Organophosphate–pyrethroid combined poisoning may be associated with prolonged cholinergic symptoms compared to either poison alone

INTRODUCTION

The usual signs and symptoms of organophosphate (OP) poisoning are characterized by muscarinic, nicotinic, and central nervous system effects, and those of pyrethrin poisoning depend on the type of pyrethrin ingested. Pyrethrins are strongly lipophilic esters; short-term exposure causes fine tremors, salivation, nausea, dizziness, headache, palpitations, chest tightness, blurring of vision, memory impairment, and choreoathetosis. There is paucity of literature mentioning the cases of mixed OP–pyrethriod poisoning. We report a case of chlorpyrifos–cypermethrin poisoning, where the cholinergic features continued manifesting till 3 weeks after exposure of poison.

CASE REPORT

A 13-year-old girl was admitted in our accident emergency with history of Bilbo 505 ingestion. The patient had ingested approximately 20 mL of Bilbo (chlopyrifos 50% and cypermethrin 5%) which was found to be a combination of OP and pyrethriod compound, with alkyl benzene sulfuric acid as emulsifier [Figure 1]. On arrival, the patient had difficulty in breathing which was accompanied by multiple episodes of vomiting. On examination, she was drowsy and had pinpoint pupils with an up-rolling of eye balls. There was no associated neck rigidity. Her heart rate was 92/min; peripheral oxygen saturation was 50%–70%, and auscultation of chest revealed bilateral crepitations, with excessive oral secretions. A chest radiograph revealed bilateral pulmonary infiltrates [Figure 2]. In view of her deteriorating clinical condition, the patient was intubated and mechanically ventilated. Gastric lavage was done to facilitate gastrointestinal decontamination. The patient received four doses of intravenous atropine, each of 6 mg. This was followed by administering atropine infusion at 6 mg/h till signs of atropinization were evident. Pralidoxime 2 g was administered intravenously in 100 mL of normal saline over 20 min, followed by repeat doses of 1 g pralidoxime four times a day. After an improvement in clinical course, tracheal extubation was done after 72 h of atropinization and pralidoxime administration. Her atropine dose was gradually tapered over the next 2 days and stopped thereafter.

However, on day 7, she developed cough, breathlessness, and diarrhea for which she received oxygen supplementation, darolac sachet (containing lactobacillus sporegens), dextromethorphan hydrobromide, and chlorpheniramine maleate syrup. However, after 48 h (day 10), there was an increase in excessive frothy secretions from mouth, severe breathlessness, and diarrhea. It was accompanied by tachycardia and bilateral crepitations in both lung fields. She was immediately intubated, and

Figure 1: Poison ingested by patient: Bilbo 505 (chlopyrifos 50% and cypermethrin 5%), a combination of organophosphate and pyrethriod compound, with alkyl benzene sulfuric acid as emulsifier

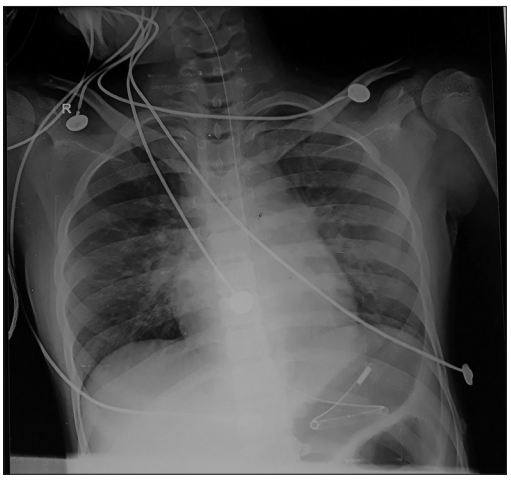

Figure 2: AP view of the chest radiograph showing bilateral pulmonary infiltrates

