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Case report: Organophosphourus intermediate syndrome

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Abstract:

Several organophosphorus esters are used as insecticides because they inhibit the acetylcholinesterase (AChE) of insects. The same mechanism accounts for acute toxicity in humans and is ischaracterised by signs of cholinergic overstimulation.

A 7 years old girl admitted to PICU with organophosphorous poisoning after stabilization and shifted to general word develop facial twisting and weakness.

Key words: Organophosphourus, Intermediate (neurologic) syndrome.

A 7 years old Saudi girl, referred from Al-Aqiq hospital on 20/5/2017 as a case of organophosphate poisoning. Patient intubated and received one dose of atropine then shifted to King Fahad Hospital at Albaha-KSA.

In our ER patient was critically ill , severe distressed, intubated, looks very sick, with clear smell of organophosphate smell, hypersalivation and both eyes miosis (pin point pupil).

Vital signs: Temperature: 38^0 C, Heart Rate: 155 beat/minute, Blood Pressure: 126/87, O2 Saturation: 95% on Mechanical Ventilation, Weight: 25kg.

Chest: Equal air entry, with bilateral wheezing.

Cardiovascular System: normal first and second heart sound, no murmer.

Abdomen: Soft, lax , no organomegally.

CNS : Semiconscious , Glasgow Coma Scale(GCS): 7/15, pupil bilateral miosis, power in upper and lower limbs 3/5, sensation and reflexes were intact.

Patient was shifted to pediatrics intensive care unit(PICU) from the ER after stabilization.

In PICU Patient immediately decontaminated (washing, irrigation of eyes by N0rmal Saline), connected to mechanical ventilator, started I.V Atropine multiple doses until no secretion, and clear wheeze with concurrent Pralidoxime IV bolus, then continuous infusion rate of 10 mg/ kg/ hr.

After 4 hours patient was stabilized and ex-tubated and stay on room air. Second day in the PICU she was well, good oral intake and normal chest and neurological examination.

S0 shifted from PICU to general word for two days with regular follow up.

Third day in general word she became very irritable with facial twisting and eyelids flickering, she was drowsy with upper and lower limbs weakness(power grade 3), GCS was 9-10/15, heamodynamically stable on Oxygen by facial mask.

Patient was shifted to PICU as a case of 2^{nd} phase of Organophosphate intermediate(neurologic) syndrome and treatment with bolus Pralidoxime and infusion started with no significant improvement in neurological findings.

MRI brain was done to the patient immediately after second admission to PICU and after 16 days when planned to discharge with the following report respectively: figure 1,2,3

Patient was seen regularly in the Out Patient Clinic for neurological evaluation which showed almost normal neurological examination.

INVESTIGATIONS AFTER SECOND ADDMISSION TO PICU:

CBC: WBC:13.5 (neutrophil: 75% , lymphocyte: 17)
Hb:13.3 PLT:310
Chemistry: Na:139 K:3.7 CA:2.3 Ph:1.4
Urea:2.6 Creatinin: 26 Albumen:32
CK: 311 LDH: 318
Blood gas: Initially PH:7.18 PCO2:52.5 PO2:48 HCO3:17.1
Then repeated PH:7.44 PCO2:26.1 PO2:56 HCO3: 20.8

MRI BRAIN

Report

Bilateral supratentorial multifocal areas of cortical and subcortical distribution of abnormal signal intensities eliciting hypointense signals at T1 changes to hyperintense signals at T2 and FLAIR series with no restricted diffusion could be seen. Otherwise unremarkable study.
Conclusion: The previously described findings correlated with history likely representing HIE.

Figure 1 MRI Brain

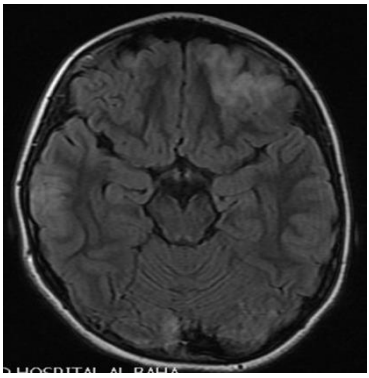


Figure 2 : MRI Brain

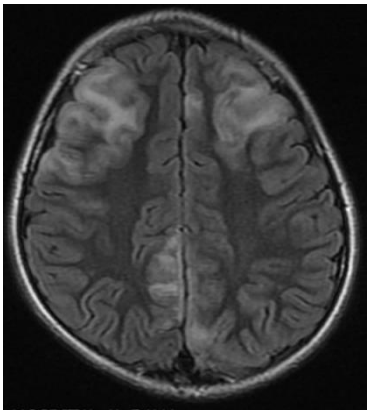
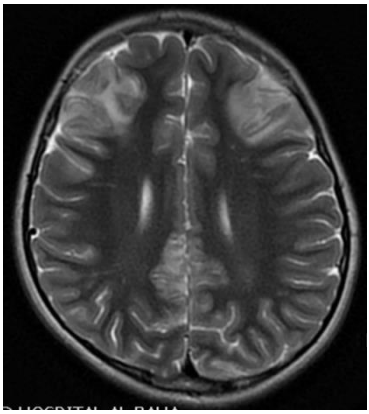


Figure3 : MRI Brain



Introduction

Several organophosphorus esters are used as insecticides because they inhibit the acetylcholinesterase (AChE) of insects(1). The same mechanism accounts for acute toxicity in humans and is ischaracterised by signs of cholinergic overstimulation(2). In addition, certain organophosphates may cause a distal, sensory-motor, central-peripheral axonopathy known as organophosphate induced delayed polyneuropathy (OPIDP)(3,4).

