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Propanil Poisoning and Toxin-Induced Methaemoglubinemia.

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Abstract:

Introduction: Propanil is a pesticide with medium to low toxicity for mammals, but heavy ingestion of the poison can produce significant clinical manifestation. However, it has been reported rarely worldwide.
Case report: A 15year old girl ingested propanil in a suicide attempt. The patient developed methaemoglobinemia, respiratory distress and decreased level of consciousness which needs intubation and paediatric intensive unit management.
Discussion: Since the mechanisms responsible for the clinical manifestation of propanil are tissue hypoxia and methaemoglobinemia, the diagnosis and treatment of them could be lifesaving for the patient.

Keywords: propanil, poisoning, suicide, methaemoglobinemia

Introduction:

Self-poisoning is one the most common methods of suicide worldwide. Intentional ingestion of pesticide is the main cause of such deaths particularly in rural areas.[1,2]

Propanil pesticide poisoning has been recorded only rarely because the most common route is through occupational exposure so the level of toxin entering the body is so little that the patient may remain asymptomatic. This is why most current texts on poison consider it to be of low toxicity. However, Propanil self-poisoning particularly by ingesting can cause significant clinical manifestations and even death although it is rare.[3] Most cases of such poisoning have been reported in Sri Lankan rural areas.[1,3] The present study report a severe propanil poisoning case that produced significant methaemoglobinemia.

Case History:

A 15-year-old girl, presented to local health centre approximately 4 hours after intentional taking of an unknown amount of a liquid pesticide, named propanil, in a suicide attempt. As revealed she has had a conflict with her father. She was brought with respiratory difficulty and nail, lip and mucosal cyanosis. She had a few episodes of emesis as well. On initial presentation, she was sleepy but arousable, with respiratory distress and dark cyanosis of lips, nails and oral mucosa. Initial vital signs were heart rate 130 /min, respiratory rate 20/min, blood pressure 70/50 mmHg and pulse oximetry 60% on room air. No temperature was recorded. Physical examination revealed a drowsy girl with Glasgow Coma Score Scale (GCSS) 9, on respiratory distress with deep and forceful respiration and intercostals recession and flaring of ala nasi. She had clear lungs, a soft abdomen and non-focal neurological examination. Cardiac exam showed tachycardia with regular rhythm. Her arterial blood gas analysis showed PH: 7.3, HCO3-: 21.8mmol/lit, PCO2: 50.7mmHg, PO2: 80mmHg, BE: -2mmol/lit and O2 Saturation: 90%. She received 2 boluses of 20 cc/kg of normal saline which showed improvement in her blood pressure reading. Oxygen 2lit/min started for her by nasal cannula. Although she showed mild improvement in her respiratory status, she had no change in her cyanosis yet. Nasogastric tube was inserted for her and gastric washing was done which removed a significant amount of poison. Activated charcoal was commenced, orally. The patient was transferred to a tertiary care hospital in need of intensive monitoring at intensive care unit. The patient arrived at paediatric intensive care unit 8 hours post ingestion.

Within an hour, the patient's GCSS decreased to 6 so intubation and artificial ventilation started for her. Her presenting vital signs and physical examination were normal apart from marked cyanosis visible at the end of her extremities and oral mucosa. Her first blood gas on PICU showed PH: 7.3, PCO2: 35, PO2: 75, HCO3-: 17.4 mmol/lit, BE: -5.4mmol/lit and O2 Saturation: 91%but pulse oximetry was showing 80-85% on room air. Her electrocardiogram was normal. Her urinalysis revealed a mild haemolysis with 2+ blood and dark colour. Her blood

tests showed a WBC: 16x106/mm³ and Hb: 10.7gr/dl and platelet of 245x106/mm³. The comprehensive metabolic profile was normal. Acetaminophen and salicylate levels were undetectable.

