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Case Report

A CASE REPORT ON GLYPHOSATE POISONING

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ABSTRACT

A 36-year-old lady, with unfortunate history of Medical termination of Pregnancy 1 month back, presented with alleged history of 400 mL of agricultural herbicide glyphosate ingestion 18 h back. On complete evaluation, she was found to have acute kidney injury with hyperkalemia, acute liver injury, respiratory depression, and myocardial depression. She was treated conservatively with IV fluids, IV antibiotics, IV calcium gluconate and insulin-dextrose, and IV noradrenaline and was put under invasive ventilation. Continuous renal replacement therapy was started along with toxin removal cartridge HA230. She improved dramatically and had complete recovery within 3 days and has now returned to her normal life.

Keywords: Glyphosate Poisoning, HA230 in Poisoning, Newer Advancesfor Complicated Poisoning

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INTRODUCTION

Glyphosate is the most commonly used non-selective and broad-spectrum herbicide in the world. Toxicity of glyphosate is supposed to be due to uncoupling of oxidative phosphorylation and the surfactant polyoxyethylene amine-mediated cardiotoxicity. Clinical features of this herbicide poisoning are varied, ranging from asymptomatic to even death. There is no antidote and aggressive supportive therapy is the mainstay of treatment for glyphosate poisoning [1]. HA230 is one of the few adsorption hemoperfusion cartridge filters, where solutes are removed by direct binding of solute materials. Initially, they were used in poisoning but now been used in inflammatory conditions, chronic uremic symptoms, and autoimmune diseases. There have been multiple studies to support their effectiveness and safety [2].

CASE REPORT

A 36-year-old lady, with previous history of Medical Termination of Pregnancy 1 month back, presented to the emergency with alleged history of 400 mL of agricultural herbicide glyphosate ingestion 18 h back. She, now, presented with cough, shortness of breath, and disorientation for the past 2 h. She was evaluated at an outside center and was transferred under our care. On further enquiry, she did not pass urine over the past 6 h. On examination, she was alert, conscious, and co-operative but speaking incoherently at times; HR-130/min, regular, reduced volume, and all peripheral pulses were palpable; RR-30/min, regular, and accessory muscles of respiration were working; SpO_2 92% in room air; and BP 80/50 mm of Hg. Pallor and icterus were present. There was no cyanosis, clubbing, and edema; neck veins not engorged; and neck glands not palpable. Systemic examination revealed bilateral basal crepitations. She was started on inhaled nasal O_2 and bolus IV fluids; laboratories for complete blood count and complete metabolic profile were sent. ECG showed wide complexes, incomplete RBBB; ABG showed metabolic acidosis with hyperkalemia and high lactate; and chest X-ray was normal (Figs. 1-3).

She was stabilized conservatively initially with IV calcium gluconate and IV insulin dextrose. Her initial blood parameters showed: Hemoglobin 10.5 g%, total leukocyte count (TLC) 15,300/cu mm, platelet count 1.83l ac/cu mm, PT 22.9 s, APTT 140 s, INR 1.68, urea 42 mg/dl, creatinine 2.3 mg/dl, sodium 147 mEq/L, potassium 6.88 mEq/L, bicarbonate 17 mEq/L, albumin 2.8 mg/dl, total bilirubin 1.6 mg/dl, direct bilirubin 1 mg/dl, SGOT 106 U/dl, SGPT 61 U/dl, and ALP 45U/dl (Table 1).

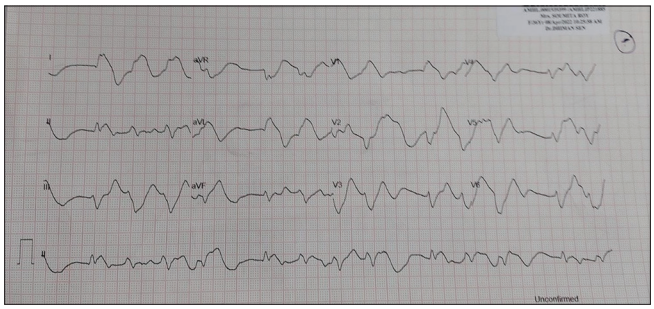

Fig. 1: ECG during admission

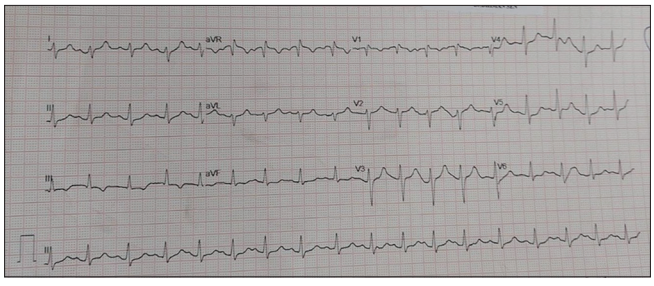

Fig. 2: ECG after initial stabilization

Table 1: Serial ABG during hospital stay

Time from admission	0 h	1 h	4 h	12 h	24 h	36 h
pH	7.2	7.1	7	7.5	7.43	7.39
pO_2	62	133	266	211	157	125
pCO_2	47	45	45	27	31	35
Na	144	143	140	139	135	133
K	7.1	6.5	4.17	4	2.8	3
HCO_3	19	17	13	21	22	26
Lactate	4	6.17	6.81	2.9	1.9	1.7

