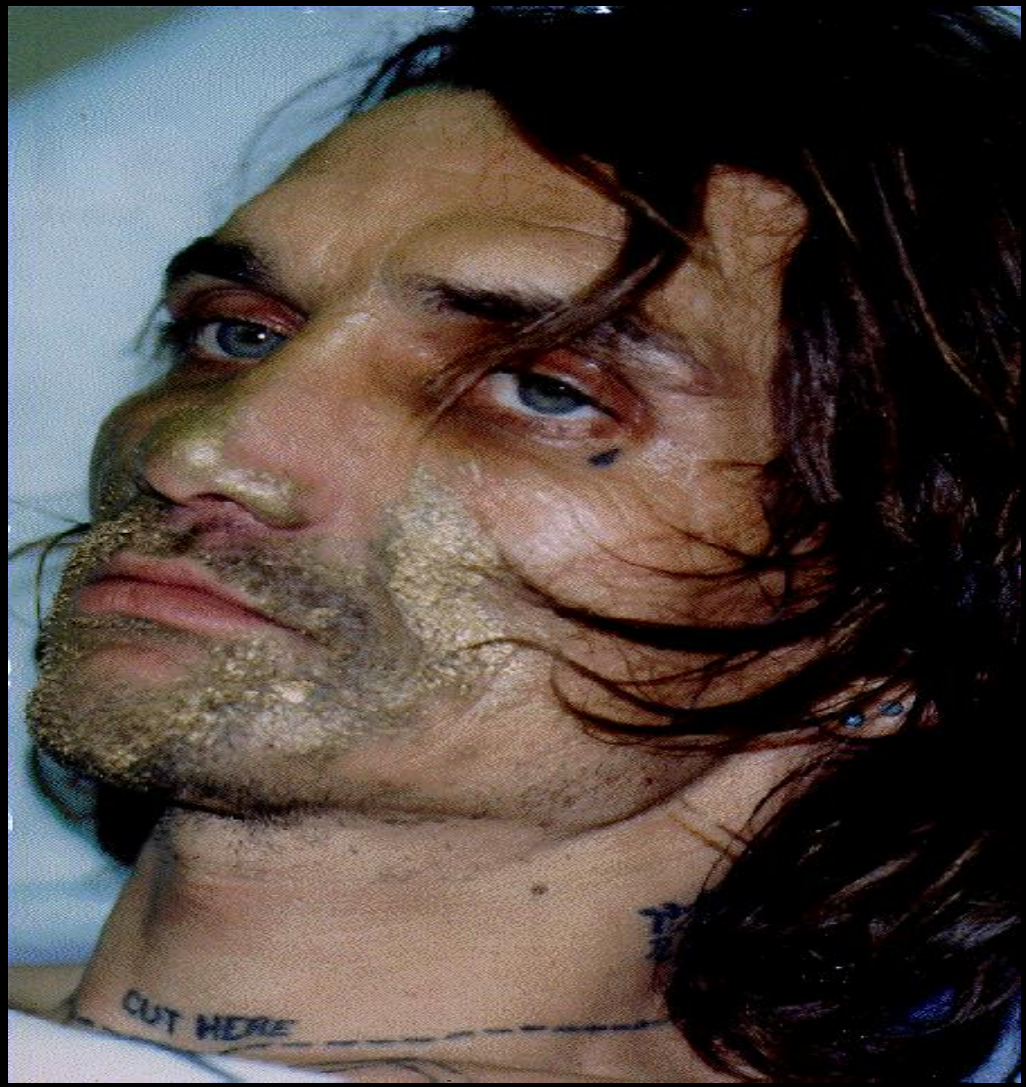
Skin

- **Needle Marks**
  - antecubital, neck, supraclavicular, groin, feet
- **Color**
  - rubor, cyanosis, jaundice
- **Axilla Moisture**
- **Pressure Sores**
- **Transdermal Patches**





