Case Report

Paraquat poisoning: A case report and review of literature

Kondle Raghu, Vidavalur Mahesh[1], Parri Sasidhar[2], Polam R. Reddy[3], Vajja Venkataramaniah[3], Amit Agrawal[4]

Departments of Emergency Medicine, [1]Medicine, [2]Pulmonology, [3]Anesthesiology, [4]Neurosurgery, Narayana Medical College Hospital, Chinthareddypalem, Nellore, Andhra Pradesh, India

Address for correspondence: Dr. K. Raghu, Assistant Professor of Emergency Medicine, Department of Emergency Medicine, Narayna Medical College Hospital, Chinthareddypalem, Nellore - 524 003, Andhra Pradesh, India. E-mail: kondle_raghu@yahoo.co.in

ABSTRACT

Paraquat (1, r-dimethyl-4,4'-bipyridium dichloride), a brown syrupy liquid is an effective herbicide that has low chronic toxicity because of its rapid deactivation on contact with soil. A high dose of paraquat or severe poisoning has a poor prognosis. At present there is no specific antidote to paraquat poisoning, hence the need to focus on prevention and in case of exposure or ingestion, aggressive decontamination to prevent further absorption. Although uncommon, paraquat ingestion can lead to severe and often fatal toxicity. However, despite its widespread availability, reports of this herbicide poisoning in India are uncommon.

Key words: Mortality, outcome, paraquat positioning

INTRODUCTION

Paraquat (1, r-dimethyl-4,4'-bipyridium dichloride), a brown syrupy liquid is an effective herbicide that has low chronic toxicity because of its rapid deactivation on contact with soil.[1-5] Although it is uncommon, paraquat ingestion can lead to severe and often fatal toxicity.[6-8] However, although it is widely available, reports of this herbicide poisoning are not common in India.[9-13] We discuss a fatal case of suicide in which paraquat was consumed and review the literature.

CASE REPORT

An 18-year-old female was admitted to the emergency room with an alleged history of attempted suicide in which an unknown quantity of paraquat (liquid form) was consumed at her residence. The patient was managed at local hospital with (intravenous (IV) fluids, antiemetic, and H2 blockers) and brought to our hospital for further treatment after 24 h. She had difficulty in opening her mouth and a decreased urine output. There was no history of vomiting, loose stools, abdominal pain, seizures, or fever. At the time of examination, the patient was conscious and oriented. There was neck edema. Examination of the oral cavity showed mucosal erosion of tongue, palate, and lips with oral bleeding [Figure 1]. On clinical examination, the pulse rate was 98 beats per min, regular, blood pressure (BP) was 130/80 mmHg, with respiratory rate of 22 per min. Cardiovascular system was normal. There was difficulty in breathing, but there were no added sounds on examination of the respiratory system. Pupils were bilaterally equal and reactive to light. The patient was intubated as there was associated laryngeal edema and difficulty in breathing. Gastric lavage was performed and charcoal was given in the emergency department. She was kept on elective ventilation. In the intensive care unit (ICU), she received IV fluids and an antiemetic as a supportive measure. Her initial chest X-ray showed a left lower zone infiltrate [Figure 2]. She had high serum urea (221 mg/dL) and creatinine (8.78 mg/dL) on the day of admission that gradually reduced to normal after two sessions of dialysis. Blood and urine cultures were sterile. Other blood investigations including thyroid and liver functions were normal. Urine examination was normal. Ultrasound of the abdomen showed bilateral grade I changes in the kidneys. Two-dimensional (2D) echo and electrocardiogram (ECG) were normal. upper gastrointestinal (GI) endoscopy showed corrosive injury to the esophagus and proximal stomach. Endotracheal culture showed *Klebsiella pneumoniae*. She received intravenous methylprednisolone 1 g in 200 ml normal saline every 2 h daily for 3 days, IV

Access this article online	
Quick Response Code:	Website: www.jfcmonline.com
	DOI: 10.4103/2230-8229.122023

