

Multidisciplinary management of pregnant adolescents intoxicated by paraquat. Report a case.

Manejo multidisciplinario de adolescente embarazada intoxicada por paraquat. Reporte de un caso.

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ABSTRACT

Paraquat is an agricultural pesticide from the bipyridyl group with toxic effects on several organs. We present the case of a 15-year-old patient with a 16-week gestation pregnancy who accidentally ingested liquid paraquat. The patient had a history of self-inflicted injuries (cutting). During her hospital stay, she developed hepatorenal damage and pulmonary fibrosis, with a favorable outcome following treatment with supplemental oxygen and corticosteroids. A multidisciplinary approach was taken, including the ethics and bioethics committee, and the pregnancy concluded successfully. Mental health treatment was initiated. We emphasize the importance of identifying risk factors for both physical and psychological health in the care of children and adolescents.

KEY WORDS: Pregnancy, Poisoning, Paraquat, Teen, Mental Health.

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RESUMEN

El paraquat es un plaguicida agrícola del grupo bupiridilo con efectos tóxicos a diversos órganos. Presentamos el caso de una paciente de 15 años de edad con embarazo de 16 semanas de gestación que ingirió accidentalmente paraquat en forma líquida, con antecedentes de autolesionarse por medio de cutting, durante su estancia presentó daño hepato-renal y fibrosis pulmonar con evolución satisfactoria tratada con oxígeno suplementario y corticosteroides, con manejo multidisciplinario incluyendo al servicio de ética y bioética, culmina el embarazo de forma satisfactoria. Se inició tratamiento por parte de salud mental. Resaltamos la importancia de identificar factores de riesgo para la salud física y mental en el control de niños y adolescentes.

PALABRAS CLAVE: Embarazo, Intoxicación, Paraquat, Adolescente, Salud mental.

Introduction

Paraquat poisoning is a significant public health issue due to its high toxicity and the absence of a specific antidote. Paraquat is a chemical compound within the bipyridyl group, and its molecular structure resembles that of alveolar membrane receptors. This characteristic explains the poison's tendency to concentrate in lung tissue. Once ingested, it causes substantial cell damage through the production of oxygen free radicals, leading to lipid peroxidation and, ultimately, severe damage to vital organs, primarily the lungs, liver, and kidneys (Chandra *et al.*, 2021). Paraquat exposure can lead to acute respiratory failure and progressive pulmonary fibrosis, contributing to the high mortality associated with its use (Marín-Cuartas & Berrouet-Mejía, 2016). Konthonbut *et al.* (2018) reported that paraquat exposure during pregnancy can cross the placenta and reach the fetus due to its relatively small diameter and low molecular weight. In cases of suicide attempts during pregnancy, paraquat levels in fetal blood were found to be 4 to 6 times higher than in maternal blood. Research has demonstrated that fetal death results from paraquat reaching organ tissues through the bloodstream, causing multiple organ failure and increasing the risk of complications for the mother.

The presence of a mental health team in the hospital area is essential to ensure comprehensive care for patients by identifying risk factors in a timely manner, providing support interventions, facilitating informed decision-making, promoting healthy coping strategies, and reducing the risk of psychological sequelae in both the short and long term. promoting better clinical recovery and person-centred medical care.

It is a priority that, at the first care level, mental health screening interventions are carried out in children and adolescents at least once a year, as established by the Official Mexican Standard NOM-047-SSA2-2015 (DOF, 2015), this measure allows for the timely identification of risk factors and the provision of early interventions that favor the integral well-being of this age group and promote positive parenting practices.

This work aimed to contribute to the literature and present satisfactory outcomes with the use of oxygen and corticosteroids and to urge practices to identify risk factors for physical and mental health.

