ASIA PACIFIC JOURNAL of MEDICAL TOXICOLOGY
APJMT 13;1 http://apjmt.mums.ac.ir March 2024

ORIGINAL ARTICLE

Cartap Hydrochloride Poisoning Mimicking Organophosphorus Poisoning

ZANETHA THOMAS[1], AKHILA ELDO P[2], MOHAMMED ISMAIL K K[1], VINOD V S[1], NIKITHA K[1*]

[1]Department of General Medicine, P K Das Institute of Medical Sciences, Vaniyamkulam, Palakkad, Kerala, India.
[2]Department of Pharmacy, Nehru College of Pharmacy, Pampady, Thrissur, Kerala, India.

Abstract

Background: Cartap is a class 4 pesticide and categorized by the insecticide resistance action committee (irac) as safe and non-toxic to people. The main routes of exposure include ingestion, skin contact, and eye contact.
Case presentation: A 35-year-old man, a bus driver from South Kerala, was bought to the emergency department with history of consumption of cartap hydrochloride after two hours of poisoning.
Results: All the necessary measures were taken to prevent further exposure to the poison. Patient was intubated and mechanically ventilated. The patient's condition began to deteriorate gradually, culminating in multiorgan dysfunction and eventual death on the 7th day of hospitalization, with no restoration of consciousness.
Conclusion: This report enables medical professionals to identify and manage an uncommon poisoning that causes lethal toxicity.

Keywords: Cartap Hydrochloride, Poisoning, Antiepileptics, Gastric Lavage, Nereis Toxin

How to cite this article:

INTRODUCTION

cartap hydrochloride was first used in Japan in 1967, before being introduced to India in 1988. Cartap is a class 4 pesticide and categorized by the insecticide resistance action committee (irac) as safe and non-toxic to people. Cartap rarely results in fatal poisoning. It was isolated from the marine annelid lumbriconereis heteropoda and acts as a nereistoxin analogue. The chemical name of cartap hydrochloride is S,S′-[2-(dimethylamino)-1,3-propanediyl] dicarbamothioate, and is frequently used as a hydrochloride (c7h15n3o2s3hcl) [1].. Cartap is sold under the brand names padan, kritap, ag-tap, thiobel, and vegetox and is offered in a variety of formulations. Two formulations available in India include a 4% granule for controlling pests in sugarcane and rice, and a 50% water-soluble powder for controlling diamond black moths in cauliflower and cabbage. The three main routes of exposure are ingestion, skin contact, and eye contact [2,3].

Cartap hydrochloride and its metabolite nereistoxin impede neuromuscular transmission by inhibiting the postsynaptic nicotinic acetylcholine receptor ion channel. Cartap functions as a non-competitive antagonist at neuronal nicotinic acetylcholine receptor (nAChR). Consequently, consuming these poisons may cause cholinergic symptoms that may be misinterpreted for organophosphate symptoms (class ib) [4,5]. The patient may experience nausea, vomiting, salivation, stomach pain, and trembling in arms and legs. In more severe cases, it can result in respiratory failure, convulsions and death [6].

CASE PRESENTATION

A 35-year-old man, a bus driver from South Kerala, was bought to the emergency department with reported history of consumption of 25 g of cartap hydrochloride. Following ingestion, he had multiple episodes of vomiting. Later he developed twitching of upper limbs and face. He was agitated and restless. He was brought to the hospital approximately two hours after poison consumption.

Observations and Investigations

The patient was restless, agitated and hypoxic with SpO2 of 80% in room air. His systolic blood pressure (BP) was 80mmHg. He was tachypneic (28/minute) and had tachycardia(106/mt). The pupils were equal (3mm) and reactive to light. He had fasciculations in his calf muscles and forearm – flexor muscles at the time of presentation. Respiratory examination had bilateral coarse crepitations in all areas of lung, but the other systemic examination was unremarkable. Within 30mts of arrival he developed generalized tonic clonic seizure and was started on antiepileptics for controlling status epilepticus. Arterial blood gas analysis showed mixed respiratory with metabolic acidosis (pCO2- 70, pH-6.9) and lactic acidosis(10mmol/l). Also, chest xray was normal and ECG showed sinus tachycardia without any ST-T changes. Besides, blood routine investigations showed neutrophilic leucocytosis, and

*Correspondence to: Nikitha K, MD, Department of General Medicine, P K Das Institute of Medical Sciences, Vaniyamkulam, Palakkad, Kerala, India.
Email: nikitatoo@gmail.com, Tel: 8943114044

hypocalcemia. Liver and renal functions were within normal limits.

Treatment Given

All the necessary measures were taken to prevent further exposure to the poison. The patient was intubated and mechanically ventilated. Thorough gastric lavage was given. Next, activated charcoal was administered at a dose 1mg/kg body weight. Seizures continued even after giving lorazepam, leviteracetam, fosphenytoin. Later fentanyl (+ midazolam) was given and seizures got controlled. Considering the possibility of aspiration, the patient was started on treatment by IV antibiotics, also serum calcium (S. Ca2+) level was found to be low and it was corrected. Even after hydrating him well, initial urine output in four hours were just 50ml. As he was anuric, hemodialysis was initiated and he underwent 3 sessions of dialysis.

Outcome

The patient's condition began to deteriorate gradually, culminating in multiorgan dysfunction and eventual death on the 7th day of hospitalization, with no restoration of consciousness. Autopsy was not performed.

