Organophosphate Toxicity Presenting with Cholinergic Crisis, Intermediate Syndrome and Delayed Polyneuropathy in Succession: a Rare Presentation

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ABSTRACT

Background:Organophosphate (OP) self poisoning is a major health hazard in a predominantly agrarian country like India. Acute cholinergic crisis and intermediate syndrome are well recognized manifestations of OP toxicity, delayed polyneuropathy being an unusual clinical event.

Case Report: We describe a 30-year-old male with suicidal chlorpyrifos poisoning who presented with cholinergic crisis; developed intermediate syndrome subsequently and ultimately three weeks later landed up with OP induced delayed polyneuropathy (OPIDPN).

Conclusion:This reported case emphasizes on the importance of strict vigilance and follow up in patients with OP toxicity in order to recognise and appropriately treat chronic toxicities like OPIDPN.

►*Implication for health policy/practice/research/medical education:*Organophosphate Toxicity Presenting with Cholinergic Crisis, Intermediate Syndrome and Delayed Polyneuropathy

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1. Introduction:

Organophosphate self poisoning is an important clinical problem in the developing countries due to easy availability and accessibility. Though manifestations such as cholinergic crisis and intermediate syndrome due to OP poisoning have long been appreciated, delayed polyneuropathy (OPIDPN) is thought to be unusual. OP toxicity presenting with both acute manifestations and delayed peripheral neuropathy is a very unusual event. Very few cases of chlorpyrifos toxicity presenting with cholinergic crisis, intermediate syndrome and delayed polyneuropathy in succession have been reported (1, 2). Herein we described a case of severe chlorpyrifos toxicity manifesting with all three

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neurological manifestations, on account of its rarity.

2. Case Report:

A 30-years-old male was brought to the emergency department with complaints of multiple episodes of loose motions, vomiting and breathlessness. He had a clinical history of alleged consumption of 150 ml of chlorpyrifos with a suicidal intent, two hours before arrival to the hospital. On examination his pupils were small and his chest was full of crackles. He was given a gastric lavage in the emergency room and immediate treatment with atropine and pralidoxime was initiated. Over the next 24 hours, patient showed clinical improvement with symptoms of cholinergic crisis resolving. Except for a low plasma pseudo-cholinesterase level of 200 units (lower limit of normal being 4000units), all other laboratory tests were within normal range. However approximately 72 hours later, patient developed neck muscle weakness and respiratory muscle paralysis which necessitated the use of mechanical ventilation for the next two weeks. The patient had developed intermediate syndrome and in view of prolonged endotracheal intubation, tracheostomy was planned four days later. At the end of two weeks patient had made complete clinical recovery and was shifted out of the intensive care unit. While the patient was awaiting tracheostomy closure and a detailed psychological evaluation, over the next one week he developed weakness of the distal muscles of both feet. The weakness progressed gradually over the next one week to an extent that he was unable to walk without support. Subsequently he developed difficulty in grasping objects with the left hand. He did not have any history suggestive of cranial nerve; sensory; bowel and bladder involvement. On examination, he had atrophy of the distal muscles of both feet as well as the small muscles of the hand, left hand being involved more than right (Figure1).

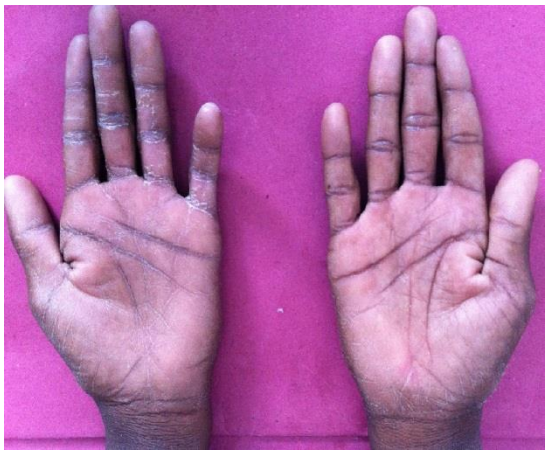

Fig. 1. Palmar aspect of the hands is showing atrophy of the thenar and hypothenar eminences of both hands, left hand being involved more than the right.

