p-ISSN: 0973-3558, e-ISSN: 0973-3566 DOI: 10.5958/0973-3566.2021.00013.4

Case Report

Toxic Hepatitis And Multiple Fecaliths Formation In Paraquat Poisoning

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Article Info

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How to cite this article: Deepak GC. Toxic Hepatitis and Multiple Fecaliths Formation in Paraquat Poisoning. JInd.Soc.Toxicolo2021;17(2): 31-35.

DOI: 10.5958/0973-3566.2021.00013.4

Abstract

Cases of Paraquat poisoning are on the rise in countries like India, where it is not banned or restricted adequately for use. Paraquat at the molecular level generates oxygen free radicals in the lungs, causing respiratory failure and may also cause acute renal failure in hyper-acute poisoning. There are renal, hepatic and pulmonary manifestations of Paraquat toxicity. We report a case of Paraquat poisoning presenting with toxic hepatitis and multiple fecaliths formations. The clinical toxicologist needs to be wary of bowel-related complications in Paraquat poisoning. The role of paraquat in disturbing bowel mobility and creating a nidus for fecalith formation is of concern in managing the poisoning. Recommendations for proper bowel care in poisoning cases are discussed in this case report.

Keywords: Toxic hepatitis; Fecalith; Paraquat; Bowel care; Paraquat tongue; chemical poisoning.

Introduction

Suicide by consuming pesticides is common in rural areas of our country. Organophosphorus and Organochlorine poisonings are commonly encountered in day-to-day practice. Aluminium phosphide and allied compounds poisoning have made considerable inroads into Indian medical toxicology. Paraquat has gained much attention from clinicians and autopsy surgeons because of its high suicidal potential and increase in abuse. Every Emergency Physician, Intensivist, Pulmonologist and Autopsy Surgeon will surely come across a case of Paraquat poisoning once in a while as long as it is not banned for agricultural use in this country.

Case details

A 21-year-old male consumed *Paraforce herbicide* (Paraquat) to threaten his opponents and instil a sense of guilt in them. He was referred to ACSR Government Medical College for management immediately after first aid at a local PHC. After necessary investigations, his condition was diagnosed as '*Paraquat poisoning with acute kidney injury, hepatitis and multi-organ dysfunction syndrome'*. The patient had a fluctuating 9-10-fold increase of SGOT and SGPT throughout the hospital stay (transaminitis). The patient's serum bilirubin levels were constantly beyond 10 mg/dl with a maximum of up to 17-18 mg/dl at times (hyperbilirubinemia). Two episodes of haemodialysis were carried out during treatment because of a deteriorating renal profile.

The patient was on oral and parenteral feeds given dyselectrolytemia (metabolic acidosis and hyperkalaemia). He developed oral candidiasis on the 9th day and was treated accordingly. On the 10th day of hospital stay, the patient complained of constipation for the past three days and was prescribed lactulose. On day 11, the patient had difficulty sleeping supine, complained of dysphagia and was treated as per requirement. He received treatment for 15 days and finally succumbed to the toxicity of paraquat as per medical records. The case sheet did not mention any prescription of enema for constipation. An enquiry was made with the nursing staff as to how

cooperative was this patient for treatment; they answered negative.

At autopsy, external examination showed a yellowish hue all over, including palms, soles, and conjunctivae. The individual appeared emaciated and showed a toxic constitution with remarkable bony prominences. On internal examination, about 100 cc of straw-coloured fluid was present in the peritoneal cavity; the liver was enlarged and yellow. The stomach contained about 50 cc of brownish-yellow fluid, no specific smell and mucosa appeared normal. The distal part of the transverse colon and proximal part of descending colon showed a string of beads appearance and was hard on palpation. The abdominal surface of the corresponding large bowel showed a greenish-brown hue suggestive of necrosis and emanated foul odour. Upon dissection, the lumen contained multiple greenish-brown and greenish-yellow rocky, and partially calcified fecaliths impacted inside throughout the aforementioned segment of the large bowel.

