

Delayed organophosphate induced polyneuropathy

Abuzer Coskun¹, Afsin Emre Kayipmaz^{2*}, Sedat Ozbay¹, Osman Mahir Okur¹,
Ilham Ozkan¹, Sevki Hakan Eren³

Abstract

Intoxication with organophosphate compounds used for pest control is common in Turkey. Organophosphate intoxication may occur during agricultural spraying, transport of organophosphate compounds, or domestic accidents, although suicide attempts are the most common way of intoxication. In this case, we present a 23-year-old woman ingested a fistful of painkillers and drank a sip of unknown syrup after having a quarrel with her family. About 18 days after drug intoxication she began noticing headache and weakness and numbness in her arms and legs. A detailed patient history taken in the emergency department indicated that the syrup she had taken for suicidal purpose was an organophosphate compound. An organophosphate –induced polyneuropathy was primarily considered. In conclusion, organophosphate intoxication should always be remembered in the differential diagnosis of intoxication cases even when no specific compound could be determined.

Keywords: Late onset, organophosphate poisoning, polyneuropathy.

Key words: Late onset, organophosphate poisoning, polyneuropathy

Introduction

Intoxication with organophosphate compounds used for pest control is common in Turkey (1). Organophosphate intoxication may occur during agricultural spraying, transport of organophosphate compounds, or domestic accidents, although suicide attempts are the most common way of intoxication (2, 3). Organophosphate intoxication may occur via oral, respiratory, transdermal, or parenteral route (4).

Organophosphates irreversibly bind to acetylcholine receptors to inhibit acetylcholine breakdown at neuromuscular junction. As a result, acetylcholine receptors are continually stimulated, leading to cholinergic, nicotinic, and central nervous system signs and symptoms (4).

The clinical picture depends on the type, dose, and route of administration of the culprit compound. Death typically occurs within the first 24 hours, usually due to respiratory failure (3). Some complications of organophosphate intoxication have been reported, including “delayed organophosphate - induced polyneuropathy” that has been only rarely reported (2).

It usually arises 14-18 days after intoxication (2, 4). This paper discusses a rare case of delayed organophosphate - induced polyneuropathy

Case

A 23-year-old woman ingested a fistful of painkillers and drank a sip of unknown syrup after having a quarrel with her family. Four hours later, she had been taken to a nearby hospital with nausea, vomiting, and abdominal pain, where she had been treated for drug intoxication at an intensive care unit for 2 days and discharged uneventfully. About 18 days after drug intoxication she began noticing headache and weakness and numbness in her arms and legs. Her symptoms progressively deteriorated over 2 days and she was admitted to our emergency department with inability to walk.

On admission, her general status was well and she was conscious. Her blood pressure was 100/70 mmHg, pulse rate 86 beats per minute (bpm), respiratory rate 18/minute, and body temperature 36.7°C. Her head and neck examination revealed no abnormality. She had normal respiratory sounds and no rales or ronchi on auscultation. Heart sounds were also normal, with no additional sounds or murmurs. Her abdomen was non-tender and there was no mass lesion on palpation.

Neurological examination revealed mild weakness in both upper extremities; both lower extremities had a 3/5 muscular weakness, reduced deep tendon reflexes, and minimal sensory loss.

Received: 01-04-2015, Accepted 22-04-2015, Available Online 01-06-2015

¹Numune Hospital, Department of Emergency, Sivas-Turkey

²Baskent University Faculty of Medicine, Department of Emergency, Ankara-Turkey

³Cumhuriyet University Faculty of Medicine, Department of Emergency, Sivas-Turkey

*Corresponding Author: Afsin Emre Kayipmaz E-mail: aeKayipmaz@baskent.edu.tr

Table 1: Important blood parameters of delayed organophosphate induced polyneuropathy patient

	Value	Normal range
Hemoglobin	12.4 g/dl	(12-16 g/dl)
White Blood Cell (WBC)	13400/ μ l	(4500-11000/ μ l),
Platelet	242000/ μ l	(150000–400000/ μ l)
Glucose	162 mg/dl	(70-105 mg/dL)
Blood Urea Nitrogen (BUN)	17 mg/dl	(6-21 mg/dl)
Creatinine	1.1 mg/dl	(0.5-1.3 mg/dl)
Alanine transaminase (ALT)	46 U/l	(0-31 U/l)
Aspartate transaminase (AST):	47 IU/l	(0-31 IU/l)
Creatine kinase (CK)	152 IU/l	(22-192 IU/l)
Creatin kinase muscle-brain (CK-MB)	41 IU/l	(0-25 IU/l)
Pseudocholinesterase	2450 U/l	(5400-13200 U/l)

Electrocardiogram (ECG) of patient showed a normal sinus rhythm with a rate of 76 bpm and laboratory examinations were as in Table 1.