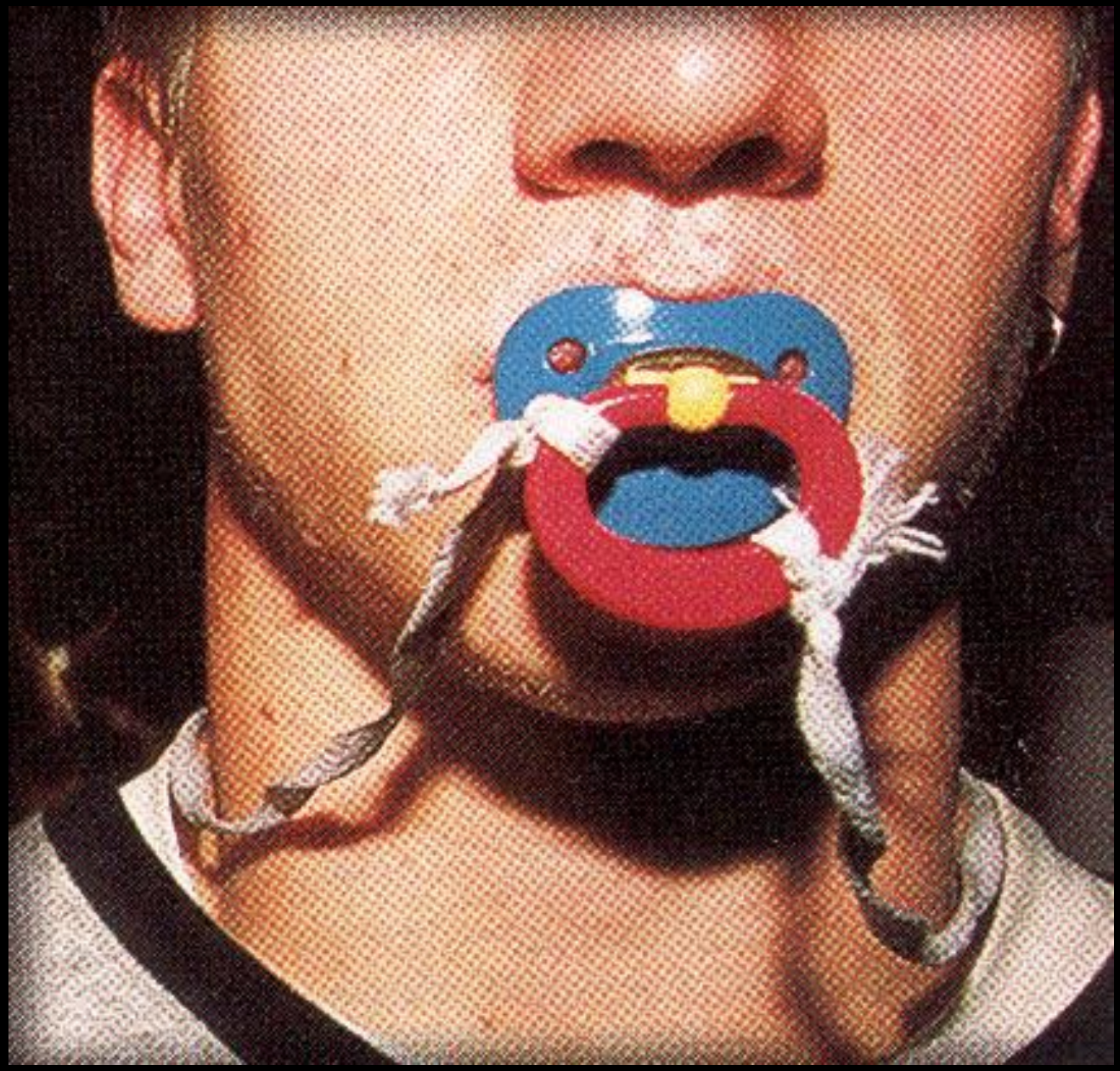



CUT HERE

Breath Odors

- **Bitter Almond** — amygdalin, cyanide - ??
- **Burned Rope** — marijuana
- **Fruity** — acetone, isopropyl alcohol
- **Garlic** — arsenic, organophosphates
- **Mothballs** — naphthalene, paradichlorobenzene
- **Pear** — chloral hydrate
- **Rotten Eggs** — hydrogen sulfide, mercaptans
- **Wintergreen** — methyl salicylate

Personnal Items



Toxic Syndromes

Putting together the physical exam to help make the diagnosis

- Anticholinergic
- Cholinergic
- Drug withdrawal
- Opioid
- Sympathomimetic

The Toxic Timebomb

Now what?

What is the role of ACLS/PALS in toxic resuscitations?