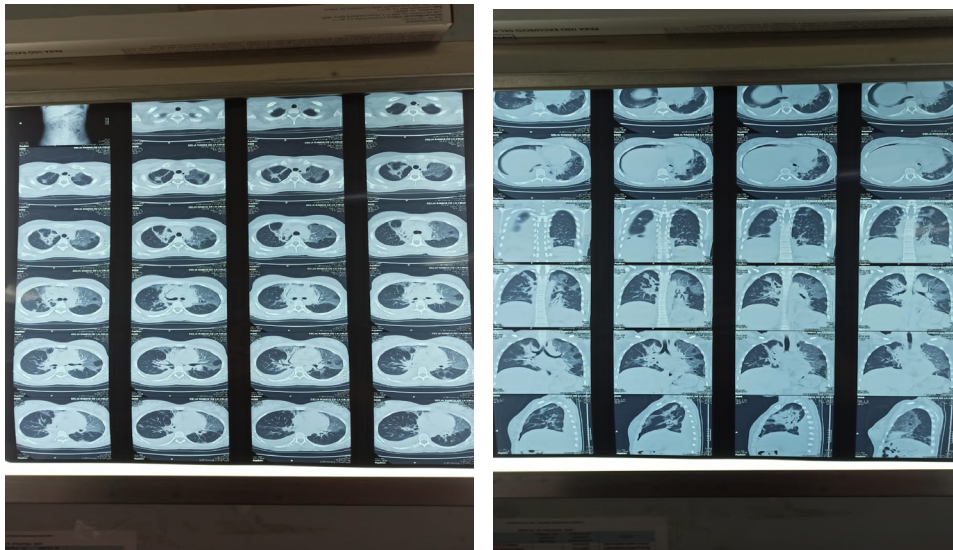
Clinical findings

This is a 15-year-old female patient, 16 gestation weeks, from a rural area of Nayarit, in concubinage with a minor, with a history of cutting-type self-injury. Her condition began on 05/29/2023 when she accidentally ingested paraquat, approximately 20 to 30 mL, presenting emesis on 5 occasions of gastro-food content, at 24 hours she started with abdominal pain, persistence of vomiting and dysphagia, at 72 hours hematemesis was added on one occasion, she went for medical evaluation to the obstetric triage, Physical examination showed poor general conditions, respiratory distress and in the abdomen by pelvic ultrasound pregnancy was confirmed with audible fetal focus, she was transferred to intensive care.

Therapeutic intervention

During her 4-day stay in intensive care, he presented acute kidney injury, his biochemicals report urea of 122.8 mg/dl, BUN 57.4 mg/dl, creatinine 9.02 mg/dl, with criteria for hemodialysis, a Mahurkar catheter was tried without success, treatment based on hyperhydration, aminophylline, corticosteroids and pentoxifylline was initiated. At the respiratory level, without supplementary oxygen support, pulmonary fields with bilateral crackling rales, a radiographic image showed right pleural effusion, which required conservative management. She remained stable and was transferred to the pediatric area with a total hospital stay of 54 days, She was evaluated by maternal fetal medicine, who reported: pregnancy of 15 weeks of gestation and 6 days by average photometry, estimated fetal weight of 129 g. Progesterone was started in addition to iron dextran. Mental health intervention is carried out by applying the Calderón Scale: 20 points (indicating no depression) and a Hamilton scale of 7 points (mild anxiety). Its biochemists of the 5th day of in-hospital stay, with urea 148 mg/dl, and creatinine decrease of 5.50 mg/dl, at the ventilatory level begins with desaturation of up to 88 %, so oxygen flow is initiated with nasal tips 3 l/min, pelvic ultrasound reports fetal heart rate 142 beats per minute and fetal weight of 121 g, endoscopy was deferred by the pediatric gastroenterology service and the oral route was initiated with good tolerance, on the 8th day of hospital stay with favorable evolution of biochemicals, with a decrease in creatinine 1.48 mg/dl, glomerular filtration rate 43mL/min glomerular filtration rate 52mL/min. On the 13rd day of the hospital stay, a contrasted chest tomography scan was performed, which

showed air entrapment in the right apical area with an organized pneumatic appearance, with bronchiolitis obliterans in the upper left lobes, with the presence of interstitial pneumonia with a homogeneous and diffuse ground glass image (Figure 1), arterial blood gases with data of normolactatemic hyperoxemic respiratory alkalosis with PELOD 2 staging points, with progressive lung damage, the possible need for phase III ventilation was not ruled out, nebulized steroid was added and diuretic was suspended due to risk of oligohydramnios, epistaxis began with a D-dimer report at 3.95 mg/l, enoxaparin was added at a prophylactic dose and third-generation cephalosporin by general pathological urine examination.