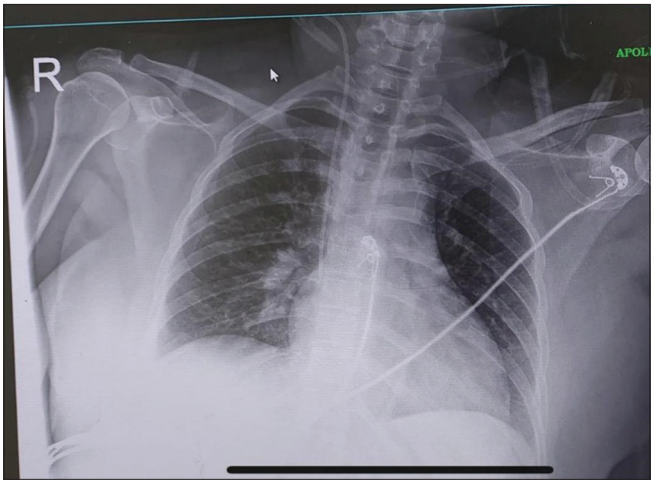

Fig. 3: Chest X-ray PA view during admission

However, her condition deteriorated with worsening sensorium, increasing heart rate and respiratory rate with hypotension, IV noradrenaline, and empirical IV antibiotics were started. She was put under invasive ventilation, sedated, and paralyzed. For acute liver injury, she was treated conservatively with IV N-acetylcysteine and other supportive medications. Due to persistent anuria, severe metabolic acidosis and persistent hyperkalemia, she was started on continuous renal replacement therapy (CRRT) within 4 h of admission with toxin removal hemoperfusion cartridge HA230.

She had no clinical improvement in next 8 h. After 8 h, her urine output gradually started to increase and with resolution of acidosis, CRRT was discontinued after 32 h. Blood pressure was stabilized gradually and IV noradrenaline was tapered off after 36 h. She was extubated after 24 h, then put on nasal oxygen and was put off oxygen within 2 days. Blood tests showed improving trend of TLC, renal, and liver function tests. She was discharged in 3 days after psychological evaluation and has now returned to her normal life.

DISCUSSION

Commercial-based glyphosate herbicide is available in the market containing 41% or more concentrate for agricultural use to 1% concentrate used for domestic use. Ingestion of more than 85 mL of concentrated formulation is likely to cause significant toxicity [3].

After oral ingestion, 30–36% of glyphosate is absorbed systematically and reaches maximum peak concentration in the body after 6 h, undergoing very little metabolism. Gastrointestinal symptoms include dysphagia, erosions, and bleeding after ingestion. Skin exposure causes dermal irritation. Inhalation causes oral and nasal irritation and tingling sensation. Severe manifestations can be dehydration, hypotension, pneumonitis, oliguria, altered level of consciousness, hepatic dysfunction, acidosis, acute renal failure with hyperkalemia, and dysrhythmias causing multiorgan failure [4]. Pulmonary and renal toxicities are the main reasons of mortality with metabolic acidosis; abnormal chest X-ray, tachycardia, and elevated creatinine level are useful prognostic factors for predicting glyphosate mortality as per a case–control study by Lee *et al*. [5].

Although traditionally regarded as minimally toxic, severe glyphosate poisoning has shown to be refractory to the most intensive supportive care. The triad of metabolic acidosis, hyperkalemia, and pulmonary edema has shown to have fatal outcome despite early recognition and aggressive treatment [6].

Treatment of glyphosate poisoning is mainly supportive. There is a previous report of Glyphosate poisoning by Mahendrakar *et al*. [7]. In that case, the patient presented within 1 h of ingestion and was treated with intravenous fat emulsion (20% intralipid 100 mL) and other supportive measures: Vasopressor, ventilatory, and renal support. The patient made recovery after a prolonged hospital stay.

HA130, HA230, and HA330 are newer hemoperfusion cartridges which have been developed in the field of extracorporeal adsorption blood purification techniques and are usually used along with dialysis technique [8]. Further studies have been done for estimation of efficacy and safety profiles. HA130 is used in chronic dialysis complications and removes molecules weighing 5-30KDa. HA230 is used in poisoning of various sources and removes molecule weighing 500Da-10KDa. HA330 is used in acute conditions such as sepsis and cytokine storm and removes molecules weighing 10–60 KDa [2].

There have been various studies for the efficacy of HA230 in various poisoning cases. Observational study by Shi *et al*. [9] for paraquat poisoning patients; randomized controlled trial by Bo [10] and retrospective observational study by Dong *et al*. [11] on acute severe organophosphate poisoning has shown that the use of HA230 is associated with better outcome as compared to standard or conservative therapy. There has been a reported case of positive outcome of a patient of deltamethrin poisoning, an insecticide following use of HA230 in Vietnam [12]. The use of these hemoperfusion cartridges has been mainly limited to China, but ever-growing evidence favor their use in times of need.

Despite extensive review of literature, we could not find any other report of glyphosate poisoning, in which HA230 hemoperfusion cartridge has been used.

CONCLUSION

As discussed, glyphosate poisoning has poor prognosis. Our patient presented after a considerable amount of time from the time of event and had all the predictors of poor outcome. However, with the use of HA230 and other supportive measures, she improved dramatically and we could discharge her within 72 h of admission. She has now returned to her normal life.

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