**REFERENCE**

1.Salek S, Boscoe AN, Piantedosi S, Egan S, Evans CJ, Wells T, Cohen J, Klaassen RJ, Grace R, Storm M. Development of the pyruvate kinase deficiency diary and pyruvate kinase deficiency impact assessment: Disease-specific assessments. Eur J Haematol. 2020 May;104(5):427-434. [PMC free article] [PubMed]

2.Machado P, Manco L, Gomes C, Mendes C, Fernandes N, Salomé G, Sitoe L, Chibute S, Langa J, Ribeiro L, Miranda J, Cano J, Pinto J, Amorim A, do Rosário VE, Arez AP. Pyruvate kinase deficiency in sub-Saharan Africa: identification of a highly frequent missense mutation (G829A;Glu277Lys) and association with malaria. PLoS One. 2012;7(10):e47071. [PMC free article] [PubMed]

3.Grace RF, Zanella A, Neufeld EJ, Morton DH, Eber S, Yaish H, Glader B. Erythrocyte pyruvate kinase deficiency: 2015 status report. Am J Hematol. 2015 Sep;90(9):825-30. [PMC free article] [PubMed]

4.Management of Pyruvate Kinase Deficiency in Children and Adults Tracking no: BLD-2019000945-CR2 Rachael Grace (Boston Children's Hospital, United States) Wilma Barcellini (IRCCS Ospedale Maggiore Policlinico di Milano, Italy)

# LESSONS FROM A TRAGEDY: FATAL SYSTEMIC POISONING FOLLOWING ACCIDENTAL PARAQUAT DERMAL CONTACT

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## INTRODUCTION

Paraquat (1,1'-dimethyl-4,4'-bipyridylium dichloride) is a widely used herbicide recognized for its high toxicity. It is commonly utilized around the globe to manage weed growth in agricultural settings, especially in crops like cotton, soybeans, and corn. While it plays a significant role in farming, paraquat is infamous for its potential to cause fatal poisoning. There have been numerous reports of accidental or intentional ingestion, and because of its deadly effects on the lungs, kidneys, and other essential organs, it is considered one of the most hazardous substances when swallowed or inhaled.

The mechanism of paraquat toxicity mainly involves the buildup of the chemical in the lungs, resulting in severe oxidative damage and inflammation, which can lead to acute respiratory distress syndrome (ARDS) and multi-organ failure. The mortality rate associated with paraquat exposure is notably high, even with low quantity ingestions. Prompt identification, supportive care, and targeted treatments can enhance the outcomes of those who are affected. This case report discusses the clinical features and diagnostic challenges that we encountered in this case of percutaneous paraquat poisoning in a patient who presented with severe respiratory distress and multi-organ dysfunction syndrome.

## CASE REPORT

A 42-year-old male, who works as a foreman for the electricity board, was admitted to the intensive care unit (ICU) due to gradually worsening

breathlessness over the past five days. His symptoms had escalated significantly in the last 24 hours before admission, and he reported no history of fever, cough, or sputum production. Additionally, he had an ulcer on his scrotum and left inner thigh that had been present for about ten days. The patient also had a history of chronic alcohol use, with his last drink taken around 15 days before his admission.

While receiving in ICU, the patient was in severe respiratory distress. He was dyspnoeic, tachypnoeic, and exhibited labored breathing. Arterial blood gas (ABG) analysis revealed respiratory alkalosis (pH 7.54) with hypoxic respiratory failure, as evident from low pO2 of 49 mm Hg, a decreased pCO2 of 25.9 mm Hg, and a bicarbonate level of 22.1 mmol/L. Chest X-ray revealed bilateral heterogeneous infiltrates, and hence provisionally diagnosed as a case of Severe Acute Respiratory Distress Syndrome (ARDS).