Ten hours post-ingestion, a blood sample was sent for methaemoglobine level and she was given the first dose of methylene blue (2mg/kg, max: 50mg) as 1% solution over 5 min intravenously and repeated in one hour. The result showed 55% methaemoglobin level. Her blood gas analysis 3 hours after the treatment revealed PH: 7.45, PCO2: 31mmHg, PO2: 151mmHg, HCO3: 21.4mmol/lit, BE: -0.5mmol/lit and O2Saturation of 93%. Her pulse oximetry was still showing 88%, and the patient was cyanotic. She was not given oral methylene blue because it was not available. Ascorbic acid commenced for her. Her GCSS gradually increased, so the tube was taken out later the day (7hrs after treatment). She exhibited marked improvement in her peripheral cyanosis. Her blood coagulation profile showed normal pattern. Her renal and liver function tests remained normal. She was eucalcemic and euglycemic all the times. Her second blood methaemoglobin showed 10%, 8 hours after treatment. Her blood gas analysis remained normal and her pulse oximetry reading showed 90% since 10 hours following the treatment and the patient remained asymptomatic afterwards, although she had mild mucosal cyanosis. She was transferred from PICU after 18 hours and was discharged with methaemoglobin level of less than 2% without any complication.

Discussion:

This case indicates that although propanil poisoning is very uncommon, it can be a severe form of self poisoning, mostly due to heavy ingestion. The patient presented with methaemoglobinemia, CNS depression, respiratory distress and haemolysis. Propanil is a highly effective herbicide from acetanilide group and is synonym to 3,3,4-Dichloropropionanilide.[4, 5] Poison texts categorised it to the group "with low or no toxicity in mammals".[5] However, in case reports mostly from Sri Lanka, it was seen to produce a significant and wide spectrum of clinical manifestations.[3] Death occurred due to respiratory depression and cardiorespiratory arrest.[3, 6] They found management difficult due to lack of iv methylene blue, inability to measure methaemoglobin levels and paucity of intensive care unit beds.[3] Poisoning occurs after occupational exposure to the herbicide (skin or eye contamination, inhalation) or ingestion of the herbicide either intentionally or accidentally. The poison causes gastrointestinal irritation due to solvent in the formula.[4] There are no human data available of its absorption, distribution, biological half-life and its metabolism.[4] Acutely, propanil is reported to induce methaemoglobinaemia which results in tissue hypoxia as we observed in this case as well.[3, 4, 6] Methaemoglobinaemia can produce cardiovascular, respiratory and neurological manifestation with level of 30% or more. Although cyanosis may be seen with level as low as15%, the patient is asymptomatic.[4] As seen in this patient, the severity of cyanosis does not correlate with the pulse oximetry reading. Concentrations

around 80% are life-threatening.[7] We observed that lower level of methaemoglobin (50%) than previously reported (50-70%) may be associated with severe symptoms.[6] The minimum dose of propanil required to produce methaemoglobinemia in human is unknown.[4] It occurs after metabolism of propanil. It may, therefore, be delayed by the need for uptake and subsequent metabolism, as reported in our patient as 4 hrs. Therefore, exposed patient should be treated symptomatically with close observation for methaemoglobin in the hospital.(4, 7) The management should start with decontamination measures such as washing of the contaminated skin and eye. In case of ingestion, gastric aspiration and lavage may be considered.[4] In this case, cuffed endotracheal tube is advisable to prevent aspiration of the associated solvent.[4]Administration of activated charcoal and an appropriate cathartic is recommended as well.[4] Treatment of methaemoglobinaemia is supportive and symptomatic.[9] Clinical experience suggests that methylene blue as an antidote results in prompt relief.[7, 8, 9] It can increase the rate of methaemoglobin conversion to haemoglobin some 6-fold.[7] In severe poisoning exchange transfusion may be necessary as a life saving measure.[6, 9] Some others recommend this method in case of relative contraindication of methylene blue in patients with glucose-6-phosphatase dehydrogenase (G6PD) deficiency.[7] Methylene blue is administered in 1-2 mg/kg intravenously and can be repeated in 30-60 minutes. The actual dose depending on the severity of the clinical features.[7, 9] Some authors recommend continuing of oral methylene blue in case of mild symptoms.[7] Supplemental antioxidants such as ascorbic acid (vitamin C) and N-acetyl cystein have been recommended as adjuvant or alternatives to methylene blue with no confirmed benefit.[7, 9]

In conclusion, although propanil is categorised as a toxin with low toxicity, it was seen that it produced severe signs and symptoms which needs ICU admission. Availability of the poison in rural areas and poor socioeconomic and cultural status are two important contributing factors for the suicide as a major public health problem. The noteworthy concentration of this case is the intentional ingestion of pesticide by an underage patient, who commonly lacks the information about the poison.

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