Case Report

A case of organophosphate induced delayed motor neuropathy without any sensory involvement

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ABSTRACT

Organophosphate induced delayed neuropathy is a sensory-motor distal axonopathy that usually occurs after ingestion of certain organophosphate compound. It is usually characterized by distal degeneration of axons of peripheral nervous systems, predominantly in lower limbs and occurs within 2–6 weeks after exposure. Clinical features include cramping muscle pain, distal numbness, paresthesia, followed by progressive weakness and loss of deep tendon reflexes in affected limbs. Electrophysiological studies reveal a motor axonal neuropathy characterized by reduced amplitude of the compound muscle potential and normal or reduced nerve conduction velocities. We report a case of 29-year-old male patient who developed progressive lower limbs weakness over four weeks after ingestion of chlorpyrifos based insecticide. His nerve conduction study revealed motor axonal neuropathy without any sensory involvement affecting both lower limbs.

Key words: *Organophosphate, delayed motor neuropathy, sensory involvement.*

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INTRODUCTION

Organophosphate (OP) poisoning is one of the common cause (27.64%) of poisoning in Bangladesh, and has the highest death rate (13.88%).[1] Organophosphate induced delayed neuropathy (OPIDN) has been reported after several epidemic outbreaks in USA.[2] Patients, after organophosphate compound (OPC) ingestion, present with acute cholinergic effects followed by intermediate syndrome and later on may develop OPIDN. After OPC ingestion, patient may develop a mixed polyneuropathy[3] which is characterized by distal axonopathy affecting both peripheral and central nervous system. Peripheral distal axonopathy can predominantly present as a motor polyneuropathy and central axonopathy can present with myelopathic features.[4] Neuropathy target esterase (NTE) is thought to be the target of OPIDN initiation. Development of OPIDN depends on the ratio of inhibitory powers for acetylcholinesterase and NTE.[5] Depending on age of the patients, chemical nature of OPC and duration of intoxication, recovery from OPIDN is considered to be poor.[6] Here, we present a patient who had shown all the three stages of the intoxication and finally developed OPC induced motor axonal neuropathy without any sensory involvement affecting both lower limbs.

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CASE REPORT

A 29-year-oldBangladeshi male patient presented with history of OPC ingestion and was brought to the emergency department of Combined Military Hospital (CMH), Ramu Cantonment, on 12 June 2023 at midnight. He had taken OPC (chlorpyrifos) at an attempt to commit suicide. After couple of hours of OPC ingestion, he

vomited several times and became agitated. In the emergency department, he was found in drowsy state with severe respiratory distress and stridor. He had sweating, tremor, excessive salivation and OPC smell from his breath. Examination findings revealed, pulse140/min, blood pressure 160/100 mmHg, respiratory rate 36/min, temperature 98.4°F, and oxygen saturation was 84%. Pupil was bilaterally pinpointed. Chest auscultation revealed transmitted sound over both sides of the chest.

Immediately resuscitation started by supplemental oxygen, hydrocortisone, nebulization and atropine injection. At extreme respiratory distress with persisting low oxygen saturation, endotracheal intubation was done and mechanical ventilation was started. Stomach wash was given as per protocol and continued for 40 minutes till clear fluid came out from stomach. After 4 hours of starting atropine injection (155 ampoule, 0.6mg/ml/ampoule), sign of atropinization was observed. Thereafter, atropine infusion was continued as per standard protocol for OPC poisoning. Pralidoxime infusion also was started within 5 hours (initially 1 gm over 30minutes followed by 500mg/hour). Recurrent symptoms and signs of OPC poisoning was closely observed (constricted pupil, excessive oropharyngeal secretion, stridor, tachypnoea) and atropine was given intermittently to recover from symptoms and signs. At the same time, features of atropine toxicity (high temperature 106^0F, excessive urine output, sinus tachycardia, and high blood pressure) had also been noticed several times and atropine was stopped intermittently. After 31 hours of initial resuscitation by atropine (total atropine180 ampoules) and pralidoxime (500mg/hour), patient became haemodynamically stable and was extubated when his respiratory parameters became acceptable for extubation. Though patient was maintaining acceptable oxygen saturation without oxygen supplementation, he was drowsy and had recurrent muscular twitching, tachypnea, salivary secretion, flickering movement of the limbs. Pralidoxime (500mg/hour) and intermittent atropine infusion had been continued as per guideline for intermediate syndrome upto day 06 (total atropine 262 ampoules). Supportive management (iv fluid, antibiotic, thimine) had also been continued and on day 07, patient was referred to a tertiary care hospital (CMH, Dhaka) with the diagnosis of 'OPC poisoning with intermediate syndrome with organophosphate induced encephalopathy'.

