



Case 318: Shortness of Breath

- **Chief complaint**
 - 18-year-old male presents via private vehicle for acute respiratory distress.
 - Nursing triage: patient dropped off by co-workers in private vehicle for “not acting right” and “seems like he can’t breathe”. No additional information is currently available because they had to go park the car.
- **Vital signs**
 - **HR: 40 BP: 80/45 RR: 36 Sat: 85% on RA T: 38.2°C Wt: 65 kg**
- **Patient appearance**
 - The patient is unresponsive to painful stimuli, no spontaneous movement, noted to be covered in vomitus, urine and stool.
- **Primary survey**
 - Airway: gag reflex absent (if checked), copious oral secretions
 - Breathing: increased respiratory rate, bilateral rhonchi
 - Circulation: 1+ peripheral pulses throughout, cool skin
 - Disability: eyes closed, pupils are pinpoint, no verbal or motor response to painful stimuli (GCS 3), incontinent of urine and stool
 - Exposure: patient is wearing a uniform with a name badge (John) and company name (“Pesky Pest Control”). Clothing should be removed using hazardous waste precautions (use PPE) and the patient should be decontaminated (mild soap and water) *after* performing life-saving interventions.
- **Action**
 - All healthcare providers should put on personal protective equipment (if not already completed)—gloves, gown, and face mask are sufficient. Respirators are not needed.
 - Place patient on the monitor, will show sinus bradycardia
 - Oxygen by NRB, consider jaw thrust and nasal airway or LMA placement with BVM ventilation
 - Two large bore peripheral IV lines (draw rainbow top)
 - 1 L IVF bolus
 - POC glucose (120, must ask)
 - If atropine standard dose is given (0.5-1 mg), there will be no response.
 - Advanced airway equipment and crash cart to the bedside, place pacer pads on patient
 - Intubate for airway protection

- Rapid sequence intubation (learner should identify approach, meds and dosages used)
 - Avoid succinylcholine (prolonged duration in cholinergic toxicity)
 - Post-intubation care (learner should provide vent settings, sedation including pain control, post-intubation OGT, CXR, Foley)
 - Order stat ECG (delayed interpretation)
 - Order stat portable CXR (delayed interpretation)
 - Decontaminate the patient (if not already completed, must describe—remove clothing, wash with mild soap and water)
 - Consider POCUS - significant for slow HR and slightly reduced EF, collapsible IVC, B-lines on lung exam, otherwise unrevealing
- **Instructor Prompt:** learners should discuss differential diagnoses
- **History**
 - Source: patient is unresponsive, co-workers are not available
 - HPI: an 18-year-old male presents via EMS for acute respiratory distress. The only info available is in the triage report above.. The patient’s uniform names his employer, “Pesky Pest Control.” If the company is called, they will report the patient was recently hired and routinely works with pesticides. The company will report no known medical problems.
 - PMHx: unknown
 - PSHx: unknown
 - Allergies: unknown
 - Meds: unknown
 - Social: unknown
 - FHx: unknown
 - Code Status: unknown
- **Response/Results**
 - Patient reevaluation and repeat vitals:
 - Still with copious secretions.
 - Vitals after 1 L IVF intervention: **HR: 40 BP: 90/60** Sat: 98% on vent
 - Vitals if no fluids given: **HR: 40 BP: 65/30** Sat: 98% on Vent (Prompt: give IVF bolus)
- **Physical Exam**
 - **General:** intubated, vomitus on clothing, incontinent of urine and stool
 - **HEENT:** bilateral pinpoint pupils, tearing bilaterally, ears normal, rhinorrhea, copious oral secretions requiring frequent suctioning
 - Neck: normal
 - Chest: nontender
 - **Heart:** bradycardic, otherwise normal

- **Lungs:** mechanical breath sounds, crackles and rhonchi diffusely
- **Abdomen:** hyperactive bowel sounds, mildly distended, otherwise normal
- **Rectal:** normal tone, incontinent of brown liquid stool, no blood
- **Extremities:** diffuse muscle fasciculations, no evidence of trauma, 1+ distal pulses throughout
- Back: normal
- **Neuro:** no motor response to painful stimuli, DTRs hyperactive but equal, Babinski negative, +muscle fasciculations, no clonus, otherwise exam limited
- **Skin:** diaphoresis, no rashes

- **Action**

- Order Labs (if not already done)
 - CBC, BMP, LFT, lipase, PT/INR, PTT, type and screen, urinalysis, ABG after intubation
 - Consider troponin, urine toxicology screen, acetaminophen level, salicylate level, lactic acid
- Order Meds
 - 1L IVF bolus (if not already given), may consider 2nd liter
 - IV Atropine (2 mg) q5 minutes, titrate to dry secretions. An alternative dosing strategy is to double the dose of atropine q5 minutes: first dose = 2 mg IV, second dose = 4 mg IV, third dose = 8 mg IV, until pulmonary secretions have dried. In clinical practice, > 100 mg may be required.