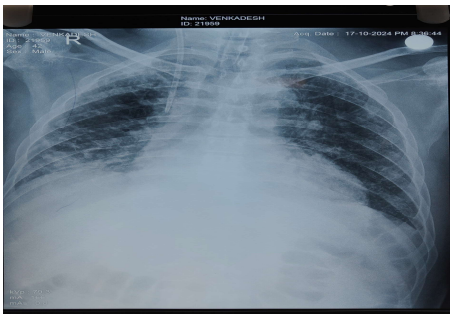


Figure 1:

Chest XRay taken at the time of admission

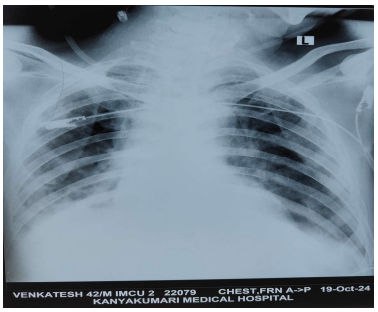


Figure 2:

Chest XRay taken on Day 3 of hospitalization

Despite initial treatment with nasal oxygen therapy with NRBM, the patient did not improve, and he could not tolerate non-invasive ventilation (NIV). Consequently, endotracheal intubation was done and mechanical ventilation was started. Routine lab investigations revealed Leucocytosis of 30,700/cu.mm, with Neutrophilic predominance (92% neutrophils, 4% lymphocytes, and 4% eosinophils), indicating a potential infection. Furthermore, renal function was impaired, with elevated urea levels (82 mg/dL) and creatinine (1.8 mg/dL), along with hyponatremia, as evidenced by a serum sodium of 119 mEq/L. However, liver function tests were normal. The patient's C-reactive protein (CRP) was elevated at 22.4 mg/L, and procalcitonin levels were also high, suggesting Sepsis with Multi-Organ Dysfunction Syndrome (MODS).

## MANAGEMENT AND DIAGNOSIS

Based on the initial presentation, the patient was started on broad-spectrum intravenous antibiotics (MEROPENEM and DOXYCYCLINE), along with IV Steroids and other supportive treatments, including intravenous fluids and electrolyte corrections. CT scan of the chest showed consolidation with air bronchograms in the bilateral basal lung fields, diffuse ground-glass opacities, thickening of the interlobular septa, reticulations, and bronchiectatic changes. These findings were indicative of interstitial lung disease, along with bilateral minimal pleural effusion. CT scan of the abdomen was taken to exclude any other underlying issues and revealed mild ascites and a left renal cortical cyst, but no other significant abnormalities were found in the abdomen.

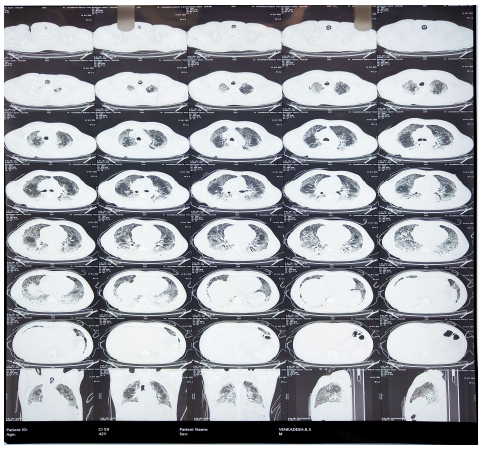

Figure 3: CT Film (Lung Window) of the patient

As there was no clinical improvement with initial treatment, the patient was started on IV Antifungal therapy with VORICONAZOLE and Antiviral therapy with OSELTAMIVIR. Sputum collected from endotracheal aspirates was tested for acid-fast bacilli (AFB) and returned negative for tuberculosis, while the CBNAAT (Cartridge-Based Nucleic Acid Amplification Test) also showed no positive results. Additionally, SARS-CoV-2 PCR, antigen, and IgM/IgG tests were all negative, effectively ruling out COVID-19 as a cause of the patient's respiratory symptoms. Sputum Culture and Sensitivity did not yield any pathogen growth.