A detailed patient history taken in the emergency department indicated that the syrup she had taken for suicidal purpose was an organophosphate compound. An organophosphate – induced polyneuropathy was primarily considered and a neurology consultation was requested with the working diagnosis of delayed organophosphate - induced polyneuropathy. Distinction between acute vs chronic organophosphate intoxication was based on patient history.

The consulting department admitted the patient to hospital and performed an electromyography (EMG), which revealed sensorimotor neuropathy consistent with “delayed organophosphate -induced polyneuropathy“. MR examinations revealed no pathology.

The patient was put on steroid therapy and discharged after resolution of much of her symptoms

Discussion

Organophosphates are chemical compounds that are commonly used for pest control in agriculture. Their wide availability and ease of access may sometimes lead to accidental or suicidal ingestions (3). Suicidal ingestions most commonly occur via oral route although parenteral route has also been reported (5).

Pesticide-induced intoxications are common in Turkey. According to 2008 statistics of the National Poison Center of Turkey (NPCT), intoxications caused by agricultural compounds ranked second among all intoxication events, with a rate of 8.34%. Among pesticide intoxications, those occurring with organophosphates rank first.

According to reports, 47.66% of all pesticide intoxications were caused by insecticides and %20.98 of them were secondary to organophosphate compounds (1).

Organophosphates act by inhibiting the cholinesterase enzyme found at nerve endings. Symptoms and course of intoxication depend on the type, amount, and route of ingestion of the culprit compound.

In acute intoxication, majority of cases become symptomatic within first 8 hours while others begin experiencing symptoms within 24 hours (4). Three stages of organophosphate intoxication have been defined. These include the acute cholinergic crisis, the intermediate syndrome, and delayed polyneuropathy (6). Death usually occurs during acute cholinergic crisis or the intermediate syndrome (2).

Acute cholinergic crisis is characterized by muscarinic, nicotinic, and central nervous system signs and symptoms, including weakness, nausea, vomiting, myosis, salivation, altered consciousness, respiratory difficulty, muscle fasciculation's, and bradycardia (2, 4).

The intermediate syndrome usually spans from the first to fourth day of intoxication and is characterized by paralysis of respiratory, cranial, flexor neck and proximal limb muscles. It may culminate into death when it involves respiratory muscles (4).

Delayed organophosphate induced polyneuropathy is typically encountered between 14th and 28th days of intoxication (2, 4). It has been linked to suppression of neuropathy target esterase (NTE) by organophosphates in the nervous tissue (2).

Many lipid-soluble organophosphates may cause delayed polyneuropathy with no signs and symptoms of acute poisoning (4). There is loss of function in the ascending and descending limbs of spinal cord as well as sensory and motor axons of peripheral nerves.

The acute stages of organophosphate-induced polyneuropathy are characterized by leg cramps. This is followed by sensory loss and muscle weakness in legs. Weakness becomes advanced and widespread and deep tendon reflexes become suppressed in later stages (2, 4).

As for the prognosis of polyneuropathy, some functions may be regained over time although some severe cases may have residual sequela, including ataxia, drop foot, and spasticity (7).

This syndrome usually mimics Guillain-Barre syndrome (4). Our patient also had bilateral muscle weakness and sensory loss. Most of the symptoms of our case disappeared by the time of discharge. Many cases with appropriate therapy at the acute intoxication stage may avoid the last stage of the intoxication (2, 4).

Our patient, unfortunately, was not managed appropriately at the acute stage and she was thus at risk of this complication. Delayed organophosphate - induced polyneuropathy has no proven therapy although one study indicated that B complex vitamins and prednisolone may be of some benefit (8). Hence, our case enjoyed a resolution of her symptoms after steroid therapy.

Parkinsonism as a result of basal ganglion injury is another neurological manifestation of organophosphate intoxication. Shahar et al reported a 15-year-old male with extra pyramidal symptoms such as poker face, rest tremor, inability to wink, cogwheel rigidity, and slow walking. He responded to amantadine treatment and his symptoms completely disappeared by 7 days (9).