- **Response/Results**

- Patient reevaluation and repeat vitals:
 - Vitals after at least 8 mg of atropine given: HR: 60 BP: 104/68
 - Improved secretions
 - Vitals if too little or no atropine given: **HR: 36 BP: 86/54** (Prompt: give atropine)
- [Case 318 Lab Results](#) (sig for WBC 14, K 3.7, CO2 15, AG 19; initial ABG 7.12 / 45 / 52 / 13 / 82%)
- Additional Lab Results: **lactate 4.5 mmol/L**, EtOH undetectable, salicylate undetectable, acetaminophen undetectable, measured serum osmolality 300 mmol/kg, troponin negative
- ECG (verbal report- sinus bradycardia, no blocks)
- CXR (verbal report- mild pulmonary vascular congestion, ETT and NGT in appropriate positions)

- **Action**

- Discuss case with Poison Control Center
 - Consultant recommendations include
 - IV atropine (as above), start atropine gtt at 10-20% of dose required to control secretions (8 mg IVP -> 1.5 mg/hour)

- 2-PAM (pralidoxime) 2 g slow IVP (30 mg/kg), repeat dose in 1 hour
 - Benzodiazepines (diazepam 5-10 mg IV) to prevent seizures, reduce fasciculations
 - IVF for euvoemia, then epinephrine prn for MAP > 65 mm Hg
- Admit patient to ICU
- **Diagnosis**
 - Primary Diagnosis: Organophosphate poisoning
- **Critical actions**
 - Decontaminate patient and utilize personal protective equipment
 - Immediately recognize coma, begin resuscitation early including intubation
 - Obtain POC glucose early or give dextrose
 - Recognize organophosphate toxidrome
 - IVF for euvoemia, followed by vasopressors
 - Treat with adequate dose of atropine
 - ICU admission
- **Instructor Guide**
 - This is a case of organophosphate poisoning in a patient presenting with acute respiratory distress, unresponsiveness, and copious secretions. He has recently started a new job with an insect extermination company. The patient was dropped off by his co-workers after acute onset shortness of breath and vomiting while at work. Clues to organophosphate toxidrome will include the clinical symptoms and the patient's clothing suggesting his line of work. Important early actions include protection of self and staff with appropriate PPE, intubation, decontamination of the patient, IV fluids and atropine. If time allows, consider repeat atropine dosing and 2-PAM for continued symptoms. Benzodiazepines may also be given to prevent seizures. The patient should be dispositioned to the ICU.
- **Case Teaching Points**
 - The differential diagnosis for a young unresponsive patient with unstable vitals should include traumatic or spontaneous intracranial hemorrhage, sepsis, metabolic derangement, and both recreational and non recreational toxic exposures.
 - **Decontamination** is an important part of management. Clothing should be treated as hazardous waste. The patient's skin should be cleaned with soap and water. Healthcare workers should take care to avoid contamination by using personal protective equipment including masks, gloves, and gowns.
 - Treatment requires **aggressive airway monitoring and intubation as necessary**, although atropine given in adequate doses may prevent the need for intubation. If a patient is intubated with suspicion for organophosphate exposure, succinylcholine should be avoided (degraded by acetylcholinesterase) as it may result in prolonged paralysis.

