

## Management of Organophosphate Poisoning Without Pralidoxim- Is It Possible?

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### Abstract:

**Introduction:** Organophosphate compounds are used as insecticides, nerve gases, ophthalmic agents, and antihelmintics. The primary mechanism of action of organophosphate pesticides is inhibition of acetylcholinesterase (AChE). However Pralidoxim has been introduced as organophosphate's antidote but recent studies establish that pralidoxim has unclear benefit in treatment of organophosphate poisoning. We explain two cases of organophosphate poisoning that they treated well without pralidoxim. The first case was a 36-years old man with history of organophosphates poisoning. He was under mechanical ventilation. Atropine was initiated due to muscarinic signs such as salivation, bronchorrhea and auscultation of alveolar rales. On admission day, the pseudocholine esterase level was 235 unit per liter. Pralidoxime was not available, so we did not use it for management of this patient. The patient was discharged when he was in free symptom completely on the 22<sup>th</sup> day. The second case was a 23 years old woman with the history of deliberate self poisoning with organophosphate compounds. Atropine was started and she was under mechanical. However, pralidoxim was not available. The pseudocholine esterase level was 1690 unit per liter on the first day which dropped to 952 unit per liter on the 2<sup>nd</sup> day. After 9 days she discharged from the hospital. Discussion: Pralidoxim has been introduced as organophosphate's antidote, on the other hand, it has benefit in organophosphate poisoning theoretically, but patients can be treated without it.

**Key words:** Organophosphate, Poisoning, Pralidoxim

### Introduction

Organophosphate compounds are used as insecticides (malathion, parathion, diazinon, fenthion, dichlorvos, chlorpyrifos, ethion), nerve gases (soman, sarin, tabun), ophthalmic agents (echothiophate, isofluorophate), and antihelmintics (trichlorfon). The primary mechanism of action of

organophosphate pesticides is inhibition of carboxyl ester hydrolases, particularly acetylcholinesterase (AChE). AChE is an enzyme that degrades the neurotransmitter acetylcholine into choline and acetic acid. Acetylcholinesterase is found in the central and peripheral nervous system, neuromuscular junctions, and red blood cells. However Pralidoxim has been introduced as organophosphate's antidote but recent

studies establish that pralidoxim has no or low benefit in treatment of organophosphate poisoning. In addition to, we explain two cases of organophosphate poisoning that they treated without pralidoxim.

### **Materials(Case history)**

#### Case 1:

A 36-years old man with history of organophosphates compounds(parathion) and depilator material suicidal poisoning that referred to Loghman-Hahim poison hospital in Tehran. He had attempted suicide one hours ago. On admission, His vital signs were stable and he was completely awake. Pupils were miotic and symmetric. Blood sugar and O<sub>2</sub> saturation were 116 milligram per deciliter and 97%, respectively. Patient mentioned had episodes of vomiting. As regards, he had history of depilator swallowing, so we did endoscopy for him that the upper gastrointestinal did not have any eruption. After 4 hours, O<sub>2</sub> saturation dropped to 90% and the patient experienced respiratory distress, so he was under mechanical ventilation. Atropine was initiated due to muscarinic signs such as salivation, bronchorrhea and auscultation of alveolar rhales. The parameters of the first arterial blood gas was as follow: pH=7.46, pressure of carbon dioxide=63.6 mmHg and HCO<sub>3</sub>=44 millimol per liter. Electrolytes levels were within normal ranges. Creatine phosphokinase and lactate dehydrogenase were 158 unit per liter and 584 unit per liter, respectively. Prothrombin time was 11.5 second and creatinine was reported to be 0.8 milligram per deciliter. Chest xray findings was diffused infiltration of both lungs. The patient was under sedation with 20 milligram per hour of midazolam. The pseudochole esterase levels were 235 unit per liter, 246 unit per liter, 390 unit per liter, 400 unit per liter, 415 unit per liter, 445 unit per liter and 610 unit per liter on