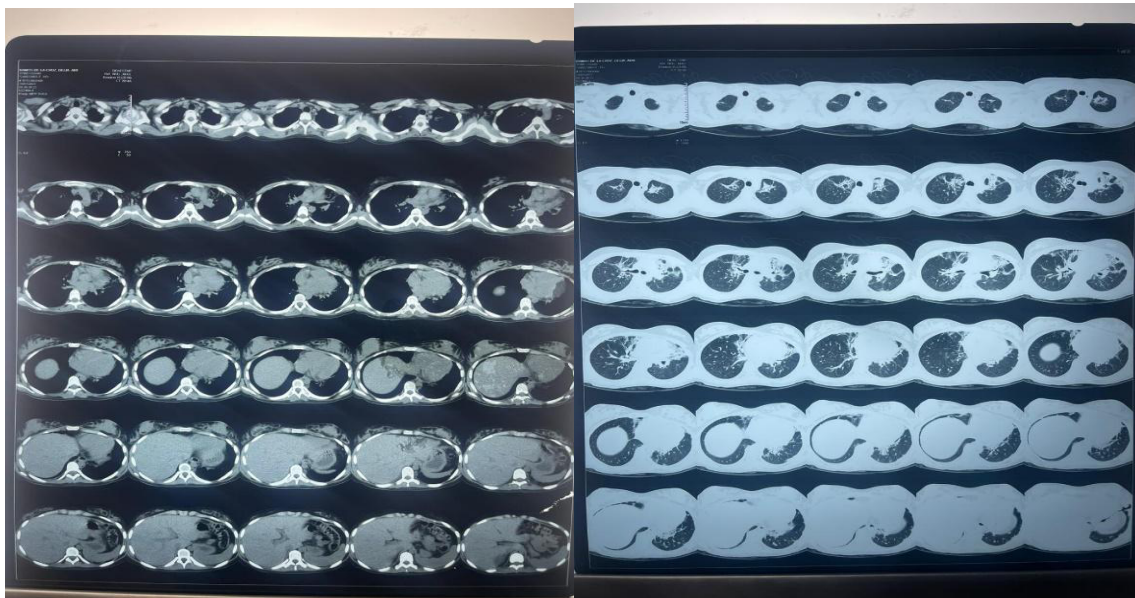


Figures 1. Contrast-enhanced chest tomography from 06/15/2023 show the right apical zone with signs of air trapping, with an organized pneumatocele-like appearance, and obliterative bronchiolitis in the left upper lobe.

There is also interstitial pneumonia with homogeneous and diffuse ground-glass opacity.

On the 14th day of hospital stay, she was evaluated by the family violence department, which diagnosed sexual violence and severe abandonment. On the 18th day of hospital stay, she presented cholestasis and ursodeoxycholic acid and ademethionine were administered, evaluated by Maternal-Fetal Medicine who reported: an obstetric ultrasound with a uterus occupied by a single fetus with a fetal heart rate of 150 beats per minute, with an estimated fetal weight of 205 grams with a pregnancy of 17 weeks of gestation and 5 days by average photometry. On day 19 of hospital stay, an ultrasound of the liver and bile ducts was performed, reporting an increase in the vascular network, reminiscent of a starry sky image, with data suggestive of an inflammatory process. At the ventilatory level, she continued with respiratory distress and desaturations, with a

radiographic image of pneumothorax, a reservoir mask was started at 10 liters per minute. On day 21 of hospital stay, O₂ weaning began with good tolerance. Its biochemists included 24-hour urine creatinine of 31.3 mg/dl, volume of 1965 mL, and serum creatinine of 0.38 mg/dl, clearance of 112.4 mg/dl, total protein of 6.2 g/dl, albumin of 3.1 g/dl, globulins 3.1 g/dl, albumin/globulin ratio 2. On day 24 of hospital stay, without O₂ support with oximetry of 92 %, during the chest x-ray the patient begins with desaturations up to 82 % accompanied by respiratory distress and fatigue, 3 liters per minute of O₂ is administered, radiographic image shows atelectasis of the middle lobe of the left lung was referred with pulmonary physiotherapy. Pediatric pulmonology performed spirometry, which reported a LVEF of 21 %, it is recommended to continue treatment with supportive and steroid measures through a spacer aerochamber. Pediatric cardiology reports echocardiogram with heart structurally within normal limits for age, preserved biventricular function, slight pericardial effusion with no hemodynamic repercussions and no suggestive data of pulmonary hypertension. The caloric requirement for the clinical nutrition service is increased. On day 31 of hospital stay, supplemental weaning from oxygen is started at 2 liters per minute, assessed by maternal fetal medicine with ostetric ultrasound with a uterus occupied by a single fetus with a heart rate of 155 bpm with an estimated fetal weight of 305 g greater than the 10th percentile with a pregnancy of 19 weeks and 4 days by average fetometry. On day 34 of hospital stay, systemic steroid was discontinued. On day 42 of hospital stay, oxygen, enoxaparin and progesterone were suspended, and on day 59 of hospital stay, a chest tomographic image compatible with approximately 20 % fibrosis was performed (Figure 2). Pediatric pulmonology performed spirometry, reporting a LVEF of 77.9 %, and discharge due to improvement with inhaled steroid and pulmonary rehabilitation.