ELSEVIER
SAUNDERS

EMERGENCY
MEDICINE
CLINICS OF
NORTH AMERICA

Emerg Med Clin N Am 24 (2006) 159–177

ECG Manifestations: The Poisoned Patient

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Emergency physicians routinely evaluate and manage poisoned patients. In 2003, more than 2 million human exposure cases were reported to poison centers throughout the United States [1]. Of those cases, 22% were treated in a health care facility with most of those cases evaluated in the emergency department. Cardiovascular drugs were listed as the fifteenth most frequently encountered human exposure (66,401) and the fifth leading cause of poisoning deaths.

Drug-induced changes and abnormalities on the 12-lead electrocardiogram (ECG) are common. There are numerous drugs that can cause ECG changes and lead to cardiac dysrhythmias. The diagnoses and subsequent management of patients manifesting ECG changes following poisonings can challenge even the most experienced physician. Drugs that are advocated in Advanced Coronary Life Support protocols for cardiac dysrhythmias may not apply or may even worsen the condition of overdose patients [2].

Despite that drugs have widely varying indications for therapeutic use, many unrelated drugs share a common cardiac pharmacologic effect if taken in overdose. The purpose of this article is to group together agents that cause similar electrocardiographic effects, review their pharmacologic ac-

Electrocardiogram

- The interpretation of electrocardiogram (ECG) in the poisoned patient can challenge even the most experienced clinician.
- There are numerous drugs that can cause ECG changes.
- The incidence of ECG changes in the poisoned patient is unclear and the significance of various changes may be difficult to define.

