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DEADLY POISOINING WITH DICHLOROPHENOXYACETIC (2,4-D) ACIDE WITH REVIEW OF LITTERATURE

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Abtract: A 13-year-old was admitted to Intensive Care Unit after voluntary ingestion of an imprecise amount of a chlorophenoxy herbicide, leading to death 48 hours after admission to a multi-visceral failure chart. The management of intoxication and the treatment of the patient consisted of the establishment of alkaline diuresis and symptomatic treatment. Toxicological analysis (liquid-phase chromatography with UV diode bar detection) confirmed the diagnosis and guided the therapeutics. Venous and urinary samples taken from the moment of admission have made it possible to identify and tame the active ingredients and their metabolites. Mass spectrometry is an interesting, more specific and more efficient alternative for research and dosage of these molecules in the blood and urine. The prognosis of this poisoning remains serious, Death is mainly related to the severity of the initial cardiovascular disease.

Keywords: Dichlorophenoxyacetic acid (2,4-D), Toxicology, cause of death

I. INTRODUCTION

2,4-dichlorophenoxyacetic acid, commonly known as 2,4-d, is a systemic herbicide of chlorophenoxy type widely used to destroy broadleaf weeds in grain crops and on industrial land, lawns, pastures and uncultivated land. It is also used to destroy aquatic weeds. 2,4-d is marketed in the form of preparations of alkaline salts, amine salts and esters. Accidental ingestion or for suicidal purposes are responsible for a panoply of clinical and biological symptoms, the evolution of which is very often fatal.

II. CASE REPORT

We report the case of a 13-year-old adolescent, admitted to Intensive care unit after voluntary ingestion, 8 hours previously, of an imprecise quantity of a herbicide, he was unconscious, with a Glasgow score of 8/15 , the pupils in tight areactive miosis, febrile at 39 oC, polypneic at 36 / min with tracheobronchial congestion and bilateral snoring groans at the two pulmonary hemi-fields, a systolic blood pressure of 80mmHg, a diastolic blood pressure of 40 mmHg. Its biological balance sheet shows rhabdomyolysis (CPK at 19,366 IU / L, 113 times normal), troponin Ic positive at 0.7 ng / L, renal failure (urea at 1.23 mmol / L, creatinine at 2, 6 mg / dL), metabolic acidosis (pH 7.19, bicarbonate level at 9 mEq / L) and a decrease in the prothrombin level (TP 49%). The rest of the blood ionogramm was free of abnormalities. Blood, urine and gastric juice samples are taken for toxicological analysis. After a vascular expansion with 1 liter of crystalloids, infusion of bicarbonate serum, artificial intubation-ventilation was performed. Upon admission, he was hemodynamically unstable, his blood pressure at 70mmHg maximum, heart rate at 130batt / min despite a blood volume expansion hence the indication for the use of vasoactive drugs (norepinephrine up to 3 microgram / kg / min). Echocardiography shows a left ventricle of normal size, preserved systolic function and hyperkinetic. Additional examinations show the persistence of acidosis (pH 7.10) and the worsening of renal function and

rhabdomyolysis. The hemodynamic state deteriorates rapidly despite the increase in doses of norepinephrine, with persistence of severe acidosis, leading to death 48 hours after admission to a multi-visceral failure table. Toxicological screening by high performance liquid chromatography coupled to a diode array detector (HPLC-DAD) has revealed the presence of dichlorophenoxyacetic acid (2, 4-D) in the blood and in the urine (Figures 1 and 2).

