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Case Report Open Access

A Case of Chlorfenapyr Intoxication with Central Nervous System Involvement

Ji Sun Kwon, Hye Yun Kim, Hyun Jeong Han*, Je Young Kim and Jong Ho Park

Department of Neurology, Myongji Hospital, Kwandong University College of Medicine, Goyang, Republic of Korea

Abstract

Background: Chlorfenapyr is a widely used insecticide worldwide for farming. However, chlorfenapyr intoxication with organic brain lesion has never been reported.

Case report: A 49-year-old man attempted suicide by ingesting 200 ml of Chlorfenapyr. He suffered from severe diaphoresis with a sustained high fever. Ten days after chlorfenapyr poisoning, he developed altered mentality. Brain Magnetic resonance imaging (MRI) showed extensive bilateral involvement of the white matter.

Conclusion: We presumed Chlorfenapyr or its metabolite can induced delayed neurotoxicity in the central nervous system. We report herein a case of Chlorfenapyr intoxication with brain MRI findings.

Keywords: Chlorfenapyr, Intoxication, Brain MRI

Introduction

Chlorfenapyr [4-bromo-2-(4-chlorophenyl)-1-(ethoxymethl)-5-(trifluoromethyl)-1H-pyrrole-3-carbonitrile] is widely used pesticide to control cotton worms or insects around the world. [1,2] Chlorfenapyr interferes with mitochondrial oxidative phosphorylation, resulting in disruption of ATP production and eventual cellular death [2]. Human intoxication with chlorfenapyr might be fatal, but chlorfenapyr poisoning has rarely been reported [3-5]. We present herein a case of chlorfenapyr poisoning with central nervous system involvement.

Case Report

A 49-year-old man with no pertinent medical history was referred to the emergency department due to sweating and dizziness. He ingested 200 ml of 6% Chlorfenapyr [a combined product of Chlorfenapyr and Clothianidine] for suicidal attempt about 1 hour before arrival to the hospital. He denied ingestion of other toxic substances or drugs. His vital signs on arrival were as follows: blood pressure 120/70 mmHg, heart rate; 60/minute, respiratory rate; 20/minute and body temperature; 36°C. He had alert mental status. The initial electrocardiogram showed normal sinus rhythm without QT prolongation. There were no abnormalities on arterial blood gas analysis and chest radiograph. We treated him with intravenous fluid, gastric lavage and activated charcoal administration. After seven days of initial treatment, he complained of generalized weakness, intermittent abdominal pain and diaphoresis. At that time, he had low blood pressure (100/60 mmHg) but normal heart rate. Laboratory results showed high serum creatine kinase (CK) (1846 IU/L), serum glutamic oxaloacetic transaminase (SGOT: 66/IU/L) and serum glutamic pyruvic transaminase (SGPT: 54/IU/L). Other laboratory data were within normal limits. Three days later, he was alert and conscious, but suffered from severe diaphoresis and tachypnea. His vital signs were as follows: blood pressure of 90/60 mmHg though hydration, respiration rate 26/min and heart rate 98/min. Laboratory data revealed pH 7.48, pCO_2 31 mmHg, pO_2 109 mmHg, HCO_3-24.2 mmol/L on arterial blood gas analysis and a marked increase of CK (14336 IU/L), CK-MB (81.1 ng/mL) and SOGT/SGPT (332 IU/L/116 IU/L). We transferred him to the intensive care unit. The following day, he still suffered from sustained diaphoresis and became confused. We suspected brain insult accompanied by multiorgan damage attributed to chlorfenapyr poisoning. We performed brain Magnetic Resonance Image (MRI) for neurological evaluation. Brain MRI demonstrated bilateral symmetric lesions along the white matter tracts including the brainstem, middle cerebellar peduncle, internal capsule, corpus callosum, and centrum semiovale (Figure 1). Electroencephalogram showed generalized delta slow activities without epileptiform discharges, which implied diffuse cerebral dysfunction. Three days later, his mental

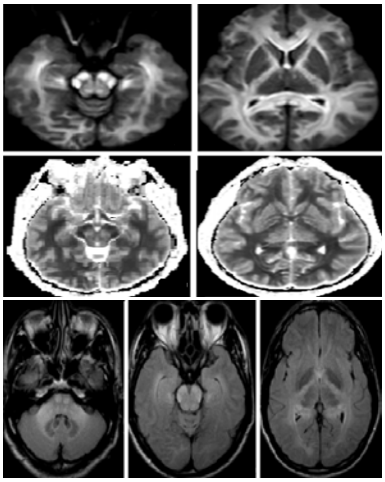

Figure 1: Brain MRI shows diffuse bilateral symmetric high signal intensities in white matter including the brain stem, cerebellar peduncle, internal capsule, corpus callosum on diffusion-weighted images (DWI) (1-A,B) and low signal intensities on the apparent diffusion coefficient map (1-C,D). Fluid-attenuated inversion recovery (FLAIR) (2-A, B, C) demonstrates high signal intensities in the same areas.

***Corresponding author:** Hyun Jeong Han, Department of Neurology, Kwandong University College of Medicine, Hwajeong dong, Goyang, Gyoenggi-do, Republic of Korea, Tel: +82-31-810-5403; Fax: +82-31-969-0500; E-mail: neurohan@kd.ac.kr

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status indicated stupor with bilateral papilledema development. His respiratory effort was decreased. Endotracheal intubation was done and a mechanical ventilator was applied to maintain his respiration. Two days after later, diaphoresis and insensible water loss were suddenly stopped. His body temperature was 40°C and blood pressure was increased to 140/100 mmHg. His respiration was markedly increased (35-40/min) and showed a sustained high fever. His heart rate was suddenly decreased and asystole was recorded. Cardiopulmonary resuscitation was performed for 30 minutes. Despite our efforts, he expired about two weeks after ingestion of chlorfenapyr.

Discussion

Chlorfenapyr poisoning causes fever, severe diaphoresis, tachypnea, rhapdomyolysis and mental change. Previous case reports showed that the initial clinical symptoms are usually present within several hours after chlorfenapyr indigestion [3-5]. However, in our case, the initial symptoms such as diaphoresis and general weakness developed one week after, and mental change was noted ten days later. This shows a possibility delayed adverse effects on high energy consuming vital organs by the metabolites of chlorfenapyr. Therefore, patients with chlorfenapyr intoxication should be carefully observed for a delayed mental status up to a couple of weeks after ingestion. Also, our patient had a sustained high fever before he expired. Body temperature is controlled through the hypothalamic regulation of the sympathetic nervous system and mitochondrial oxidative phosphorylation. Non-shivering thermogenesis occurs primarily by the uncoupling of oxidative phosphorylation through the activity of a group of mitochondrial proteins known as uncoupling proteins [6,7]. Chlorfenapyr seems to possibly have an effect on the uncoupling of oxidative phosphorylation. Lack of adenosine triphosphate leads to glucose consumption and increased cellular activity. This can in turn cause severe damages in high energy requiring organs including the heart, muscles, kidney and brain. Chlorfenapyr intoxication is known to induce seizure attacks and deaths in rats [5,8,9]. However, there are only few reports on chlorfenapyr induced brain insults. To our knowledge, our case is the first report of central nervous system involvement with neuroimaging of chlorfenapyr intoxication. In the present case, brain MRI showed extensive involvement of white matter in the brainstem, middle cerebellar peduncle, internal capsule, corpus callosum, and centrum semiovale. The findings were suggestive of chlorfenapyr injuries specifically to white matter of central nervous system such as Leigh's disease or mitochondrial neurogastrointestinal encephalopathy [10].

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