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PARAQUAT POISONING: A CASE SERIES IN NORTH INDIA

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ABSTRACT

The present study is done on paraquat poisoning, its modes of presentation, complications and outcome. The study is conducted over a period of 2 years and 10 cases of paraquat poisoning were documented at our tertiary care centre. Paraquat is a bipyridium herbicide used for agricultural purpose with good safety record. Most cases were of intentional ingestion i.e. suicidal attempt and the survival rate was two out of ten patients, which clearly indicates that high survival chances are there in patients who present early (6-8 hours) and with lesser amount of ingestion in our study. The most common mode of presentations was with oral ulcerations, esophagitis & acute kidney injury. The most common complications leading to death are pulmonary fibrosis, circulatory failure, myocarditis and eventually multi-organ failure in our study.

KEYWORDS: Paraquat, pulmonary fibrosis, immunosuppression, multi-organ failure.

INTRODUCTION

Poisoning is a major public health problem worldwide especially in the developing countries like India. India is a predominantly agro-based country, where agricultural chemicals are often used as poisons, suicidal or homicidal. The chemical paraquat is (1,1' – dimethyl-4, 4'-bipyridinium) is a widely used contact herbicide (Conning et al. 1969). However, several studies have been done on paraquat poisoning globally. Jones et al. (1999) reported that out of 375 patients, 49 had renal toxicity and median time from ingestion to death in the 241 deaths reported was 270 hours. However, very limited studies on paraquat poisoning are done in India. Khosya and Gothwal, (2012) studied the Paraquat Poisoning from Kota, Rajasthan with ingestion of 20 mL paraquat dichloride and they reported that patients became haemodynamically unstable with features of adult respiratory distress syndrome. Two cases of paraquat poisoning from Himachal Pradesh was studied by Raina et al. (2008) and reported that the patient who consumed 5 ml of paraquat dichloride caused oral erosions and icterus. Raghu et al (2013) reported that there is no specific antidote to paraquat poisoning, hence the need to focus on prevention.[1,2] It is associated with respiratory failure, pulmonary fibrosis and multi-organ failure. Paraquat, a widely used nonselective contact herbicide that is used, primarily in agriculture and by government agencies and industries for control of weeds. In the Indian market it is available as a liquid concentrate (29.1%) for agricultural use.

Paraquat poisoning can be classified into three categories

1) Mild poisoning (20 mg/kg) in which the patients generally have minor gastrointestinal symptoms.
2) Severe poisoning (20-40 mg/kg) in which the patients develop acute kidney injury, acute lung injury and progressive pulmonary fibrosis.
3) Fulminant poisoning (40 mg/ kg) in which the patients develop multiple organ failure. In patients with "fulminant poisoning", death occurs due to circulatory failure in one to four days.

Ingestion of smaller amounts primarily results in progressive pulmonary damage secondary to diffuse alveolar damage with resultant acute respiratory distress syndrome. Paraquat causes damage to the lungs, liver and kidneys. Use of immunosuppressive therapy (combination of glucocorticoids and cyclophosphamide) has been shown to be beneficial in improving survival in those patients with moderate to severe poisoning and progressive pulmonary fibrosis.[3,4]

METHODOLOGY

The present study includes the data of 10 patients of paraquat poisoning over 2 years. Analysis of data was performed and presented in a descriptive pattern. Patients with the history of paraquat poisoning were selected. At admission to the Igmc Shimla, diagnosis of paraquat poisoning was established on the basis of the clinical history and documentation of the poisoning bottle. Patients were classified to have renal dysfunction if the serum creatinine was between 1.2-3.4 mg/dL. Renal

failure if the creatinine was ≥3.5 mg/dL or if the urine output was less than 500 ml/day. Renal replacement therapy was initiated if the patient had complications such as oliguria, metabolic acidosis (pH ratio of 200-300 or <200 as classified as having acute lung injury or acute respiratory distress syndrome, respectively.

Circulatory failure was said to be present if the patient had dopamine requirements <5 µg/kg/minute and cardiovascular failure if the dopamine requirements was ≥5 µg/kg/minute. All patients with severe and fulminant paraquat poisoning were started on the same day of hospital admission with following medications. Intravenous Methylprednisolone 30 mg/kg/day for three consecutive days, Intravenous Cyclophosphamide 15 mg/kg/day for two consecutive days followed by Intravenous Dexamethasone 8mg thrice a day until recovery or death. The patients were clinically screened for any evidence of infection and routine blood & urine investigations were performed in all patients. All patients were subjected to ABG, RFT, LFT & Chest x-ray. Informed consent was taken from all patients or their relatives as per protocol.

Additional Treatment

IV N-Acetyl cysteine 2g/day for 3days. Vit C (500mg/tab) 2 tabs thrice daily. Vit E (400 IU/ tab) 2tabs thrice daily. Triamcenolone paste, sucralphate and lignocaine viscous for oral ulcerations. All patients had local corrosive symptoms, dyspnoea. It is probable that N-acetylcysteine protects against paraquat toxicity by helping to maintain intracellular glutathione levels.