Sodium Channel Blockers

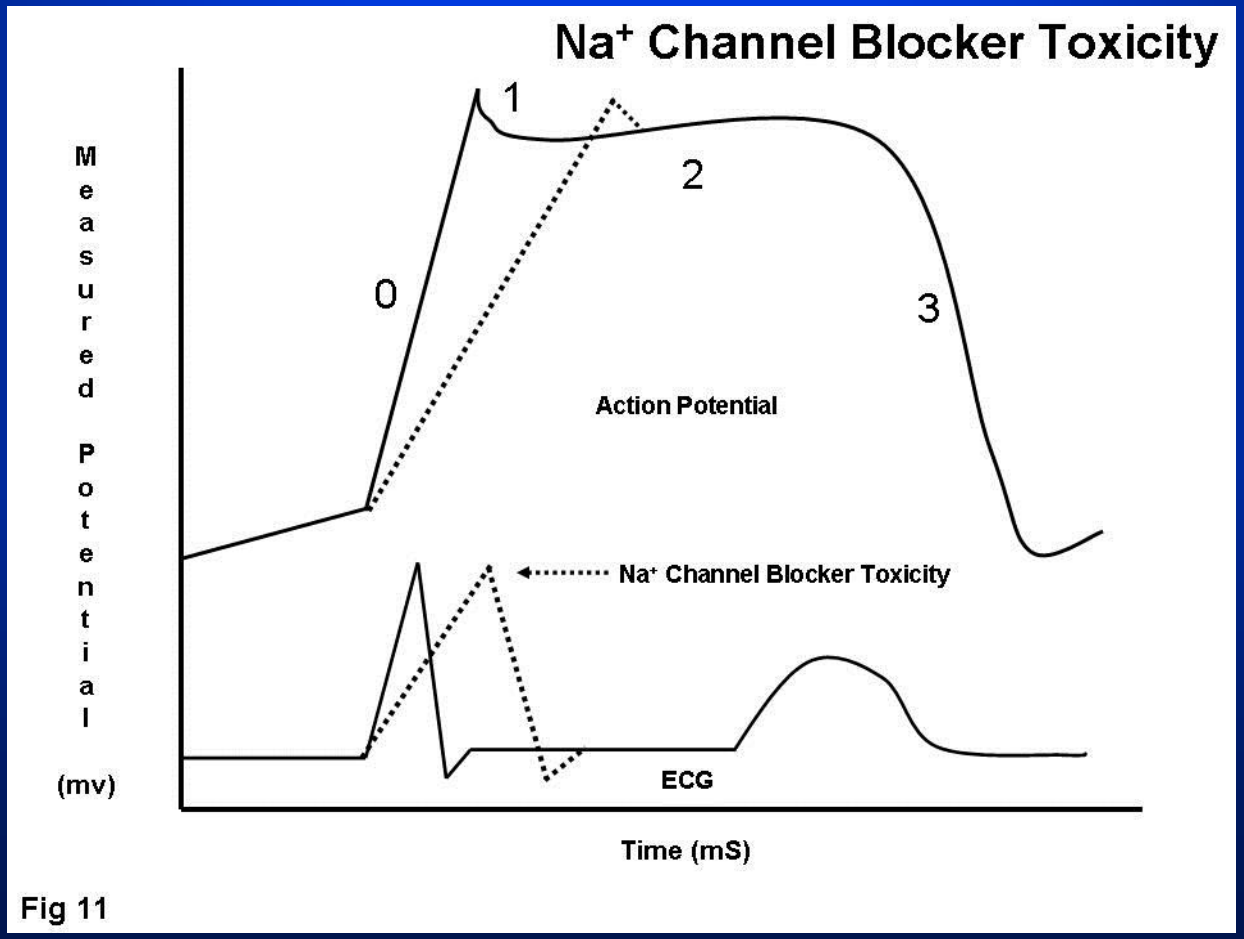


Fig 11

Sodium Channel Blockers

- Amantadine
- Carbamazepine
- Chloroquine
- Class IA antiarrhythmics
  - Disopyramide
  - Quinidine
  - Procainamide
- Class IC antiarrhythmics
  - Encainide
  - Flecainide
  - Propafenone
- Propafenone
- Citalopram
- Cocaine
- Cyclic Antidepressants
  - Amitriptyline
  - Amoxapine
  - Desipramine
  - Doxepin
  - Imipramine
  - Nortriptyline
  - Maprotiline
- Diltiazem
- Diphenhydramine
- Hydroxychloroquine
- Loxapine
- Orphenadrine
- Phenothiazines
  - Medoridazine
  - Thioridazine
- Propranolol
- Propoxyphene
- Quinine
- Verapamil