Organophosphate intoxication is usually diagnosed by history, clinical signs and symptoms, and laboratory test (4). Package of the ingested compound should be inspected to determine the responsible molecule whenever possible (6).

The characteristic garlic-like smell of these compounds may sometimes warn physician. Cholinergic signs and symptoms also help in the diagnostic process. Myosis is the most common sign. The prognostic role of plasma and erythrocyte cholinesterase level measurements is low and does not predict the amount of the antidote or need for ventilatory support. Routine laboratory tests also have limited diagnostic role (4).

Some patients may exhibit signs of pulmonary edema or acute respiratory distress syndrome (ARDS) on chest X-Ray (8). In our case no cholinesterase level measurement had been done at the outside center since she had not been considered to suffer from organophosphate intoxication. Treatment of organophosphate intoxication consists of decontamination, airway control, gastric lavage, and administration of antidotes, atropin and pralidoxime (4). As our patient applied at a later stage, these therapies were not applied.

Karasu et al reported a 29-year-old woman with sub-acute neuropathy 3 weeks after organophosphate ingestion. The authors suggested that organophosphate intoxication should be considered in the differential diagnosis of unilateral distal neuropathy (10). Gulle et al published a 13-year-old

male child with polyneuropathy 3 weeks after organophosphate intoxication (11).

Conclusion

In intoxication cases, package of the ingested compound should be inspected to determine the culprit molecule whenever possible.

Organophosphate intoxication should always be remembered in the differential diagnosis of intoxication cases even when no specific compound could be determined since suicidal attempts with agricultural pesticide compounds are common in Turkey.

Early diagnosis and therapy of the deadly organophosphate intoxication may avoid much of the complications and sequel in the long term

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. This study was presented as poster presentation at the 10th National Emergency Medicine Congress and the 1st Intercontinental Emergency Medicine Congress, 15-18 May 2014, Antalya, Turkey.

References

1. Ozcan N, Ikinçioğullari D. Ulusal Zehir Danışma Merkezi 2008 Yılı Çalışma Raporu Özeti. *Türk Hij Den Biyol Derg.* 2009; 66: 29-58.
2. Karalliedde L. Organophosphorus poisoning and anaesthesia. *Anaesthesia.*1999; 54: 1073-88.
3. Yurumez Y, Durukan P, Yavuz Y, İkizceli I, Avsarogullari L, Ozkan S, et al. Acute organophosphate poisoning in university hospital emergency room patients. *Intern Med.* 2007; 46: 965-9.
4. Robey CW, Meggs WJ, section 15: Toxicology, chapter 195: Pesticides. Tintinalli JE, Stapczynski JS, Cline
5. MD, Ma JO, Cydulka RK, Merckler GD. Tintinalli's Emergency Medicine 7th New York: McGraw-Hill CO 2010: 15: 1297-305.
6. Malla G, Basnet B, Vohra R, Lohani SP, Yadav A, Dhungana V. Parenteral organophosphorus poisoning in a rural emergency department: a case report. *BMC Res Notes.* 2013; 6: 524.
7. Kozaci N, Acikalin AA, Satar S, Icme F. Causes of death and treatment of organophosphorus pesticide poisoning. *JAEM.*2012; 11: 176-82.
8. Singh S, Sharma N. Neurological syndromes following organophosphate poisoning. *Neurol India.*2000; 48: 308-13.
9. Kass R, Kochar G, Lippman M. Adult respiratory distress syndrome from organophosphate poisoning. *Am J Emerg Med.* 1991; 9: 32-3.

10. Shahar E, Bentur Y, Bar-Joseph G, Cahana A, Hershman E. Extraparamidal parkinsonism complicating acute organophosphate insecticide poisoning. *Pediatr Neurol*. 2005; 33:378-82
11. Karasu M, Baransel IA, Ozdil S, Dulger HE. Sub acute peripheric neuropathy after organophosphate poisoning (Chlorpyrifos-diethyl): A case report. *JAEM*. 2007; 5: 37-8.
12. Gulle S, Agin H, Asilsoy S, Atlihan F, Bak M, Genel F, et al. Two serious complications of organophosphate poisoning in the same patient: Acute pancreatitis and late-onset polyneuropathy: case report. *Turkiye Klinikleri J Pediatr* 2010; 19:62-5.