The fecaliths have taken the contour of the bowel and had an exceptionally smooth surface. The large bowel mucosa showed focal areas of necrosis on gross appearance in areas of fecalith impaction. Other systems had no significant pathology on gross examination. Viscera were preserved for chemical analysis, and large bowel showing necrotic changes was sent for histopathological examination. The pathologist reports confirmed that the bowel was thinned out and necrosis of all layers of the corresponding segment of the bowel was present.

On gross examination, both lungs were oedematous, congested and showed fibrotic changes on cut-section. On gross examination, both kidneys on the cut section showed widened cortex and darkened medulla. Viscera reports are awaited. However, based on history, inquest and clinical findings, primarily this is a case of Paraquat poisoning.

Discussion

Paraquat (1, 1′-dimethyl-4, 4′-dipyridylium) is a broad-spectrum liquid herbicide associated with accidental and intentional ingestion, leading to severe and often fatal toxicity. There is no specific antidote available for Paraquat poisoning. It is essential to establish the diagnosis early, pursue aggressive decontamination and prevent further absorption.[1]

Paraquat accumulates into the lung by diamine transport process located in the alveolar epithelial cells and the Clara cells of the airways. When accumulated, paraquat undergoes an NADPH-dependent electron reduction to form its free-radical, which almost instantly reacts with molecular oxygen to reform the cation and concomitantly produce superoxide anion. The reactive oxygen species thus generated causes ARDS in acute form and pulmonary fibrosis in chronic conditions. Paraquat also tends to accumulate in the kidneys and cause acute renal failure.[2]

The lethality of poisoning depends on the dose. Patients who ingest large doses (50–100 ml) present with fulminant multi-organ dysfunction syndrome (MODS), pulmonary oedema, cardiac and renal hepatic failure, and central nervous system involvement with seizures. They are considered in a severe category or the hyper-acute form of poisoning and die within a few days because of renal tubulopathy, centrilobular hepatic necrosis, and pulmonary fibrosis. Patients who ingest smaller quantities present with predominant involvement of two organs – kidney and lung (renal failure and pulmonary fibrosis). Although classified as moderate severity, the morality in this group is still more than 50%. The pulmonary lesion has two phases: acute alveolitis over 1–3 days, followed by secondary fibrosis. Gastrointestinal toxicity is commonly presented as mucosal lesions of the mouth and the tongue ("Paraquat tongue"). [3-6]

Paraquat is commonly eliminated quickly eliminated by haemodialysis. The management protocols and prognostic indicators for Paraquat poisoning are out of context for us, yet details can be accessed from the literature.[5-10] However, it is pertinent to highlight that Fuller's earth (Multani mitti), used as an adsorbent in the early decontamination of paraquat, can cause severe complications like intractable fecalith formation

and hypercalcemia.[11] In the instant case, the administration of Fuller's earth as an antidote to inactivate paraquat during the early decontamination phase was ruled out as a possible cause for fecalith formation.

Sequential whole gastric and bowel irrigation practices using activated charcoal, Poly Ethylene Glycol (PEG) and montmorillonite proved to be efficacious in managing Paraquat poisoning.[12]In a study conducted in dogs by using PEG for bowel irrigation, plasma Paraquat concentrations 2 and 3 h after the initiation of bowel irrigation and at the end of the study (5 h later) were significantly lower in the bowel irrigation groups than in the control (no bowel irrigation) group.[13]

Though there is no specific antidote for Paraquat poisoning, there are few interesting developments in management. Animal studies have demonstrated that 5-hydroxy-1-methylhydantoin (HMH) is an intrinsic antioxidant and can be used to protect against renal damage caused by PQ. It was found that PQ decreased superoxide dismutase (SOD) activity and elevated the level of malondialdehyde (MDA), while HMH elevated SOD activity and decreased the level of MDA.[14]

It is also appropriate to mention that paraquat was banned in the European Union (EU) way back in 2007, considering its abnormal toxicity profile and risk to farmers even when wearing personal protective equipment. However, it is shocking to know that the EU allows Europe based companies to pump these toxic pesticides into low- and middle-income countries recklessly.[15]

Commonly, we see pulmonary and renal toxicity features in Paraquat poisoning. The present case of Paraquat toxicity had some peculiar manifestations like Toxic hepatitis associated with multiple fecaliths formation. These features can be included in GI manifestations of Paraquat poisoning subject to verification by other practitioners in their routine casework. As per the history of informants, the deceased did not suffer from any liver disease or any bowel-related pathology prior to consumption of poison.