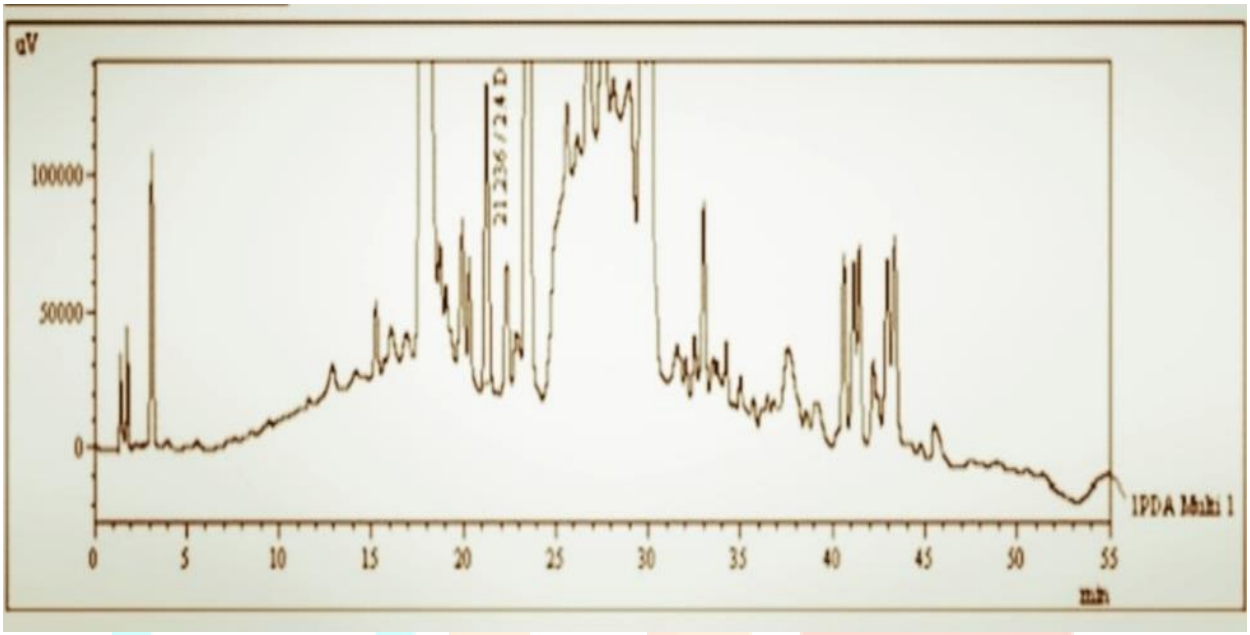

Figure 1 : Chromatogram showing the peak of 2.4 D in the patient's blood

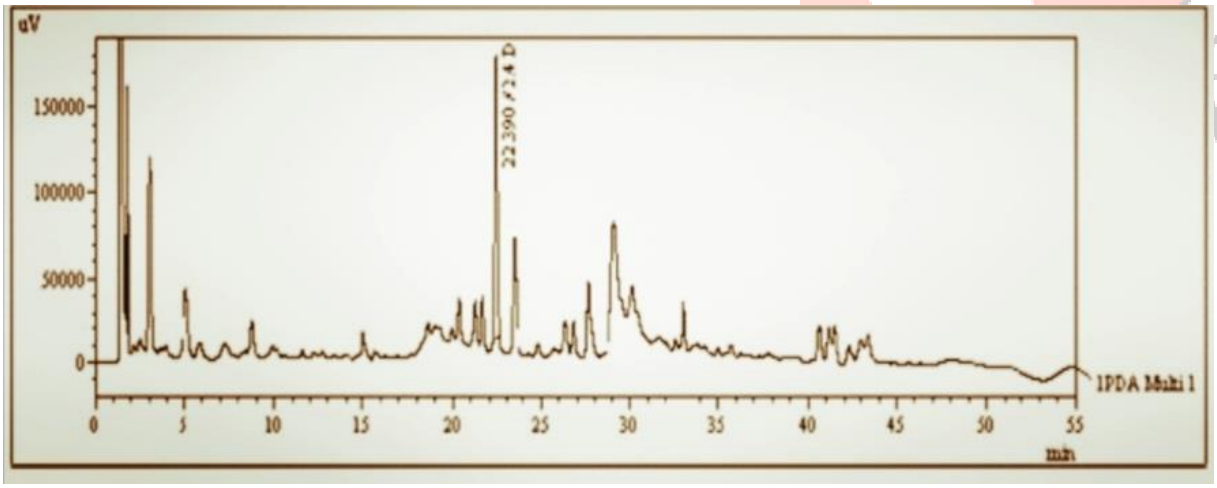

Figure 2: Chromatogram showing the peak of 2,4-D in the patient's urine

III. DISCUSSION

Dichlorophenoxyacetic acid (2,4-D) is a systemic herbicide, belonging to the group of phytohormones, widely used in agriculture (forest maintenance) and in products for household use. [2,3] Intoxication by these herbicides is rarely described in the literature. It is mainly seen in a professional environment where the symptomatology can be minor, however, ingestion for a suicidal purpose is responsible for serious or even fatal poisoning. [3-4] In terms of toxicokinetic, these herbicides are rapidly absorbed regardless of the route of administration: cutaneous, respiratory or digestive, and are rapidly distributed in the body (liver, kidney, nervous system) then are eliminated in urine mainly in unchanged form (90%) by active transport at the level of the proximal renal tubules. [6] At low doses, the elimination half-life of 2,4-D is around 12 h; in high doses, it rises to 133 h. [1] However, it is considerably reduced by alkalinization of the urine [12] and hemodialysis. [5] The mechanism of toxicity of these substances is imperfectly known. [1,3,4] These are dose-dependent lesions of cell membranes with alteration of the blood-brain barrier and disruption of transmembrane ion transfers explaining neurological toxicity. Furthermore, 2,4-D acid is capable of

experimentally interfering with the metabolic pathways involving acetyl-coenzyme A and thus of forming choline esters which act as false neurotransmitters at the nicotinic and muscarinic receptors. The induced cell damage seems to be accompanied by a decoupling of oxidative phosphorylation. [2,3] The lethal oral dose 50 ranges from 300 to over 1,000 mg / kg. It should be noted, however, the absence of a good correlation between the plasma concentration of chlorophenoxy-herbicides and the severity of intoxication. [1,2,6.13]. After a free interval, the symptomatology associates digestive disorders (epigastralgia and vomiting), neurovegetative disorders (impairment of consciousness, ataxia, hyperthermia, pupils with tight miosis), rhabdomyolysis (clinical and biological with metabolic acidosis) and cardiovascular disease (refractory arterial hypotension, arrhythmia due to myocardial damage and vasoplegia). [2,5] Toxicological analysis (liquid chromatography