Electrocardiogram

Potassium Efflux Channel Blockers

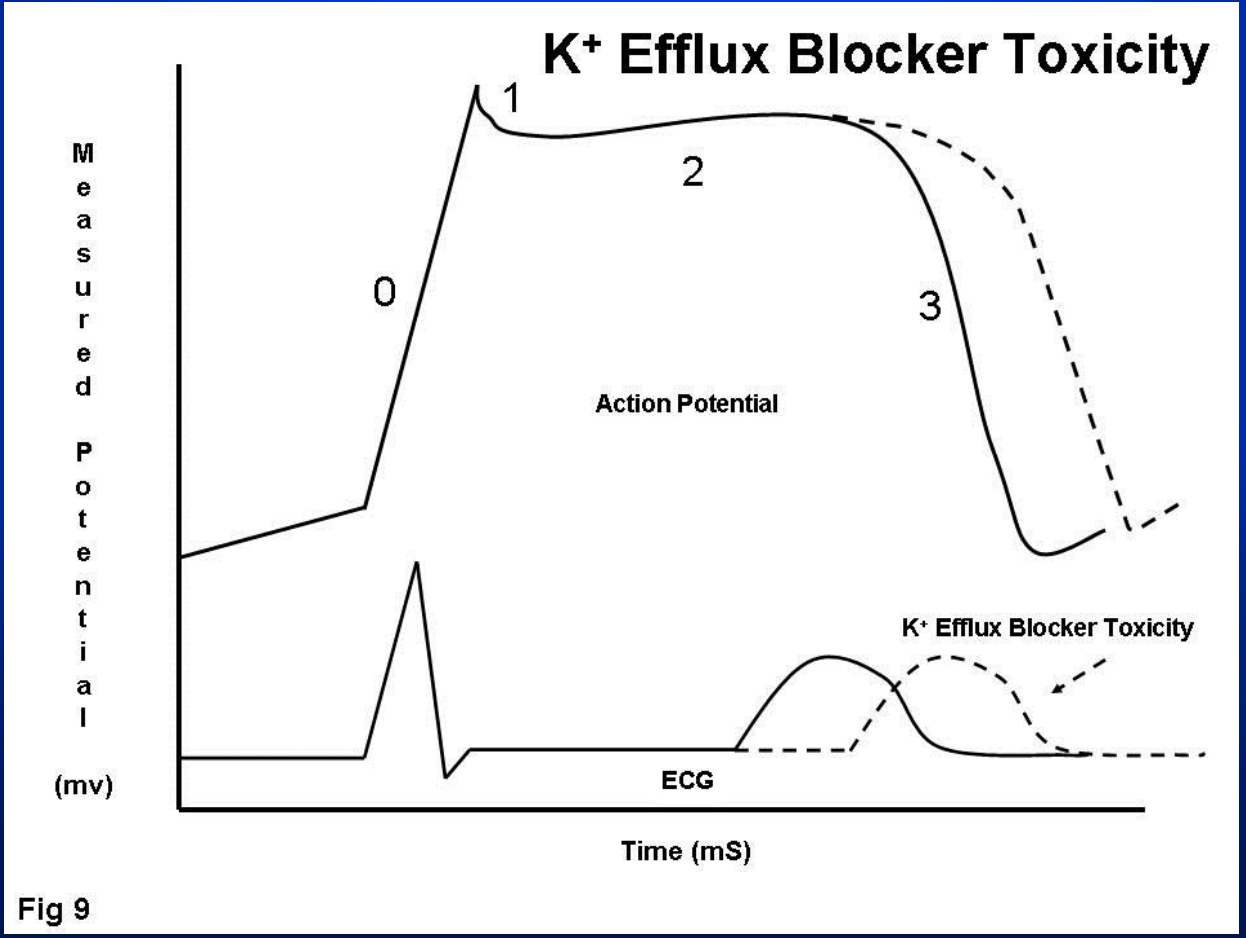
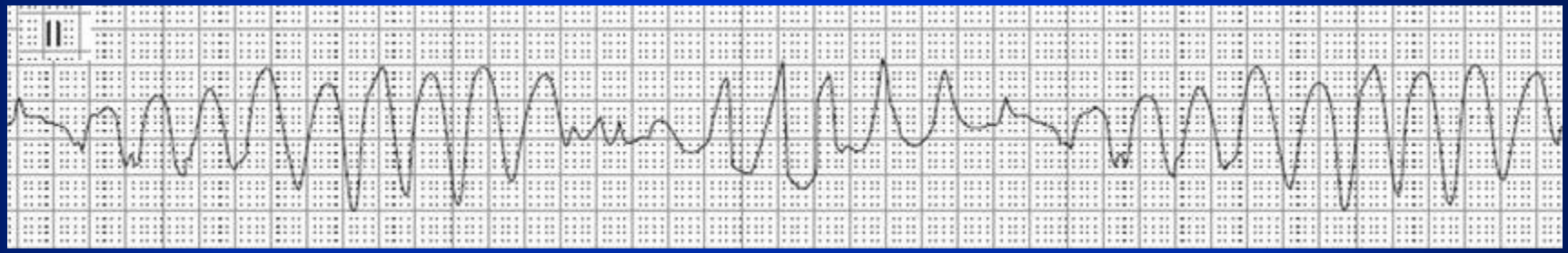


Fig 9

Potassium Efflux Channel Blockers

- Antihistamines
  - Astemizole
  - Clarithromycin
  - Diphenhydramine
  - Loratidine
  - Terfenadine
- Antipsychotics
  - Chlorpromazine
  - Droperidol
  - Mesoridazine
  - Pimozide
  - Quetiapine
  - Risperidone
  - Thioridazine
  - Ziprasidone
- Arsenic trioxide
- Bepridil
- Chloroquine
- Cisapride
- Citalopram
- Clarithromycin
- Class IA antiarrhythmics
  - Disopyramide
  - Quinidine
  - Procainamide
- Class IC antiarrhythmics
  - Encainide
  - Flecainide
  - Moricizine
  - Propafenone
- Class III antiarrhythmics
  - Amiodarone
  - Dofetilide
  - Ibutilide
  - Sotalol
- Cyclic Antidepressants
- Erythomycin
- Fluoroquinolones
- Halofantrine
- Hydroxychloroquine
- Methadone
- Pentamidine
- Quinine
- Venlafaxine

Rhythm Strip



Treatment

Clin Pharmacol Therap 1961;2:220-9

Therapeutic trends in the treatment of barbiturate poisoning

The Scandinavian method

The "Scandinavian method" of treating barbiturate poisoning is presented. As a result of close and constant attention to the support of vital function (the cardiovascular system, respiration, renal function, electrolyte homeostasis) and the prevention of infection, the mortality rate from barbiturate poisoning in our clinics has been brought down to 1.5 per cent whereas previously it was over 10 per cent. The details of this method, the history of its development, and the basis of its use are explained.

