Case Report

Fatal 2,4-D (Ethyl Ester) Ingestion

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Abstract

2,4-D (2,4-dichlorophenoxyacetic acid) is widely used in agriculture and forestry to destroy broad leaved weeds (herbicide). It has a moderate mammalian toxicity and human poisoning has rarely been reported except following ingestion with suicidal intent. We report two young adults who ingested it with suicidal intent, developed neurological, cardiac, hepatic and renal toxicity and died.

INTRODUCTION

2,4-D (2,4-dichlorophenoxyacetic acid) is a selective herbicide which kills broad leaved plants but not grasses. It is not toxic to beneficial insects and has moderate mammalian toxicity. It is used widely in agriculture and forestry as a herbicide in either ester or salt formulation.1 In Northern India it is marketed as Sohna 2,4 Diethyl ester (34% E.C.) and is used mainly in wheat cultivation. Human poisoning with 2,4-D is rare and is generally following suicidal ingestion.2-4 To the best of our knowledge we could not find any report from India and are reporting two fatalities following 2,4-D ester ingestion with suicidal intent.

CASE I

LD, a 20 year unmarried female was found unconscious at home by her mother with bottle of 2,4-D diethyl ester lying by her side. She had apparently vomited after ingestion but there was no hematemesis. She was taken to a local hospital where gastric lavage was undertaken and was also given i.v. fluids. However, she failed to improve and was referred to the Institute. On admission, she was drowsy and restless. Pulse was 108/min, B.P. 130/80 mmHg and RR 22/min. Systemic examination was normal. Investigations revealed Hb 9.5 gm/dl; TLC 9800 with normal differential count. Blood biochemistry revealed serum Na+ 134 mmol/l; K+ 3.5 mmol/l; urea 55 mg/dl; creatinine 1.8 mg/dl; bilirubin 0.7 mg/dl; total proteins 7.3 gm/dl with albumin 4.3 gm/dl; SGOT 109 IU; SGPT 58 IU; alkaline phosphatase 6 KAU; calcium 5.8 mg/dl; sugar 84 mg/dl. Urine R/E was normal. Blood gases revealed pH 7.49; PaO$_2$ 103 mm Hg; SaO$_2$ 98%. She developed respiratory depression for which she was intubated and provided mechanical ventilation. She also developed coagulopathy with prothrombin time 21 sec (control 16 secs), prothrombin index 62%, PTTK 47 sec (control 32 sec). She also developed renal failure with creatinine rising upto 3.6 mg/dl. She continued to deteriorate despite supportive measures and died 2 days later following a cardiac arrest. Autopsy revealed congestion of lungs, liver, kidneys, adrenals and brain. Histopathology revealed presence of pulmonary edema, and hemorrhages. No other specific findings could be observed.

CASE II

V, a 27 years male farmer consumed about 100 gms of 2,4-D ethyl ester with suicidal intent. About an hour later he become markedly restless and drowsy. He also vomited repeatedly and with these complaints he was taken to local hospital where gastric lavage was performed and was referred to the institute. At admission he was restless and incoherent. BP was 120/70 mm Hg; pulse 110/min and was tachypnoeic (RR 30/min). There was no icterus. Systemic examination was normal. Investigations revealed Hb 14.5 gm/dl; TLC 8400 with normal differential count. Platelets were normal (1.55 lacs/cumm). Blood biochemistry revealed Na+ 132 mmol/l; K+ 3.5 mmol/L; urea 50 mg/dl; creat. 1.7 mg/dl; bilirubin 0.7 mg/dl; SGOT 82 IU; SGPT 38 IU; alkaline phosphatase 6 KAU; calcium 5.8 mg/dl; sugar 84 mg/dl. ABG revealed mild PaO$_2$ 137; PaCO$_2$ 15; pH 7.44 HCO$_3$ 17; O$_2$ sat 99%. He had markedly elevated creatinine phosphokinase (CPK) 27360 IU (normal 20-200). Urine R/E was normal, EKG and chest x-ray were normal. He was treated with i.v. fluids and antibiotics for suspected aspiration pneumonia. His condition, however continued to deteriorate and required mechanical ventilation for respiratory failure. He also developed thrombocytopenia and elevated SGOT and SGPT. Despite supportive measures he continued to have progressive hypotension and died of cardiac arrest 3 days later. Necropsy did not reveal any specific findings other than congestion of various organs as in first case.
DISCUSSION

Chlorophenoxy compounds are widely used as herbicides in forestry and agriculture. The common formulations are either solid alkali salt concentrate, salt miscible solution or as ester based emulsifiable concentrate. In Northern India it is available as an ester formulation. Most of the available reviews concentrate on 2,4,5-T (agent orange) used extensively in Vietnam war. Reports on 2,4-dichlorophenoxyacetate either following suicidal ingestion or occupational exposure are scanty.2-4 2,4-D is neurotoxic, myotoxic, cardiotoxic and also produces haematological toxicity.5 In addition, it has pulmonary, hepatic, renal and gastrointestinal toxicity. The reported neurological effects are impaired coordination, unconsciousness and coma. Muscle fibrillations, myotonia, myoglobinuria and muscular weakness are the myotoxic effects. Our second patient had markedly elevated CPK suggesting myotoxicity in him. Myocardial dystrophy, myocarditis, cardiac arrhythmias have been observed following large ingestion and our first patient had changes suggestive of myocarditis. Pulmonary oedema, hyperaemia and hemorrhages have been found in fatal cases.1 On autopsy our both patients had pulmonary congestion, edema and one had pulmonary hemorrhages. Liver necrosis or fatty liver cell change has also been observed in two fatal cases.1 Elevated SGOT and SGPT are common biochemical changes even in non-fatal cases and our both patients had these. Nephrotoxicity has been observed in fatal and in nearly fatal cases. Our both patient had developed renal insufficiency.

The management is mainly supportive as no specific antidote is available. However forced alkaline diuresis6 or hemodialysis7 can enhance its excretion. Unfortunately we could not carry out this in both of our patients. As herbicides are now being increasingly used, clinicians should be aware of this poisoning.

REFERENCES

1. Environmental health criteria 29. 2,4-dichlorophenoxyacetic acid (2,4-D). WHO 1984.