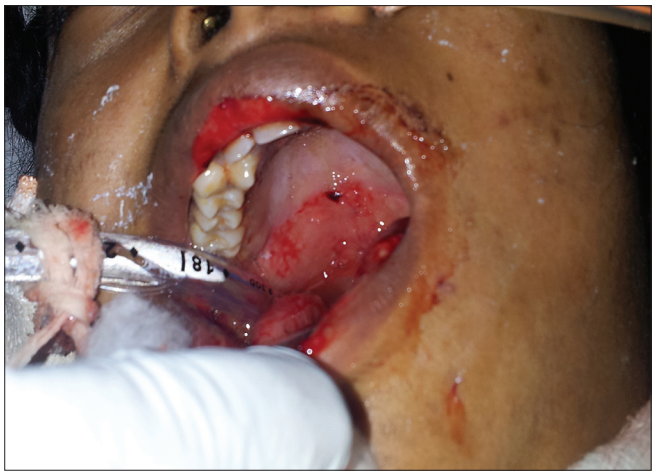

Figure 1: Clinical photograph showing extensive oral ulcerations

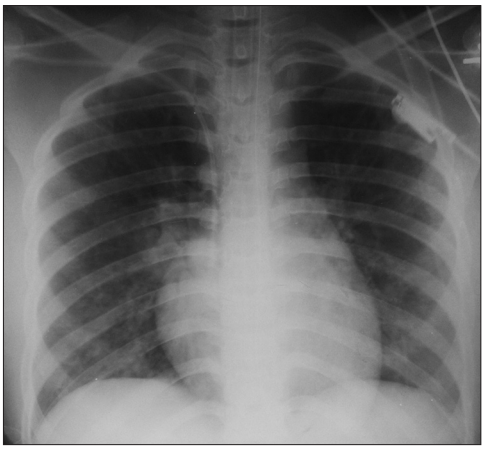

Figure 2: X-ray chest posteroanterior (PA) view showing bilateral patchy consolidation involving lower lobes

cyclophosphomide 750 mg (15 mg/kg/day) in three divided doses (in 200 ml of N-saline over 2 h) for 2 days followed by IV dexamethasone 5 mg 6 hourly, injection N-acetylcysteine 2 g stat followed 1 gm TID for 5 days, vitamin C (500 mg/amp) 6 g/day IV, vitamin E (400 i.u./tab) 2 tabs QID. The patient did not respond to treatment and expired on the 12th day post injury as a result of septicemia and respiratory failure.

DISCUSSION

When consumed orally, Paraquat is sequestered in the lungs and causes a release of hydrogen and superoxide anions which cause lipid damage in the cell membranes, causing oxidant free radical damage that results in hepato/nephrotoxicity and pulmonary fibrosis.[14-18] In fatal cases of paraquat poisoning, histopathological findings range from pulmonary congestion, edema, and hemorrhage to extensive pulmonary fibrosis.[19] Paraquat toxicity produces local as well as systemic effects.[12,20] As seen in the present case, paraquat ingestion results in an inflammation of the tongue, oral mucosa and throat, corrosive injury to the gastrointestinal tract, renal tubular necrosis, hepatic necrosis, and pulmonary fibrosis.[14] The patient complains of burning and ulceration of the throat, tongue, and esophagus.[8,14,20,21] The pulmonary manifestations of paraquat poisoning begin with diffuse consolidation, which evolves several days later into cystic lesions followed by focal fibrotic lesions with very high mortality.[22] Ingestion of large amounts is considered to be uniformly fatal from multiorgan failure and cardiogenic shock.[14,18] Identification of paraquat in urine has not only been used to confirm the diagnosis,[14] but also investigated for the prognostication.[23] It has been found that plasma concentration of >1.6 pg/ml 12 h after ingestion is universally fatal.[8]

