

## CASE REPORT

# Organothiophosphate Induced Acute and Reversible Parkinsonism: Case Report and Literature Review

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## Abstract

**Introduction:** Organophosphate compound poisoning is one of the most common causes for admission to the Medical Intensive Care Unit. Parkinsonism is a primary neurotoxic manifestation of organophosphate intoxication. In this case report, we present the case of a 26 year old man who had the experience of organothiophosphate poisoning.

**Case presentation:** A 26 year old man was admitted with tremors in upper and lower limbs together with the rigidity of all 4 limbs as well as difficulty in swallowing and in daily activities like walking, rising from chair, and turning on bed. He had consumed organophosphorus compound quinalphos, 15 days before. The basal ganglia changes were documented radiologically by Magnetic Resonance Imaging (MRI). Gradual recovery was observed by treatment with dopaminergic agents and central anticholinergics over few weeks. Only 0.5% of organophosphate poisoning patients develop neurotoxic manifestations in the form of extrapyramidal syndromes such as Parkinsonism.

**Discussion:** The occurrence of Parkinsonism as a complication of organophosphate poisoning raises safety concerns, especially in developing countries. Yet, this study is the first case report on Organothiophosphate induced Parkinsonism.

**Conclusion:** Clinicians should be aware of the possibility of extrapyramidal manifestations following organophosphate poisoning and the patients should be asked for regular follow-ups as the symptoms may appear even 1 month after the poisoning.

**Keywords:** Quinalphos, Parkinsonian Disorders, Dopamine Agents

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## INTRODUCTION

Organophosphorus compounds are one of the most important and common causes of poisoning in rural India <sup>(1)</sup>. It should be noted that neurological illness following Organophosphorus poisoning has three phases. Acute paralysis secondary to continued depolarization at neuromuscular junction is the first phase. Phase 2 (intermediate syndrome) appears 24-96 hours after the resolution of the first phase. Extrapyramidal symptoms are rarely seen in Organophosphate poisoning during intermediate phase <sup>(2)</sup>. Organophosphorus induced delayed polyneuropathy is the third phase which occurs 2-3 weeks after the exposure <sup>(3)</sup>. Here we are reporting a rare case of extrapyramidal complications and its response to therapy. Organothiophosphate is a subclass of organophosphorus compounds. These compounds are usually used as pesticides, but some have medical applications as well <sup>(4)</sup>.

## CASE REPORT

A 26 year old man, who was the resident of Tamil Nadu, was admitted in the neurology department with 5 days history

of tremors, initially involving both upper limbs which progressed over to lower limbs in the same day. He had stiffness in all 4 limbs, speech difficulty, regurgitation of food, and drooling of saliva from mouth. The patient also had difficulty in walking and in activities like rising from a chair and turning in bed. There were signs of the intake of an organophosphorus compound "Ekalux (quinalphos)" 15 days earlier, for which he was admitted and discharged in stable condition after being treated for 10 days.

Neurological examination revealed low pitched hypophonic speech and tongue tremors. Moreover, the examination of eye movements demonstrated delays in the initiation of gaze to one-side, slow conjugate movements, hypometric saccades, and the breakdown of pursuit movements into small saccades. However, the other cranial nerves were normal. Furthermore, there was rigidity in all four limbs and power was normal. Deep tendon reflexes were exaggerated and ankle clonus was present bilaterally. Bilateral plantar reflex was non responsive. Patient had festinating gait and arm swing was significantly reduced. The blink rate was significantly decreased, and there was a slight widening of the palpebral fissures, creating a stare.

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Additionally, routine hematological investigations were indicative of hypochromic microcytic anemia, serum cholinesterase was normal, and other biochemical examinations were normal. Nerve conduction studies revealed to be normal. Brain MRI manifested T2 and FLAIR symmetrical hyperintensities in basal ganglia bilaterally.

We managed the patient with dopaminergic agents and central anticholinergic agents. There was significant improvement in difficulties related to swallowing and drooling of saliva, within a week of treatment. Gait also improved after treatment with dopaminergic and central anticholinergic agents after 5 days.

**DISCUSSION**

The prevalence and multitude of pesticides in India results in the use of organophosphorus compounds for suicides. These compounds inactivate Acetylcholinesterase by phosphorylating the enzyme. In the present case, the patient manifested Parkinsonism by the sixteenth day of Organothiophosphate consumption. Tracing back the related literature in this area, we identified few cases in which extrapyramidal features have been reported by day 4<sup>(5)</sup>, 5<sup>(6)</sup> and 40<sup>(2)</sup>. The causative agents reported in such studies were dimethoate<sup>(3, 6)</sup>, fenitrothion<sup>(7)</sup>, dichlorvos<sup>(8)</sup>, chlorpyrifos<sup>(9)</sup>, and fenthion<sup>(2)</sup>.