As the patient's condition continued to deteriorate and no infectious organisms were found, our clinical team explored alternative diagnostic methods to uncover the reason behind the patient's worsening clinical status. During a thorough review of the patient's history, his wife recalled seeing a greenish stain on the patient's pants in the left thigh area about 20 days before his admission. This detail turned out to be vital in refining the diagnosis. The stain was traced back to an accidental spill of pesticide, which the patient had encountered while trying to open the container. Upon investigating further, the pesticide was found to be PARAQUAT. He had unintentionally spilled PARAQUAT on his clothes, and there were no immediate symptoms after the exposure. However, the later development of respiratory distress and subsequent organ dysfunction raised concerns that led to the diagnosis of percutaneous paraquat poisoning.

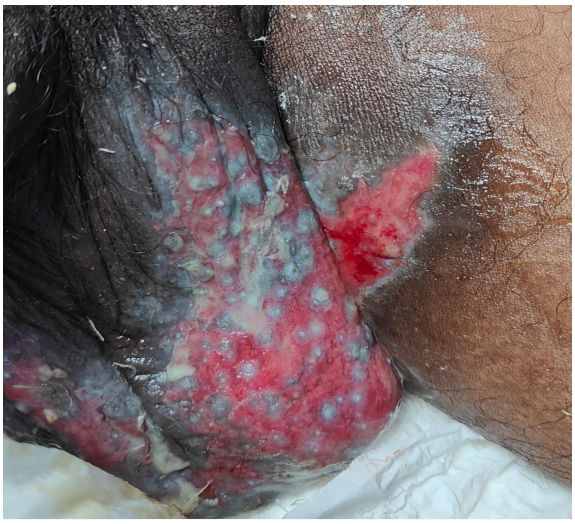

Figure 4: Scrotal and left thigh contact ulcer

**DISCUSSION**

Paraquat is a highly toxic herbicide that can cause severe pulmonary toxicity following ingestion, inhalation, or skin exposure. Its toxicity arises from its ability to undergo redox cycling, leading to the generation of reactive oxygen species (ROS), which induce cellular oxidative damage. Once absorbed,

paraquat primarily accumulates in the lungs, where it causes direct injury to alveolar epithelial cells, leading to inflammation, fibrosis, and eventual respiratory failure. In severe cases, the damage progresses to ARDS, requiring mechanical ventilation and intensive care.

The initial signs of paraquat poisoning can be quite vague, with symptoms that may vary from mild stomach discomfort, oral ulcers to more serious complications like pulmonary edema. The defining feature of paraquat toxicity is its swift advancement to acute respiratory distress syndrome (ARDS) and multi-organ failure, which can result in death within days to weeks following exposure. Early detection and supportive care are crucial for improving outcomes, which may involve low oxygen therapy, corticosteroids, and medications aimed at reducing oxidative stress, although there is currently no specific antidote for paraquat poisoning.

In this case, the patient exhibited severe hypoxia and signs of ARDS, which, combined with laboratory results indicating infection and multi-organ dysfunction, initially led the clinical team to suspect an infectious cause. The delayed recognition of paraquat exposure highlights the necessity of obtaining a comprehensive history, particularly in cases of unexplained respiratory failure and multi-organ involvement.

The treatment for paraquat poisoning is mainly supportive. If paraquat ingestion or exposure is suspected, patients should be promptly decontaminated, which includes removing contaminated clothing and administering activated charcoal if ingestion occurred within a few hours. While various agents like antioxidants (e.g., N-acetylcysteine, glutathione) have been tested, none have shown definitive effectiveness in enhancing survival.

**CONCLUSION**

This case underscores the necessity of maintaining a high level of suspicion for paraquat poisoning in patients who show signs of acute respiratory distress and multi-organ dysfunction. Although the initial symptoms appeared to align with an infectious cause, a detailed investigation

into the patient's background revealed paraquat exposure as the probable reason for his condition. Prompt recognition and supportive care are vital in treating paraquat poisoning, as the situation can quickly escalate to life-threatening organ failure if not managed properly.

Healthcare providers should be alert to potential environmental exposures, like pesticides, in patients with unexplained symptoms, particularly in agricultural or industrial environments. Additionally, a comprehensive clinical history that includes any contact with toxic substances is crucial for making a swift diagnosis and informing treatment strategies in these intricate cases.