As there is no specific clinically proven antidote for paraquat poisoning, supportive treatment is given to avoid free radical injury to lungs (vitamins C and E),[9,24-27] with pulse therapy using steroids (methylprednisolone or dexamethasone) and cyclophosphamide to prevent pulmonary fibrosis,[13,28,29] elimination of paraquat from circulation (hemodialysis), and gastric decontamination.[11,27,30-32] In contrast, the use of oxygen can enhance the toxicity of Paraquat by providing more electron acceptors and should be given in lower concentrations to the hypoxic patients.[30,33,34] In spite of advances in medical care, prompt treatment, and supportive care, mortality is high (mainly due to multiorgan system and respiratory failure) in patients with paraquat poisoning.[8,12,25,27,35-39] Although there have been isolated case reports of survivors (mainly due to the smallness of the dose or effective and early treatment),[12] an ingestion of a high dose or severe paraquat poisoning has a poor prognosis. At present, there is no specific antidote to paraquat poisoning. Therefore, it is recommended that the crucial focus should be on preventive measures and in case of exposure, when it has been ingested, the institution of aggressive decontamination to prevent further absorption.

REFERENCES

1. Conning DM, Fletcher K, Swan AA. Paraquat and related bipyridyls. Br Med Bull 1969;25:245-9.
2. Bullivant CM. Accidental poisoning by paraquat: Report of two cases in man. Br Med J 1966;1:1272-3.
3. Almog C, Tal E. Death from paraquat after subcutaneous injection. Br Med J 1967;3:721.
4. Mourin KA. Paraquat poisoning. Br Med J 1967;4:486.
5. Matthew H, Logan A, Woodruff MF, Heard B. Paraquat poisoning: Lung transplantation. Br Med J 1968;3:759-63.
6. Forget G. Pesticides and the Third World. J Toxicol Environ Health 1991;32:11-31.
7. Klein-Schwartz W, Smith GS. Agricultural and horticultural chemical poisonings: Mortality and morbidity in the United States. Ann Emerg Med 1997;29:232-8.
8. Sittipunt C. Paraquat poisoning. Respir Care 2005;50:383-5.
9. Khosya S, Gothwal S. Two Cases of Paraquat Poisoning from Kota, Rajasthan, India. Case Rep Crit Care 2012;2012.
10. Singh S, Yadav S, Sharma N, Malhotra P, Bambery P. Fatal 2,