Investigations revealed, haemoglobin13 gm/dl, total white cells 15000/cmm, platelet 4,40,000/cmm, d dimer 2.3mg/l, and s creatine phosphokinase was 910u/l. All other investigations including, s c-reactive protein, s lactate dehydrogenase, s electrolytes, s urea, s creatinine, SGPT, s albumin, random blood sugar, prothrombin time, APTT, s magnesium and s procalcitonin were within normal limit.

At CMH Dhaka, his Mental Status Examination (MSE) revealed that his insight was intact with calm and cooperative behavior. Initially, his mood was anxious to depress and later on became euthymic. Subsequently, patient developed progressive weakness of all four limbs (more marked in both lower limbs) over 4 weeks. On examination, weakness and wasting of all four limbs (more marked distally) were found (Figure 1). Muscle power was grade 4 in upper limbs and grade 2 in lower limbs. Deep tendon reflexes were absent in both upper and lower limbs. Nerve conduction study (NCS) of crossed limbs revealed, motor axonal polyneuropathy affecting the lower limbs (Figure 2, Table I) without any sensory involvment. All other relevant investigations including magnetic resonance imaging of brain were unremarkable. Finally, patient was labeled as a case of OPIDN. At present, he is on regular physiotherapy (stretching and strengthening exercise of both upper and lower limbs) and improving gradually.

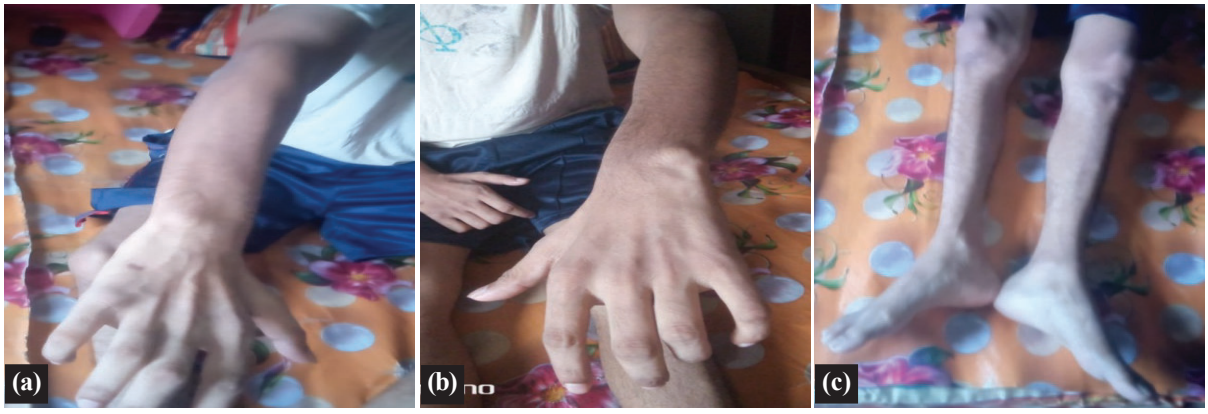
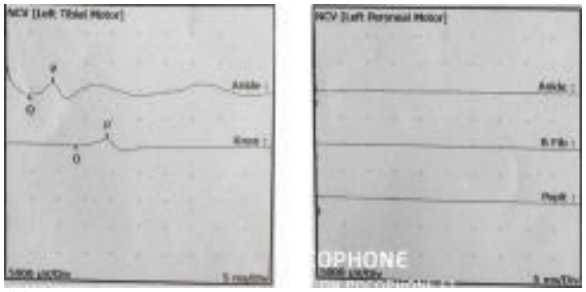


Figure 1. Wasting of muscles of upper (a, b) and lower limb (c)

Evaluation of the left tibial motor nerve (a) showed reduced amplitude (2.4mV). The left peroneal nerve (b) was inexcitable. All remaining nerves were within normal limits (table I). All F wave latencies were within normal limits (table I).