considering the cholinergic symptoms of poisoning, atropine was restarted at an infusion of 3 mg/h. She responded rapidly to the antidote and was extubated uneventfully after 24 h. The dose of atropine was weaned-off by day 15. However, on day 18, the patient again had cholinergic symptoms characterized by miosis, excessive salivation, lacrimation, diarrhea, blurring of vision, and up-rolling of eyeballs. Atropine was restarted at low dose of 1.6 mg/h and the patient was asymptomatic. Simultaneously we sent her plasma and red blood cell cholinesterase and it was is in normal range. The patient was observed for prolonged poisoning effects and was kept under observation in a high dependency unit. She had few episodes of urinary incontinence, blurring of vision, and cough on day 25 of poisoning, which subsided without any further need of atropine administration. She had no new symptoms of lacrimation, bronchorrhea, and miosis. The patient was observed for few more days to look for delayed intermediate symptoms or rebound cholinergic symptoms. She was discharged after a month of poisoning and was being followed telephonically. Since the last telephonic contact, the patient was not known to have any symptoms and was living a healthy life.

DISCUSSION

Our case was unique as it involved managing a patient who had taken mixed poisoning –OP and pyrethroid. The poisoning by pyrethroid compounds simulates OP poisoning but is associated with extremely low fatality as they are metabolized to harmless products in body after absorption. The mechanism of action involves inhibition of closure of voltage-gated sodium channels in axons. There are two main syndromes of pyrethroid toxicity. Type I syndrome presents with reflex hyperexcitability and fine tremors, whereas type II syndrome presents with choreoathetosis, seizures, and salivation.[1]

To our knowledge, there is only one case report and two case series of mixed OP–pyrethroid human poisoning reported in literature. Tripathi *et al*. reported a case series of eight patients where ingestion of mixture of OP–pyrethroid poison presented with a diagnostic dilemma. They emphasized that the occurrence of seizures, pulmonary oedema and, undue sensitivity to very small dose of atropine should raise suspicion of additional pyrethroid poisoning in a suspected case of pure OP poisoning.[2] Iyyadurai *et al*. observed patients with mixed poisoning to have shorter ventilator-free days than patients poisoned by either of pesticides alone.[3] Srinivasan *et al*. reported a case of prolonged and severe nature of delayed peripheral neuropathy in a young lady persisting at 2 years following low-dose ingestion of a mixed pesticide. They attributed this to potentiation of permethrin toxicity, as OP inhibits esterases, involved in detoxification of pyrethroid leading to additive toxicity.[4]

To the best of our knowledge, we are reporting this case as the first case, in which the patient continued to have cholinergic symptoms for 25 days. In classical OP poisoning cases, usual cholinergic symptoms last for only 24–48 h, which may be followed by intermediate syndrome and a phase of delayed neuropathy. The manifestations in cholinergic phase occur due to inhibition of enzyme acetyl cholinesterase (AChE). In case of chlorpyrifos poisoning, it is transformed into chlorpyrifos-oxon in liver which is a potent respiratory poison and much more toxic to nervous system than the parent compound.[5] We believe that prolonged cholinergic symptoms in our patient can be attributed to two reasons. First, children may be more sensitive to pesticide poisoning when compared with adults as they have smaller body weight and their detoxification system is not fully mature. The poison ingested by our patient has a 10:1 ratio of chlorpyrifos to cypermethrin, leading to predominant manifestation of cholinergic symptoms. Chlorpyrifos causes more persistent inhibition of AChE activity than that caused by other OPs. Animal studies have shown measurable inhibition of enzyme at 2–6 weeks after exposure. This is because chlorpyrifos is lipophilic in nature and is stored in fatty parts of body tissues. It is released slowly so that effects occur over a long interval.[6] The potentiation of toxicity of pyrethroids by OP poisoning has been reported in literature, but the possibility of an increased duration in toxicity of OP compounds by pyrethrins is not known.

CONCLUSION

Cholinergic symptoms in isolated cases of OP or pyrethrin poisoning may not last for long. However, in cases of mixed OP and pyrethrin poisoning or chlorpyrifos poisoning, cholinergic symptoms may persist for a longer duration. The clinician should have a high degree of suspicion in such cases and monitor the patient closely.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the

patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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