4-D (Ethyl ester) ingestion. J Assoc Physicians India 2003;51:609-10.
11. Singh S, Bambery P, Chaudhry D, Makharia G, Kakkar N, Singh D. Fatal paraquat poisoning: Report of two cases. J Assoc Physicians India 1999;47:831-2.
12. Sandhu J, Dhiman A, Mahajan R, Sandhu P. Outcome of paraquat poisoning-a five year study. Indian J Nephrol 2003;13:64.
13. Agarwal R, Srinivas R, Aggarwal AN, Gupta D. Experience with paraquat poisoning in a respiratory intensive care unit in North India. Singapore Med J 2006;47:1033-7.
14. Tominack R, Pond S. Herbicides. Goldfrank's toxicologic emergencies. 7th ed. New York: McGraw-Hill; 2002. p. 1393-410.
15. Clark DG, McElligott TF, Hurst EW. The toxicity of paraquat. Br J Ind Med 1966;23:126-32.
16. Hargreave TB, Gresham GA, Karayannopoulos S. Paraquat poisoning. Postgrad Med J 1969;45:633-5.
17. Suntres ZE. Role of antioxidants in paraquat toxicity. Toxicology 2002;180:65-77.
18. Lock EA, Wilks MF, Academic D. Paraquat. In: Handbook of Pesticide Toxicology. 2nd ed. 2001.
19. Smith P, Heath D. The ultrastructure and time sequence of the early stages of paraquat lung in rats. J Pathol 1974;114:177-84.
20. Vale JA, Meredith TJ, Buckley BM. Paraquat poisoning: Clinical features and immediate general management. Hum Toxicol 1987;6:41-7.
21. Vanholder R, Colardyn F, De Reuck J, Praet M, Lameire N, Ringoir S. Diquat intoxication: Report of two cases and review of the literature. Am J Med 1981;70:1267-71.
22. Im JG, Lee KS, Han MC, Kim SJ, Kim IO. Paraquat poisoning: Findings on chest radiography and CT in 42 patients. AJR Am J Roentgenol 1991;157:697-701.
23. Wright N, Yeoman WB, Hale KA. Assessment of severity of paraquat poisoning. Br Med J 1978;2:396.
24. Bismuth C, Garnier R, Baud FJ, Muszynski J, Keyes C. Paraquat poisoning. An overview of the current status. Drug Saf 1990;5:243-51.
25. Böhler J, Riegel W, Keller E, Logemann E, Just H, Schollmeyer PJ. Continuous arteriovenous haemoperfusion (CAVHP) for treatment of paraquat poisoning. Nephrology, dialysis, transplantation: Official publication of the European Dialysis and Transplant Association. Euro Renal Association 1992;7:875-8.
26. Hampson EC, Pond SM. Failure of hemoperfusion and hemodialysis to prevent death in paraquat poisoning: A retrospective review of 45 patients. Med Toxicol Adverse Drug Exp 1988;3:64-71.
27. Koo JR, Kim JC, Yoon JW, Kim GH, Jeon RW, Kim HJ, *et al*. Failure of continuous venovenous hemofiltration to prevent death in paraquat poisoning. Am J Kidney Dis 2002;39:55-9.
28. Lin JL, Leu ML, Liu YC, Chen GH. A prospective clinical trial of pulse therapy with glucocorticoid and cyclophosphamide in moderate to severe paraquat-poisoned patients. Am J Respir Crit Care Med 1999;159:357-60.
29. Buckley NA. Pulse corticosteroids and cyclophosphamide in paraquat poisoning. Am J Respir Crit Care Med 2001;163:585.
30. Fairshter RD, Wilson AF. Paraquat poisoning: Manifestations and therapy. Am J Med 1975;59:751-3.
31. Hwang KY, Lee EY, Hong SY. Paraquat intoxication in Korea. Arch Environ Health 2002;57:162-6.
32. Lee EY, Hwang KY, Yang JO, Hong SY. Predictors of survival after acute paraquat poisoning. Toxicol Ind Health 2002;18:201-6.
33. Thurlbeck WM, Thurlbeck SM. Pulmonary effects of paraquat poisoning. Chest 1976;69:276-80.
34. Fogt F, Zilker T. Total exclusion from external respiration protects lungs from development of fibrosis after paraquat intoxication. Hum Toxicol 1989;8:465-74.
35. Papanikolaou N, Paspatis G, Dermitzakis A, Tzortzakakis E, Charalambous E, Tsatsakis AM. Neutropenia induced by paraquat poisoning. Hum Exp Toxicol 2001;20:597-9.
36. Bismuth C, Garnier R, Dally S, Fournier PE, Scherrmann JM. Prognosis and treatment of paraquat poisoning: A review of 28 cases. J Toxicol Clin Toxicol 1982;19:461-74.
37. Yamashita M, Yamashita M, Ando Y. A long-term follow-up of lung function in survivors of paraquat poisoning. Hum Exp Toxicol 2000;19:99-103.
38. Yoneyama M, Rainuma T, Tarevchi I. Swift death by poisoning caused by the new herbicide Gramoxone. Jap J Med Sci Biol 1969;2374:32-4.
39. Gardiner AJ. Pulmonary oedema in paraguat poisoning. Thorax 1972;27:132-5.

How to cite this article: Paraquat poisoning: A case report and review of literature. J Fam Community Med 2013;20:198-200.
Source of Support: Nil, **Conflict of Interest:** None declared