admission, 2<sup>nd</sup>, 6<sup>th</sup>, 12<sup>th</sup>, 14<sup>th</sup>, 16<sup>th</sup>, and 20<sup>th</sup> days of hospitalization respectively. The pseudochole esterase level measured spectrophotometrically that the normal range of hitachi kite is 1900-3800 unit per liter. Atropine was firstly given with the dose of 10 milligram per hour which tapered to 8 milligram per hour, 5 milligram per hour and 2.5 milligram per hour on the 4<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> days of hospitalization respectively. However, increase in the dose of atropine infusion was necessitated on the 10<sup>th</sup> day of hospitalization after trying for its taper. On the 20<sup>th</sup> day, the patient was on 2.5 milligram per hour atropine. The patient was extubated on the same day. On the next day atropine was discontinued. The patient was completely awake on the 7<sup>th</sup> day of hospitalization. Pralidoxime was not available, so we did not use it for management of this patient. The patient was discharged when he was in free symptom completely on the 22<sup>th</sup> day.

#### Case 2:

The second case was a 23 years old woman with the history of deliberate self poisoning with organophosphate compounds(malathion). She had attempted suicide half an one hours ago. She was completely awake at presentation. The pupils were normal size and reactive to light. She complained of abdominal pain. Diarrhea and miosis was prominent five hours after admission. Level of consciousness decreased and she was intubated 12 hours after admission, so she admitted in intensive care unit. Atropine was started with the dose of 1 milligram per hour. This dose was increased to 4 milligram per hour infusion and lasted up to the 4<sup>th</sup> day of hospitalization. The patient was under mechanical ventilation for 3 consecutive days and sedation with 1 milligram per hour midazolam. On the 5<sup>th</sup> day, the patient was extubated. However, pralidoxim was not available.

On the fourth day of hospitalization the patient was completely awake however was still intubated and sedated due to intolerance to disconnect from the ventilator machine. The pseudocholine esterase level was 1690 unit per liter on the first day which dropped to 452 unit per liter on the 2<sup>nd</sup> day. Aspartate transaminase, alanine transaminase, calcium, phosphorus, Albumin, lactate dehydrogenase and creatine phosphokinase level were 34 unit per liter, 19 unit per liter, 8.1 milligram per deciliter, 2.1 milligram per deciliter, 4.3 gram per deciliter, 597 unit per liter and 154 unit per liter respectively. All of them were in normal range. The pseudocholine esterase level measured spectrophotometrically that the normal range of Hitachi Kite is 1900-3800 unit per liter. After 8 days the patient transferred from intensive care unit and one day later, she was discharged from the hospital.

## Discussion

Organophosphate poisoning is a major global public health problem, causing an estimated 200,000 deaths each year. Although the World Health Organization recommends use of pralidoxime, this antidote's effectiveness remains unclear (1). Oximes, capable of regenerating the active enzyme from the organophosphate-cholinesterase complex, is also available to treat organophosphate poisoning (2, 3). Pralidoxime is the oxime most often used worldwide but it has failed to reduce the attendant mortality and morbidity (2, 3). Complications of oximes include: hypertension, cardiac dysrhythmias, headache, blurred vision, dizziness. Two randomized

clinical trials (RCTs) are available from India, those suggest that oximes do not benefit and with 12 gm over 3 days increase the risk of death, intermediate syndrome and requirement of ventilation (4).

## Conclusion

However, Pralidoxim has been introduced as organophosphate's antidote but recent studies establish that pralidoxim has no or low benefit in treatment of organophosphate poisoning such as these 2 cases of organophosphate poisoning that they treated without pralidoxim. They did not have any sequel and complication when they discharged. Therefore, this point of view is confirmed that the accurate management of organophosphate poisoning is the use of atropine and ensure airway protection. On the other hand, pralidoxim has benefit in organophosphate poisoning theoretically, but patients can be treated without it. However, confirm this further studies are needed.

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