Complications of paraquat poisoning

1) Pulmonary haemorrhage and fibrosis.
2) Acute renal failure.
3) Hepatocellular damage.
4) Myocarditis.
5) GI bleeding, ulceration and perforations.
6) Multi organ failure.

DISCUSSION

Paraquat is a quaternary nitrogen herbicide that is sprayed on unwanted weeds and other vegetations before planting crops. It is a fast-acting, nonselective compound, which destroys tissues of green plants on contact and by translocation within the plant. Paraquat exerts its herbicidal activity by inhibiting reduction of NADP to NADPH during photosynthesis. This disruption leads to the formation of superoxide anion, singlet oxygen, hydroxyl and peroxyl radicals. These reactive oxygen species (ROS) interact with the unsaturated lipids of membranes, resulting in the destruction of plant organelles, inevitably leading to cell death.[5] It is produced commercially as a brownish concentrated liquid of the dichloride salt in 10–30% strength under the trade name of “Gramoxone” and for horticultural use as brown granules called “Weedol” at about 5% concentration. 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. In fatal cases of paraquat poisoning, histopathological findings range from pulmonary congestion, edema, and hemorrhage to extensive pulmonary fibrosis.[6] Paraquat toxicity produces local as well as systemic effects. 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. The patient complains of burning and ulceration of the throat, tongue and esophagus. 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. Ingestion of large amounts is considered to be uniformly fatal from multi-organ failure and cardiogenic shock. Identification of paraquat in urine has not only been used to confirm the diagnosis, but also investigated for the prognostication. It has been found that plasma concentration of >1.6 pg/ml 12 hors after ingestion is universally fatal. 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), with pulse therapy using steroids (methylprednisolone or dexamethasone) and cyclophosphamide to prevent pulmonary fibrosis, elimination of paraquat from circulation (hemodialysis) and gastric decontamination. 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. In spite of advances in medical care, prompt treatment and supportive care, mortality is high (mainly due to multi-organ system and respiratory failure) in patients with paraquat poisonin.

RESULTS AND ANALYSIS

Most of the patients were young males (7) around the age 25-40 years and remaining (3) females in the age group of 25-35 years. 6 patients had moderate to severe poisoning. The degree of poisoning was assessed by number of mouthful (20 ml) of paraquat concentrate ingested i.e. < 1 mouthful as mild, 1 mouthful as moderate and 2 or more as severe. Due to lack of facility, plasma paraquat levels were not done. 3 patients were admitted within 6 hours of paraquat ingestion. The commonest symptoms were vomiting (70%) followed by altered sensorium (59%), oral ulceration or dysphagia (50%), dyspnoea (41%) or loose stools (34%). Five patients developed acute renal failure with a peak serum creatinine of 4.15 mg/dl. Five patients needed dialytic support. The indications for dialysis was serum creatinine > 2.5 mg/dL and impending hyperkalemia and severe metabolic acidosis (pH 6.98, HCO3 10 mEq/L, serum creatinine 6.8 mg/dL). Only 2 patient survived.

Conclusions from our Case Series Study

1) Patients presenting early to the emergency department within 6-8 hours of paraquat poisoning have high rates of survival.
2) Lesser the quantity of ingestion (20mg/kg) of paraquat, better is the survival rates.
3) No specific antidote available.
4) Combination of immunosuppression and antioxidant medication is the key to the management of paraquat poisoning patients apart from other supportive measures.
5) The common complications noted in paraquat poisoning are oropharyngeal ulcerations, oesophagitis, respiratory failure, acute kidney injury, hepatitis and in fulminant cases circulatory failure, multi organ failure and eventually death.

REFERENCES

1. N-acetylcysteine enhances recovery from acute lung injury in man. A randomized, double-blind placebocontrolled clinical study. Arch Toxic, l984; 55(1): 11- 5. Dawson JR, Norbeck K, Anundi I.
2. A prospective clinical trial of pulse therapy with glucocorticoid and cyclophosphamide in moderate to severe paraquat poisoned patients. Thorax, 1996; 51: 661-3. Lin JL, LeuML, Liu YC, Chen GH.
3. Carvalho F. Paraquatpoisonings: mechanisms of lung toxicity, clinical features and treatment. Crit Rev Toxicol, 2008; 38: 13–71.
4. Blake D K, Gallegher R T, Woollen B H. Improved methodsfor theanalysis of paraquat in biological fluids. Chromatographia, 2002; 55(Suppl): S183–S5.
5. E A Lock, M F Wilks. Paraquat. In: Krieger, R.I. (ed.), Handbook of Pesticide Toxicology, 2001; (2): 1559-1603.
6. Eddleston M, Wilks M F Buckley N A. Prospects for treatment of paraquat-induced lung fibrosis with immunosuppressive drugs and the need for better prediction of outcome: a systematic review. QJM., 2003; 96: 809–24.