

Cartap poisoning: A rare case report

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Abstract

Cartap is a pesticide commonly used to control weevil and caterpillars. It is an analogue of nereistoxin, a neurotoxic substance isolated from the marine annelid *Lumbriconereis heteropoda*. It causes neuromuscular blockade. Poisoning with cartap is very rare and not yet reported from India. We report a 35-year-old lady with cartap poisoning who presented with nausea, vomiting, and dyspnea. She improved with N-acetyl cysteine and symptomatic management.

Keywords: Cartap hydrochloride, N-acetyl cysteine, nereistoxin, pesticide, respiratory failure

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Introduction

Cartap is a pesticide first introduced in Japan in 1967 and commonly used to control weevil and caterpillars.^[1] Its basic chemical structure is *S,S*-[2-(dimethylamino)-1,3-propanediyl] dicarbamothioate and is normally used as the hydrochloride (cartap hydrochloride). Cartap is recognized as an analogue of nereistoxin. Nereistoxin is a neurotoxic substance isolated from the marine annelid *Lumbriconereis heteropoda*.^[1] There are only a few reports of cartap poisoning in humans in the literature^[2-6] and no reports from India. We report a case of cartap poisoning in a 35-year-old female who presented with vomiting, abdominal pain and dyspnea.

Case Report

A 35-year-old lady presented to our casualty with history of suicidal consumption of handful of cartap powder mixed in water (50% cartap). At presentation, she complained of nausea, vomiting, abdominal pain and breathlessness. There was no history of seizures, loss of consciousness or altered behavior. Also, there was no history of increased salivation, diarrhea, chest pain or palpitations. Her pulse rate was 96/min, blood pressure

120/80 mmHg, and respiratory rate was 26/min, and there was no respiratory paradox or neck flop. The pupils were 4 mm in size and reacting to light. Examination of respiratory and other systems was normal.

The arterial blood gas analysis showed respiratory alkalosis (pH 7.50) with saturation of 98% (SpO₂), partial pressure of oxygen 74 mmHg (PaO₂), PaCO₂ 40 mmHg and bicarbonate of 24 mEq/L. The hemogram, renal and liver functions tests were normal.

The patient was managed initially with gastric lavage with water, and in view of tachypnea and breathlessness, she was treated with intravenous *N*-acetyl cysteine at a total dose of 15 g over 24 hours. Her symptoms completely resolved after 2 days of symptomatic management and she was observed in the hospital for a week before discharge.

Discussion

Cartap has been considered to be a relatively safe compound and is used worldwide.^[7] It is obtained as a granular powder material with the brand name Padan in Japan and various brand names in India. The use of cartap in India began in 1988 after an agreement with Japan from where the technical grade product (cartap) is imported. Two formulations are made in India from this technical grade product: 4% granule form and 50% water-soluble powder form.^[8] The 4% granule form is

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used for controlling paddy and sugarcane pests and 50% powder form for control of diamond black moth in cabbage and cauliflower. The World Health Organization (WHO, 1978) has classified cartap hydrochloride as a "moderately hazardous technical product"^[8] (toxicity class II).

The toxicity of cartap is usually low and rarely fatal toxicity occurs. The main routes of exposure are ingestion, skin contact and eye exposure. Cartap and its metabolite, nereistoxin, are thought to act by neuromuscular blockage through inhibition of the postsynaptic nicotinic acetylcholine receptor ion channel, leading to salivation, nausea, vomiting, abdominal pain, and tremor of the arms and legs.^[9] In severe cases, it causes convulsions, respiratory failure, and subsequent death.^[9,10] The main cause of death in cartap poisoning is respiratory failure due to neuromuscular blockage. There are reports of death due to multiorgan failure and disseminated intravascular coagulation (DIC).^[2,5] A study by Liao *et al.* in rabbits showed that respiratory failure following ocular exposure of cartap was mainly due to calcium-mediated diaphragmatic contracture rather than neuromuscular blockage.^[11] It was thought that similar kind of mechanisms could be involved in the development of respiratory failure in humans.

There are only five reports of human cartap poisoning in the literature and are mostly from Japan and China. Among them, three reports are of fatal toxicity and the patients succumbed to poisoning,^[2,3,5] and the other two reports are of low toxicity and the patients recovered completely with treatment.^[4,6] Namera *et al.* reported an 83-year-old woman with suicidal cartap poisoning by ingestion of Padan containing 4% cartap, who presented with coma and received gastric lavage 3 hours after ingestion. She recovered completely with the gastric lavage and supportive management.^[4] Kiyota *et al.* reported a case of cartap intoxication in a woman who ingested Padan solution containing 50% cartap and presented with loss of consciousness to the hospital presumably 45 min after ingestion. She received gastric lavage immediately after hospitalization and recovered consciousness 8 hours after ingestion.^[6] These are the only two reports out of five case reports in the literature in which the patients recovered from poisoning with gastric lavage and supportive management. Kuwahara *et al.* reported a fatal case of cartap intoxication in a 50-year-old female who ingested Padan containing 75% cartap. She presented with loss of consciousness and cyanosis due to hypoxemia. She received treatment only with gastric lavage and died due to multiple organ failure and DIC on the 6th day of hospital admission.^[2] In a recent report by Kurisaki *et al.*, a 35-year-old man

with 13 g of Padan (75% cartap) poisoning presented with hypoxemia and decreased level of consciousness. At hospital, he developed multiorgan failure, DIC and expired on day 5 of poisoning.^[5] He was treated with gastric lavage and symptomatic management with mechanical ventilator support. It is clear from the above reports that none of them have used *N*-acetyl cysteine in the management of cartap poisoning, and presently there are no recommendations for its use in humans.

Acute accidental/suicidal ingestion of cartap is managed by stomach wash with water and by administering cysteine as an antidote (Universal Crop protection data sheet, 2007). Several sulphhydryl-containing compounds (L-cysteine, D-penicillamine) in experimental animals have delayed the onset of symptoms from cartap hydrochloride poisoning.^[12] There are no case reports or studies regarding the use and effectiveness of *N*-acetyl cysteine in humans with cartap poisoning. In the case report by Kiyota *et al.*, gastric lavage is recommended as an effective treatment for cartap poisoning.^[6] Kuwahara *et al.* reported a case that did not improve following gastric lavage within 45 min of cartap poisoning and the patient died of multiorgan failure and DIC.^[2] Hence, the use of gastric lavage as an effective treatment alone is controversial.

Our patient presented within 8 hours of cartap poisoning with nausea, vomiting, abdominal pain and dyspnea. She was initially managed with stomach wash and intravenous fluids. In view of dyspnea, increased respiratory rate and reports of fatal toxicity and as gastric lavage alone is controversial in the management of poisoning, our patient received treatment with intravenous *N*-acetyl cysteine (15 g) though there are no clear recommendations for its use in human cartap poisoning. Her symptoms completely resolved over 2 days and she was monitored in the hospital for respiratory muscle weakness. Her stay in the hospital was uneventful and she was discharged from the hospital after a week.

In conclusion, cartap poisoning is very rare and usually causes low toxicity though fatal toxicity can occur. Early recognition of respiratory failure and effective treatment can prevent mortality and morbidity. The role and effectiveness of *N*-acetyl cysteine in cartap poisoning is yet to be clarified in humans and more case studies may aid in this regard.

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