He had a high stepping gait with features of foot drop bilaterally. While he had a weak handgrip in the left hand, the power tested in the muscles around the ankle joint was 1/5 on both sides. Sensory examination and cranial nerves were within normal limits. Other systems were unremarkable on examination. At this point of time all the laboratory tests including serum electrolytes, serum vitamin B12 level and radiological investigations such as radiograph of the cervical; and lumbar spine were within normal range. Nerve conduction study was consistent with distal motor axonal neuropathy (Table 1). Electrophysiological examination revealed markedly reduced amplitude of the compound muscle action potential (CMAP) with reduced nerve conduction velocity (NCV) in tibial nerve and peroneal nerve of both lower limbs as well as the ulnar nerve and median nerve of both upper limbs. Sensory nerve action potential (SNAP) was normal in all four limbs.

In view of the neurological manifestations presenting after three weeks of organophosphate poisoning and the presence of a conclusive nerve conduction study, a diagnosis of organophosphate induced delayed motor polyneuropathy was made. The patient was given intensive limb physiotherapy and was prescribed

Table 1: Electrophysiological profile

	Normal values	Patient
Motor Nerve Conduction NCV(m/s)		
Tibial Nerve	>48	37(R)/36.2(L)
Peroneal Nerve	>44	NR (B)
Median Nerve	>52	40(R)/38.3(L)
Ulnar Nerve	>57	41.2(R)/39.1(L)
CMAP amplitude (mV)		
Tibial Nerve	>5	0.5(R)/0.8(L)
Peroneal Nerve	>2	NR(B)
Median Nerve	>4	3.2(R)/3(L)
Ulnar Nerve	>4	2.3(R)/1.9(L)
Sensory NerveConduction SNAP		
Median Nerve	>15	30.6(R)/30.2(L)
Ulnar Nerve	>10	33.4(R)/33.7(L)
Sural Nerve	>6	7.2(R)/9.1(L)

CMAP = Compound muscle action potential,
NCV = Nerve Conduction velocity;
SNAP = Sensory nerve action potential;
NR = No response;
R= Right;
L= Left;
B= Bilateral.

splints for the foot drop. He made gradual recovery over six months and currently claims to be in good mental and physical health.

3. Discussion:

Organophosphate (OP) self poisoning is a major clinical problem in the developing countries. These chemicals act by interfering with the activities of acetyl-cholinesterase; an enzyme which essential for the proper functioning of the nervous system. Three different types of neurological presentations have been described following OP poisoning.

Type I paralysis or cholinergic crisis occurs due to excessive stimulation of muscarinic receptors by acetylcholine (Ach) due to blockade of acetylcholinesterase by an OP agent.

Type II paralysis or intermediate syndrome, typically occurs 24 to 96 hours following poisoning and has an incidence of 8-49%.

Type 3 paralysis or OPIDPN is a pure motor or predominantly motor axonal neuropathy characterized by wrist drop and foot drop with minimal or no sensory loss which occurs 7-20 days after exposure to an OP agent (3).

The neurological disturbance relates in some way to phosphorylation and inhibition of the enzyme, neuropathy target esterase (NTE), which is present in essentially all neurons and has an uncertain role in the nervous system (4). The OPIDPN is motor, predominantly. Weakness appears early and initially involves legs muscles before those of the hands. Despite the paucity of sensory complaints, objective evidence of the sensory loss is almost always present. There is no known effective treatment of the organophosphate-induced delayed neuropathy, but only supportive and symptomatic care is available (5). Recovery in most cases is usually incomplete. It is possible that several others factors such as age of patients, the difference in the chemical structure of OPs and the duration of initial intoxication, also in some way, contribute towards the favourable outcome (6).

The case herein described was noteworthy for various reasons. OPIDPN, secondary to chlorpyrifos is a rare clinical entity. Very few cases of chlorpyrifos induced delayed neuropathy have been reported (7-9). Furthermore OP toxicity presenting with all the three neurological manifestations in quick succession is a very unusual occurrence especially with chlorpyrifos. Most of the cases reported with similar

presentation were secondary to dichlorvas toxicity (10-12).

Intoxication with pesticides such as OP compounds is a major clinical problem in the developing countries. Besides the well known cholinergic crisis, the clinicians should be aware of the chronic toxicities of OP, the clinical consequences of which have not been well described. The reports of this case emphasizes on the importance of strict vigilance and follow up in patients with OP toxicity in order to recognise and appropriately treat chronic toxicities like OPIDPN.

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