(a) (b)

Figure 2. NCS of the crossed limbs- motor axonal neuropathy affecting the lower limb

Table I. NCS of the crossed limbs- motor axonal neuropathy affecting the lower limb

Nerve Conduction Study	Patient	Normal value
Motor nerve conduction		
CMAP amplitude (mV)		
Right median	6.1	>4
Right ulnar	8.7	>6
Left tibial	**2.4**	>4
Left peroneal	**Not recordable**	>2
Nerve conduction velocity (ms)		
Right median	55	>50
Right ulnar	**52**	>50
Left tibial	47	>40
Left peroneal	**Not recordable**	>40
Distal latency (ms)		
Right median	3.8	<4.4
Right ulnar	2.7	<3.3
Left tibial	4.5	<5.8
Left peroneal	**Not recordable**	<6.5
Sensory nerve conduction		
SNAP amplitude (μV)		
Right median	68.4	>20
Right ulnar	61.3	>17
Left sural	12.9	>6

DISCUSSION

Neurological manifestations in OPC poisoning can be classified into three types: type 1 or cholinergic crisis, type 2 or intermediate syndrome and type 3 or OPIDN.[7] After OPC ingestion, type 1 paralysis occurs within 24 hours and type 2 usually after 24 hours. Type 3 paralysis or OPIDN occurs after 2-6 weeks of ingestion of OPC.[6] OPIDN, either clinical or subclinical, was observed in about 35% patient from a six months follow-up study.[8]

The pathogenesis of OPIDN involves the phosphorylation and inhibition of neuropathy target esterase (NTE) causing axonopathy by Wallerian axonal degeneration. This enzyme is present in brain, spinal cord, peripheral nerve, and also in non-neural tissues such as muscle and spleen.[9] Seventy to ninety percent of NTE should be inhibited by active metabolite of OPC for the neuropathic effects to occur.[5] OPIDN can be classified into four stages: latent, progressive, stationary and improvement stages.[4] Latent period is characterized by a delay of 10 days to 03 weeks in developing neurological symptoms. In the progressive phase, signs and symptoms advance rapidly to present with sensory motor polyneuropathy. During the stationary phase, neurological symptoms persist. As the patient enters the improvement phase, the sensory symptoms resolve prior to motor symptoms.

The OPIDN is a predominantly motor neuropathy.[9] Weakness appears early and initially involve leg muscles before those of the hands. Motor signs comprise foot drop, weakness of the intrinsic hand muscles, absent ankle jerks, weakness of hip and knee flexors, and may progress to involve all four limbs with flaccid paralysis. Sensory symptoms include both positive and negative symptoms like muscle cramp, tingling and burning pain in gloves and stocking pattern.

Our patient presented after a latent phase of 28 days with signs of bilateral lower motor neuron involvement characterized by flaccid weakness of both lower limbs. However, he had no sensory symptoms or signs. In previously reported cases sensory impairment was not detected at the onset of polyneuropathy and it recovered at later stages, when motor neuropathy was still evident.[10] In the present case, despite the initial seriousness, we did not observe any sensory symptoms. NCS of OPIDN demonstrate an axonal

neuropathy with acute and chronic denervation in distal and occasionally proximal limb muscles. Despite symptoms being predominantly motor, diminished sensory potential amplitudes in NCS appears to be more sensitive than motor conduction changes in screening for OPIDN.[10] NCS examination carried out in our patient indicated motor axonal neuropathy, mainly in the lower limbs. No evidence of sensory impairment was observed during NCS.

There is no specific treatment for OPIDN. Rehabilitation therapy along with proper nursing care has shown to improve the condition from a long-term follow-up study.[11] Age of the patient and time between initial intoxication and treatment initiation is an important contributing factor for favorable outcome.[12]

The OPIDN is predominantly a motor axonal neuropathy that affects lower limbs prior to upper limb within 2-6 weeks after ingestion of OPC. At later stage of OPIDN, no evidence of sensory impairment may be observed in NCS because of early recovery of sensory neuropathy while motor neuropathy was still evident.

Authors' contribution: MMHC and GK has planned for publication. MMHC and MRH has drafted the manuscript. MMHC, AM, HMK, GK and MRH was directly involved with the management of the case. FTZ helped in preparing the manuscript.

Consent: Informed consent has been taken from the patient for publication of this case report and accompanying images.

Conflict of interest: Nothing to declare.

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