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The present review of the treatment of barbiturate poisoning does not embrace the world-wide literature on this subject. A review of this sort should perhaps have such a background, but the countless articles

tion of this department will be referred to later.

Rising incidence

Barbiturate poisoning and its treatment

Treatment
General

- Always start with the ABC's
  - protect that airway
- Seizures
  - Benzodiazepines (e.g., midazolam)
  - Ketamine
- Agitation
  - use combination of physical and chemical restraints
  - physical restraints without chemical restraints leads to rhabdomyolysis
  - benzodiazepines and some antipsychotics are the agents of choice

“Excited Delirium”

Excited Delirium

Forensic Sci Med Pathol (2014) 10:223–228

Forensic Sci Med Pathol (2014) 10:223–228
DOI 10.1007/s12024-014-9530-2

REVIEW

The syndrome of excited delirium

James R. Gill

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Abstract The excited delirium syndrome (EDS) is a life-threatening condition caused by a variety of factors including drug intoxication and psychiatric illness. Fatal instances of excited delirium frequently come to the attention of the medical examiner/coroner due to the circumstances and potential causes. Excited delirium may include paranoid, aggressive, and incoherent behavior which may lead to an encounter with law enforcement. In some instances, the person may die while in the presence of law enforcement. This circumstance further broadens the

Keywords Forensic pathology · Agitated delirium · Excited delirium · Cocaine psychosis · Restraint

Introduction

There has been debate in medicine as to how to characterize the syndrome of excited (or agitated) delirium and if it even exists [1–7]. In 2009, the American College of Emergency Physicians issued a white paper on the excited

Excited Delirium

Definition:

- The term ‘‘Excited Delirium’’ has been used to refer to a subcategory of delirium that has primarily been described in the forensic literature. It has also been referred to as ‘‘Agitated Delirium’’ and is closely associated with the ‘‘Sudden Death in Custody Syndrome.’’
- Originally, the concept of excited delirium was described in the forensic literature and has been synonymous with death, but over time the term has made its way into the emergency medicine, psychiatric, law enforcement, prehospital, and medicolegal literature.
- It has generally been used to describe patients displaying altered mental status with severe agitation and combative or assaultive behavior that has eluded a unifying, prospective clinical definition.
- There has been debate in medicine as to how to characterize it and if it even exists.

Treatment

- **Midazolam**
  - C_{max} = 17 min; $T_{1/2}$ = 2-5 hours
- **Haloperidol**
  - C_{max} = 20 min; $T_{1/2}$ = 20 hours
- **Ketamine**
  - C_{max} = 12 min; $T_{1/2}$ = 1 hour

Activated Charcoal

- **Tremendous Surface Area**
  - adsorbs toxins into pores on the surface
  - dose 1gm/kg
- **Not effective for:**
  - toxic alcohols, heavy metals, hydrocarbons
- **Multidose for**
  - Salicylates, theophylline, phenobarbital , sustained release products
- **Complications**
  - aspiration pneumonitis
  - bowel obstruction
  - electrolyte imbalances if given with a cathartic
- **Contraindications**
  - central nervous system depression with unprotected airway
  - pending endoscopy
  - ingestion of agents not bound to activated charcoal
  - lack of bowel sounds in repeat dosing
  - repeat dosing with cathartic combination

Antidotes

- **Naloxone**
  - reverses respiratory/CNS depression due to opioids
  - titrate dose, with large doses possibly necessary
  - effect of agent may last longer than naloxone & renal failure
  - consider restraint before giving
- **Flumazanil**
  - reverses respiratory/CNS depression due to benzodiapezpines
  - 0.2mg in 10cc and titrate dose
  - effect of agent may last longer then flumazanil
  - contraindicated in chronic benzodiazepine use, cyclic antidepressent

Antidotes
examples

- Acetaminophen
- Benzodiazapines
- Beta blockers
- Calcium channel blockers
- Cardiac glycosides
- Crotalid envenomation
- Cyanide
- Ethylene glycol
- Iron
- Isoniazid
- Methanol
- Methemoglobinemia
- Opioids
- Organophosphates
- Sulfonylureas

- N-acetylcysteine
- Flumazenil
- Glucagon
- High dose insulin therapy
- Digoxin immune Fab
- Crotalidae polyvalent immune Fab
- Hydroxocobalamin
- Fomepizole; Thiamine; Pyrodixime
- Deferoxamine
- Pyridoxine
- Fomepizole, Folate
- Methylene blue
- Naloxone
- Atropine; Pralidoxime
- Octreotide