This case illustrates the need for vigilant bowel care in Paraquat poisoning and all poisoning cases managed in the Intensive Care Unit (ICU) setup in general. Moreover, improper bowel care may lead to stool impaction and fecalith formation, sequestrating the toxic compound inside the body in undesirable concentrations. Such fecaliths during evolution can serve as secondary toxic depots affecting patient care.

Paraquat is corrosive, and patients generally present with poor haemodynamic status to casualties. The benefit of whole bowel irrigation practices with different decontaminant solutions or multiple attempts of gastrointestinal lavage providing any relief to the patient is a topic of debate for clinicians.

Recommendations for Bowel care in poisoning cases: [11,16]

There are two aspects to discuss here. One is the therapeutic role of GI decontamination, and the other is the role of supportive therapy as part of further management. Regarding gastrointestinal decontamination, certain poisoning cases respond well to induced vomiting or gastric lavage, which is not so eagerly advocated these days. Whole bowel irrigation/gastrointestinal lavage with anhydrous sodium sulphate, PEG and several other commercial preparations are routinely prescribed for bowel cleansing and decontamination in poisoning unless otherwise contraindicated.

The list of protocols and studies in this arena is never-ending and is beyond the scope of our case report. One thing that is worth mentioning here is that both induced vomiting gastrointestinal lavage and whole bowel irrigation are always fraught with complications like gastrointestinal perforation and aspiration pneumonia.

Post emergency stabilisation, the patient may need ICU care for a few days in most serious

poisoning cases. The supportive aspect of bowel care comes into play at this juncture. Here, the crux of the treatment is nothing but quality nursing care. In such scenarios, generally, the patient won't respond adequately to questioning by the clinician. The treating doctors are much concerned about the patient's vital status and are less probative on bowel status. Nurses are the lynchpin coordinators in ICU care, and they are the ones who tend to be by the bedside almost continuously. The only source of information regarding a patient's bowel habits is the duty nurse, who maintains the entire input/output chart most of the time. Enquiring or observing whether a patient passed stools may not appear as an important issue. Still, those who have suffered or seen the consequences of bowel dysmotility will say otherwise.

Adequate bowel motility is a vague term used by most caregivers with the basic idea that passing stools up to 3 times a day or once in 3 days is a "normal range". But these parameters are highly unreliable in a sick patient. The simple trick of knowing pre hospitalisation bowel movement and periodicity of the patient from attenders and assessing regular bowel outflow and quantity with occasional monitoring of residual or impacted "stuff" through a plain X-ray abdomen might make a massive difference in the patient's experience of well-being.

There are reports of residual impacted stools even after using multiple doses of laxatives and enemas. These treatments alter the enteral bioavailability of any medication and disturb the pharmacokinetics of drugs. Maintaining good hydration, the judicious balance of enteral and parenteral nutrition and regular assessment of bowel movement can shift the balance towards a better outcome in any poisoning case. The success of the intensive care setup requires concerted efforts of medical and paramedical staff and, above all, a cooperative patient.

Conclusion

Paraquat is a very lethal substance and causes nightmares even for the best of practitioners as there is no single effective antidote for it. Few metabolomics level studies showed proof of concept for developing effective antidotes. The regulation of pesticides and insecticides in India is governed by the Insecticides Act 1968 and Rules 1971. The government of India has recently come up with a new Pesticides Management Bill, 2020. Let us hope the bill will uphold the spirit of the international code of conduct on pesticide management and ensure farmer and environment safety by banning or strictly regulating the use of paraquat considering its very harmful nature of causing death after consumption of even a few millilitres and severe deleterious effects upon occupational exposure.[17-20]

Conflicts of interest/Competing interests: None

Acknowledgement: We are thankful to Dr Anirudh Suseel Nalumaru and Dr Namdev V for their contributions.

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