**Table 1. Laboratory findings**

Laboratory Values	Day 1	Day 2	Day 3	Day 4	Normal values
Urea mg/dl	30	30	26	26	7-20
Creatinine mg/dl	1.0	1.1	1.0	1.0	0.84-1.21
Na mmol/L	134	132	135	135	135-145
K mmol/L	4.0	4.0	4.2	3.8	3.5-5.5
Serum Cholinesterase U/L	4660			6000	Males:4620-11500 Females:3930-10800
Total Bilirubin mg/dl	0.5	0.6	0.5	0.5	1.2
AST I.U/L	23	23	24	23	8-48
ALT I.U/L	14	14	14	14	7-55
ALP I.U/L	46	46	46	46	40-129

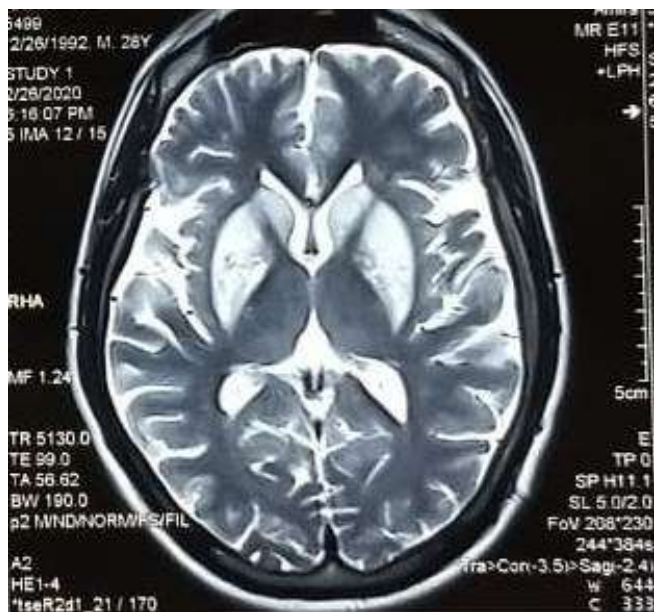


Figure 1. MRI brain (axial view) shows symmetrical hyperintensities in bilateral basal ganglia.



Figure 2. MRI brain (coronal view) showing symmetrical hyperintensities in bilateral basal ganglia.

In our case it was quinalphos. In a retrospective study by Madhavan et al on suicidal cases autopsied at a tertiary care hospital, pesticides constituted the majority of the poisons causing death. The most identified pesticides on chemical analysis were quinalphos (n=123) and chlorpyrifos (n=87)<sup>(10)</sup>. The current case happens to be the first report on organothiophosphate induced extrapyramidal manifestations. Nevertheless, the first report of Parkinsonism following Organophosphate exposure was in 1978 by Davis et al<sup>(11)</sup>.

It is critical to note that Quinalphos is an example of organothiophosphate insecticide which plays a significant role as an EC 3.1.1.7 (acetylcholinesterase) inhibitor, an acaricide, and an agrochemical. Senanayake and sanmuganathan proposed that the impaired balance between dopamine and acetylcholine in substantia nigra due to probable selective access of organophosphates to the basal ganglia results in extrapyramidal manifestations<sup>(2)</sup>. Muller et al.<sup>(12)</sup>, proposed increased Acetylcholine concentration in the cholinergic interneurons of the striatum has the potential to stimulate efferent GABA projections to the globus pallidus externus containing enkephalin. Moreover, Hsieh et al proposed that, by functional impairment of acetylcholinesterase, organophosphate pesticides hinder the appropriate modulation of nigrostriatal dopaminergic system<sup>(5)</sup>. Organophosphates rarely involve basal ganglia in a bilateral symmetrical manner. A research in China on 30 healthy cats revealed symmetrical bilateral involvement of the basal ganglia after OP poisoning<sup>(13)</sup>. Saroj et al proposed that reduced striatal acetylcholinesterase activity may result in a decreased cortical glutamate stimulation, which clinically mimics a dopamine deficiency syndrome. Brain imaging may reveal vital signal changes or can be completely normal<sup>(14)</sup>.

## CONCLUSION

In summation, in this case study, we have presented a report of Organothiophosphate poisoning which induced acute Parkinsonism. The frequent use of such insecticides in India often results in their application for suicidal attempts. The results of this study indicated that clinicians should be aware of the extrapyramidal manifestations of poisoning by such compounds and its management. The results of the reported case also revealed the importance of requesting the patients for regular follow-ups.

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