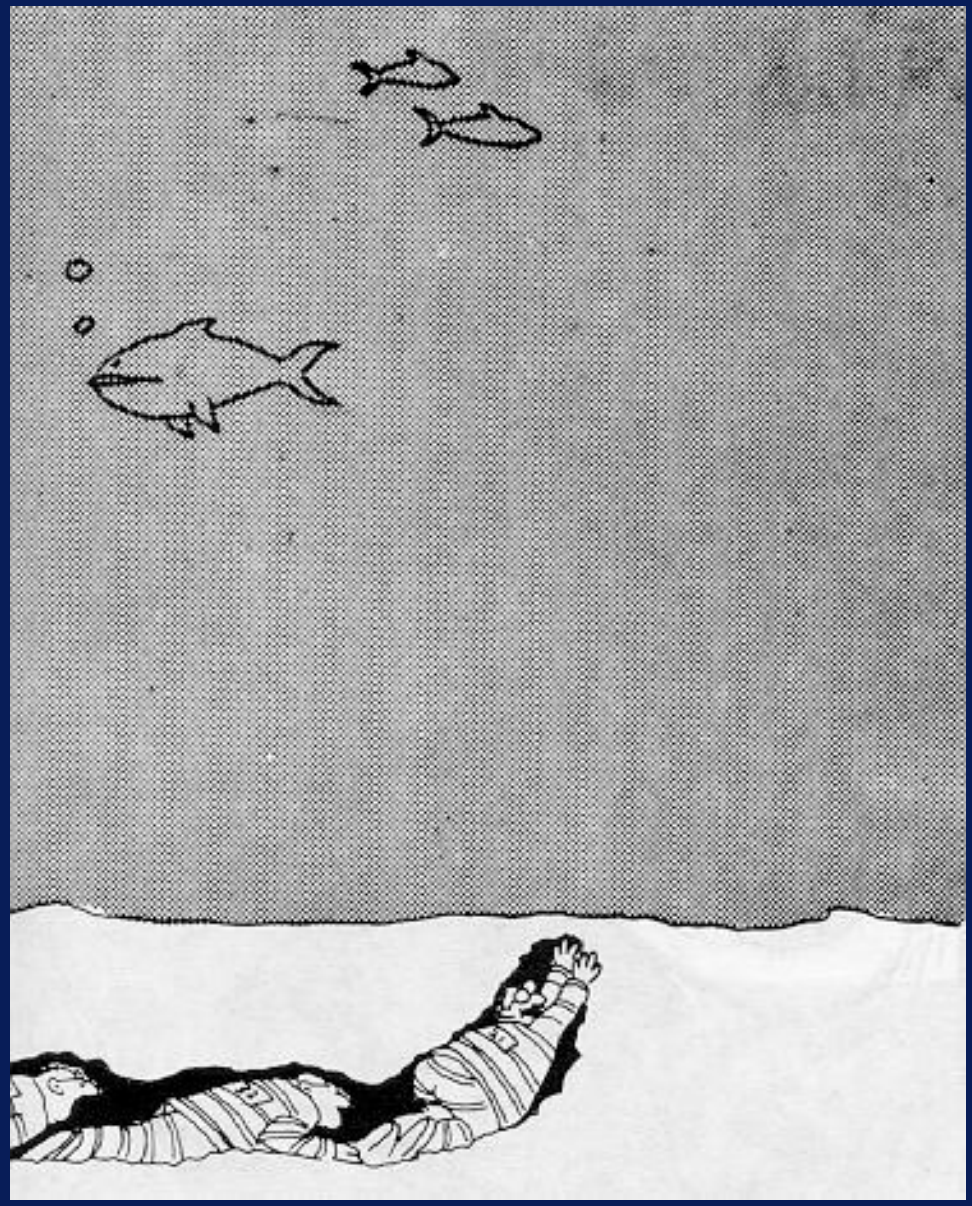
Dialysis

Toxins amendable to hemodialysis:

- Bromide
- Caffeine
- Ethylene Glycol
- Lithium
- Methanol
- Salicylate
- Theophylline

Complications

- Anoxic brain injury
- Aspiration pneumonia
- Seizures
- Rhabdomyolysis
- Dysrhythmias



“We’re almost free, everyone!... I just felt the first drop of rain.”