Toxicology Analysis

During gastric lavage, samples of plasma, urine, and stomach fluid were collected. The samples were then kept at 4°C until analysis. All of the compounds used were of analytical reagent quality. To a sample for hydrolysis, sodium hydroxide and benzylacetone (an internal standard) were introduced. It showed the presence of nereistoxin in the sample. Through hydrolysis, cartap is converted to nereistoxin. Nereistoxin is present in stomach fluid, plasma, and urine.

DISCUSSION

Cartap is known for having a minimal level of toxicity. Furthermore, there are sporadic cases of fatal or severe cartap poisoning. It is believed that cartap and its metabolite nereistoxin block the neuromuscular postsynaptic nicotinic acetylcholine receptor ion channel, causing neuromuscular blockage that results in salivation, vomiting, trembling in the arms and legs, tonic or clonic convulsions, respiratory failure, and ultimately death [6].

Several reports claim that some Japanese men killed themselves after ingesting cartap. It is sold as a granular powder product under the brands Boregan SP and other. Half of the cartap in the world is found in Boregans SP. Following ingestion, the individuals developed dyspnea, convulsions, and eventually loss of consciousness. Sodium dimercaptosuccinate (DMS) and sodium dimercaptopropane sulfonate (DMPS) have been shown to be effective antidotes for cartap and effective aganist respiratory depression brought by cartap hydrochloride.

Moreover, isolated mice and rabbits can develop ca2+-dependent contracture in response to cartap. In the sarcoplasmic reticulum, cartap inhibits [3H]-ryanodine binding to the Ca2+ release channel in a dose-dependent manner. A possible hypothesis was that the sarcoplasmic reticulum Ca2+ pump protein Ca2+ ATPase was partially inhibited by Cartap, which led to contracture. The sarcoplasmic reticulum's calcium would be discharged if the ATPase were inhibited.

The main cause of death behind cartap poisoning is respiratory failure as a result of neuromuscular inhibition. There have been instances where cartap intake resulted in multiorgan failure (DIC) and disseminated intravascular coagulation (DIC) deaths. Liao *et al*. (2000) from Taiwan conducted a study on rabbits and discovered that calcium-mediated diaphragmatic contracture, rather than neuromuscular inhibition, was the main factor contributing to respiratory failure following ocular exposure to cartap. Kiyota et al. (1994), from Japan, recommended that gastric lavage is an effective way of treating cartap poisoning [1]. Namera et al, (1999), from Japan, reported that 4% cartap-containing Padan was consumed by an 83-year-old woman in an attempt to commit suicide. She went into a coma two hours after eating, and three hours later, gastric lavage was performed. The following morning, she became conscious. In contrary, kuwahara et al, (2000), from Japan, reported that intoxication from cartap led to death in a 50-year-old lady who consumed Padan, which contained 75% cartap. She presented to hospital with cyanosis and a loss of consciousness due to hypoxemia. She only had stomach lavage as treatment, and six days after being sent to the hospital, she died from multiple organ failure and disseminated intravascular coagulation (DIC) [1]. The clinical course of that case was similar to that of our case. Kurisaki *et al*. (2010), from Japan, reported a case with decreased consciousness and hypoxemia in a 35-year-old man who consumed 13 g of Padan (75% cartap). He passed away on the fifth day due to multiorgan failure and DIC. The treatment provided included gastric lavage and symptomatic therapy with mechanical ventilator assistance [7]. These findings indicate that gastric lavage was ineffective in both situations and that the concentration of cartap in the formula plays a significant role in predicting prognosis, even when gastric lavage is done early on.

CONCLUSION

Intentional or inadvertent, cartap exposure is increasing among the general public, particularly among farmers. Cartap hydrochloride shows similar symptoms of organophosphate poisoining and its essential to distinguish them as its rare kind of poisiong. Effective management is required for life saving.

Conflict of Interest: None to be declared.
Funding: None

REFERENCES

1. Kumar ASP, Amalnath D, Dutta TK. Cartap poisoning: A rare case report. Indian J Crit Care Med Peer-Rev Off Publ Indian Soc Crit Care Med. 2011;15(4):233–5.
2. Vivek V. Studies on acute toxicity of cartap hydrochloride (50% SP) a carbamate impact on freshwater fish, Labeo rohita (Hamilton). 2015;
3. Professor & HOD, Department of General Medicine, Rajah Muthiah Medical College, Annamalai University, Chidambaram, Tamilnadu, India, Senthilvelan PDM. Cartap Hydrochloride Poisoning - A Case Report. J Med Sci Clin Res [Internet]. 2019 Oct 24 [cited 2023 Oct 5];7(10). Available

from: http://jmscr.igmpublication.org/v7-i10/116%20jmscr.pdf
4. Kalyaniwala K, Abhilash K, Victor PJ. Cartap Hydrochloride Poisoning. J Assoc Physicians India. 2016 Aug;64(8):91–2.
5. Raymond-Delpech V, Matsuda K, Sattelle BM, Rauh JJ, Sattelle DB. Ion channels: molecular targets of neuroactive insecticides. Invertebr Neurosci IN. 2005 Nov;5(3–4):119–33.
6. Boorugu HK, Chrispal A. Cartap hydrochloride poisoning: A clinical experience. Indian J Crit Care Med Peer-Rev Off Publ Indian Soc Crit Care Med. 2012;16(1):58–9.
7. Kurisaki E, Kato N, Ishida T, Matsumoto A, Shinohara K, Hiraiwa K. Fatal human poisoning with Padan: a cartap-containing pesticide. Clin Toxicol Phila Pa. 2010 Feb;48(2):153–5.