with UV detection with diode array) makes it possible to confirm the diagnosis and guide therapy. Venous and urinary samples taken upon admission make it possible to identify and measure the active ingredients and their metabolites (they must be sent quickly to the laboratory or stored at 20 ° C). Mass spectrometry is an interesting, more specific and more efficient alternative for the research and determination of these molecules in the blood and in the urine. [6,7,8,9] In the absence of a specific antidote, the treatment remains essentially symptomatic:

• Alkalinization and maintenance of correct diuresis to increase the urinary excretion of these compounds [10,12]. The alkalinization of the urine must be early for the treatment of acidosis and for the purification of the toxic. Indeed, the renal clearance of 2,4 D is directly linked to the urine pH and can be increased by almost 5 times for each increase in a pH unit of urine [10,11,12]. Hemodialysis has an effect similar to alkaline hyperdiuresis without modifying the urine pH and administering large quantities of intravenous fluids. The final choice between these two purification methods may be dictated by the availability of hemodialysis [5,10].

• Decontaminating treatment (skin washing in the event of cutaneous projection or digestive decontamination in the event of ingestion) respecting the indications and contraindications

• Artificial ventilation intubation.

• Abundant vascular fluids infusion associated with the use of pressure-reducing and inotropic drugs for the treatment of shock.

• External cooling for the treatment of hyperthermia.

The prognosis for this intoxication remains serious: lethality of 0.05% [13]. Death is mainly related to the severity of the initial cardiovascular damage [2].

IV. CONCULSION

Intoxication by dichlorophenoxyacetic acid (2,4-D) remains rare, but it is responsible for a heavy mortality. In our context, the commercial availability of this product becomes worrying, justifying the use of a broad prevention program to inform the public and the authorities of the danger of this herbicide.

Competing interest

The authors declare that they have no competing interests.

Authors' contributions

all the authors contributed to the realization of this article, the read and approved the final manuscript.

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None

Patient consent

Obtained by his family

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