- **Atropine** (competitive inhibitor at *muscarinic* cholinergic receptors) is the mainstay of treatment and very high doses are often required. The initial dose should generally be 2 mg IV push, repeated every 5 min as needed. The endpoint of therapy is dried pulmonary secretions and adequate oxygenation. In patients with acute respiratory distress/failure, consider doubling the dose of atropine with each round of administration for more rapid effect.
- **What are organophosphates?**
 - Chemical compounds (insecticides, nerve gases) that inhibit acetylcholinesterase, leading to accumulation of acetylcholine and overstimulation of muscarinic and nicotinic receptors.
 - Organophosphates are the most common chemical exposure related reason for an ED visit.
 - Examples include: diazinon, acephate, malathion, parathion, and chlorpyrifos.
- **What are the muscarinic effects of cholinesterase inhibition?**
 - Use the mnemonic “SLUDGE/DUMBELLS”
 - Salivation, Lacrimation, Urinary incontinence, Defecation, GI pain, Emesis
 - Defecation, Urination, Miosis, Bradycardia, Bronchorrhea, Bronchospasm, Emesis, Lacrimation, Salivation
 - Remember the “Killer Bs:” bradycardia, bronchorrhea, and bronchospasm
- **What are the nicotinic and CNS effects of cholinesterase inhibition?**
 - Nicotinic
 - Muscle fasciculations, cramps, weakness
 - Mydriasis, pallor
 - Tachycardia, hypertension
 - CNS
 - Anxiety, restlessness, emotional lability
 - Tremor, headache, dizziness
 - Confusion, delirium, hallucinations
 - Seizures, coma
- **What is the progression of organophosphate poisoning?**
 - Acute
 - Symptom onset typically within the first 8 hours after exposure
 - Usually CNS, muscarinic, nicotinic and somatic motor symptoms seen
 - Intermediate syndrome
 - Typically 1 to 5 days after exposure, with resolution in 7 days
 - Symptoms include paralysis of neck flexor muscles, muscles innervated by cranial nerves, proximal limb muscles and respiratory muscles
 - No signs of cholinergic excess
 - Organophosphate-induced delayed neuropathy

- Cognitive dysfunction, impaired memory, mood changes, autonomic dysfunction, peripheral neuropathy, extrapyramidal signs
 - More likely related to inhalation as opposed to cutaneous exposure
 - Chronic toxicity
 - Usually agricultural workers
 - Symptoms include symmetrical sensorimotor axonopathy such as leg cramps, weakness and paralysis, can mimic Guillain-Barre
- **What is the role of atropine and 2-PAM in the treatment of organophosphate poisoning? Are there additional treatment options?**
 - Atropine (competitive inhibitor at *muscarinic* cholinergic receptors) dosing begins at 2 mg IV and can be given every 5 minutes. It may even be doubled on each subsequent dosing. The titration endpoint for atropine is drying of pulmonary secretions. Very high doses of atropine may be required (even as high as double-digit doses and > 100 mg total).
 - If atropine is limited or patients develop anticholinergic delirium, glycopyrrolate (peripheral antimuscarinic) or diphenhydramine may be used to improve some symptoms as a last resort. Atropine toxicity may present as dilated pupils and HR > 120.
 - 2-PAM (pralidoxime) reactivates acetylcholinesterase (treats both muscarinic and nicotinic symptoms) and historically was used to reverse fasciculations and neuromuscular blockade. For adult patients, start with a bolus dose 30 mg/kg IV over 30 min, followed by continuous infusion of 8 mg/kg/hour for 24-48 hours.
 - Use benzodiazepines (diazepam 5-10 mg IV) to prevent seizures and reduce fasciculations.
 - Give IVF for euolemia, then epinephrine prn for MAP > 65 mm Hg.
 - Patients with symptomatic organophosphate toxicity should be admitted to the ICU.
- **Attributions**
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Case 318 Lab Results

Basic Metabolic Panel:

Na	138 mEq/L
K	3.7 mEq/L
Cl	104 mEq/L
CO ₂	15 mEq/L
BUN	15 mg/dL
Cr	0.9 mg/dL
Gluc	86 mg/dL

Liver Function Panel:

AST	32 U/L
ALT	14 U/L
Alk Phos	90 U/L
T bili	1.1 mg/dL
D bili	0.3 mg/dL
Lipase	40 U/L
Albumin	4.0 g/dL

Complete Blood Count:

WBC	14.0 x 10 ³ /uL
Hb	13.1 g/dL
Hct	39.5%
Plt	300 x 10 ³ /uL

Urinalysis:

SG	1.018
pH	6.8
Prot	Neg
Gluc	Neg
Ketones	Neg
Bili	Neg
Blood	Neg
LE	Neg
Nitrite	Neg
Color	Yellow

Coagulation Panel:

PT	13.1 sec
INR	1.0
PTT	26 sec

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