Such poisonings are associated with several syndromes, including acute cholinergic crises, the intermediate syndrome (IMS), and organophosphate-induced delayed neuropathy.

Organophosphate poisoning is poisoning due to organophosphates (OPs). Organophosphates are used as insecticides, medications, and nerve agents. (5) Symptoms include increased saliva and tear production, diarrhea, vomiting, small pupils, sweating, muscle tremors, and confusion. (6)While onset of symptoms is often within minutes to hours, some symptoms can take weeks to appear. (7)Symptoms can last for days to weeks(6).

Organophosphate poisoning occurs most commonly as a suicide attempt in farming areas of the developing world and less commonly by accident(6). Exposure can be from drinking, breathing in the vapors, or skin exposure(5). The underlying mechanism involves the inhibition of acetylcholinesterase (AChE), leading to the buildup of acetylcholine (ACh) in the body. Diagnosis is typically based on the symptoms and can be confirmed by measuring butyrylcholinesterase activity in the blood. Carbamate poisoning can present similarly(6).

The onset and severity of symptoms, whether acute or chronic, depends upon the specific chemical, the route of exposure (skin, lungs, or GI tract), the dose, and the individuals ability to degrade the compound, which the PON1 enzyme level will affect.

The intermediate syndrome (IMS) appears in the interval between the end of the cholinergic crisis and the onset of OPIDP. Symptoms associated with IMS manifest within 24–96 hours after exposure. The exact etiology, incidence, and risk factors associated with IMS are not clearly understood, but IMS is recognized as a disorder of neuromuscular junctions. IMS occurs when a person has a prolonged and severe inhibition of AChE and has been linked to specific OP pesticides such as methylparathion, dichlorvos, and parathion. Patients present with increasing weakness of facial, neck flexor and respiratory muscles.

Current antidotes for OP poisoning consist of a pretreatment with carbamates to protect AChE from inhibition

by OP compounds and post-exposure treatments with anti-cholinergic drugs. Anti-cholinergic drugs work to counteract the effects of excess acetylcholine and reactivate AChE. Atropine can be used as an antidote in conjunction with pralidoxime or other pyridinium oximes(suchas trimedoxime or obidoxime), (8)though the use of "-oximes" has been found to be of no benefit, or possibly harmful, in at least two meta-analyses(9). Atropine is a muscarinic antagonist, and thus blocks the action of acetylcholine peripherally. (10)These antidotes are effective at preventing lethality from OP poisoning, but current treatment lack the ability to prevent post-exposure incapacitation, performance deficits, or permanent brain damage(11). While the efficacy of atropine has been well-established, clinical experience with pralidoxime has led to widespread doubt about its efficacy in treatment of OP poisoning(12).

Organophosphates have been used as insecticides worldwide for more than 50 years. The use of these agents has declined in the last 10 to 20 years, in part due to the development of carbamate insecticides, which are associated with similar toxicities(13).

Worldwide, an estimated 3,000,000 people are exposed to organophosphate or carbamate agents each year, with up to 300,000 fatalities.(14 ,15).

Discussion

This is the first reported case of intermediate syndrome of OP poison in King Fahad Hospital-Albaha inspite of many cases admitted with organophosphorus poison.

OPs are commonly used in agricultural products, including insecticides and defoliants. They are rapidly absorbed by all routes of exposure, including dermal, respiratory and gastrointestinal, and irreversibly inhibit the enzyme acetylcholinesterase at cholinergic synapses, resulting in excess cholinergic stimulation at the neuromuscular junction, the

sympathetic and parasympathetic nervous systems, and the CNS (16).

In our patient the absorption was mostly through the skin and respiratory tract as it was sprayed to here hair to kill lice's from here hair. So the initial management by early decontamination is important, but in our patient the decontamination was done after she was admitted to our PICU. Mohammed A Al Jumaan et all showed in their study in Saudia Arabia that skin contamination represented 6% most of them non accidental and their ages more than 18 years old.(17)

The initial respiratory failure in our patient mostly due to excessive secretions and muscle spam as stimulation of nicotinic receptors causes weakness and paresis of the respiratory muscles(18)..So resulting in respiratory failure, which is the most common complication encountered in the literature. (19,20)

Unlike adults, infants mainly present with acute CNS depression (21) and do not demonstrate the typical muscarinic effects. Symptoms such as fasciculation, bradycardia and acute respiratory failure are more common in children (22).

In our patient she represented CNS manifestations after showing improvement and discharged from PICU to general word. Unfortunately, atropinization does not reverse either the central or nicotinic cholinergic signs or symptoms, particularly the muscle weakness and/or paralysis (23).

Treatment is aimed at reversal of muscarinic signs with atropine and enzyme reactivation by pralidoximes.

Frequent atropine doses or continuous titrated infusions are used to achieve drying of secretions and the resolution of bradycardia (24) The pupillary response (resolution of miosis) is not considered an end point of atropine therapy, as miosis may persist for weeks after significant exposure (24). In our cases, the miosis was resolved within 4 hours.

Conclusion

This report emphasis the misuse of organophosphourus compounds may be life threatening even through skin.

The early decontamination, airway management, oxygen and fluid administration are life saving.

The involved health care personnel should be aware of the potential risk of becoming intoxicated themselves when taking care of contaminated patients

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Conflict of interest: None.

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