Figures 2. Contrast-enhanced chest tomography dated 08/01/2023 show an image in the right apical zone with signs of air trapping and hyperlucency.

Areas of ground-glass opacities are observed, which are homogeneous and diffuse, especially in the upper

lobes, along with findings consistent with obliterative bronchiolitis and pulmonary fibrosis.

Follow-up and results

The patient was discharged by an adult caregiver (mother-in-law) and common-law partner, with outpatient follow-up by the pediatrics, pulmonology, gynecology, gastropediatrics, and mental health services, with a favorable clinical evolution for the pair.

On November 10th, 2023, a cesarean section was performed and a live term product was obtained, with adequate weight and height for apparently healthy gestational age (Figure 3).



Figure 3. Final recovery. Full-term newborn, alive, with appropriate weight and length for gestational age, without any complications.

Discussion

This case review shows the importance of paraquat consumption and its high degree of intoxication, since poisoning by this substance is a major public health problem, and an estimated 60 % mortality rate due to intentional oral ingestion is maintained, which is why its serious toxicity prevails. According to the clinical manifestations, paraquat poisoning is classified as stage I, when the ingestion of paraquat is estimated to be 10 mL or <20 mg/per kg of weight, they may be

asymptomatic or have mild symptoms, especially of the upper digestive tract, it does not leave significant sequelae; Stage II, when paraquat ingestion is estimated at 10 to 20 mL or >20 and <40 mg/kg body weight with manifestations such as esophageal or gastric ulcers and hepatorenal damage, as well as pulmonary fibrosis, death may occur between the fifth day and the following weeks; Stage III, with intake >20 mL or >40 mg/kg of body weight, between 1 and 3 days multiple organ failure, shock and death occur; In the case of our patient with stage II, (Ramos-Gutiérrez, *et al.*, 2019; Chandra *et al.*, 2021; Marín-Cuartas & Berrouet-Mejía, 2016; Khazraei, *et al.*, 2019).

As demonstrated in the literature, children and adolescents living in rural areas who are poisoned by paraquat were not in the care of their parents. (Li & Deng, 2019).

One of our difficulties was the pregnancy that our patient was going through, since paraquat can cross the placenta and reach the fetus due to its relatively small diameter and low molecular weight, creating complications that are related during different windows of exposure time in fetal development (Ramos-Gutiérrez, *et al.*, 2019).

It was observed in a publication with pregnant patients that the highest concentration of paraquat was recorded during the postpartum period. It is believed that this could be because the glomerular filtration rate is higher during pregnancy and the rate is reduced after delivery. Based on the literature, it is reported that during pregnancy, there is a high degree of complications including the loss of the product. In our clinical case, sessions were held with the ethics and bioethics service, deciding to prevail the pregnancy without putting the patient's integrity at risk. It should be noted that the patient was more than 12 weeks pregnant; however, according to Mexican law, the termination of pregnancy is legal at any time during pregnancy if there is a risk to the life of the mother, after a medical opinion. After the multidisciplinary assessment, it was concluded that it was possible to continue the pregnancy under specialized management, prioritizing both maternal and fetal health (Ministry of Health, 2022).

In paraquat poisoning the target organ is the lung, patients develop respiratory failure that can be explained by an initial activity that involves great oxidative stress, with the presence of oxygen free radicals and lipid peroxidation, with its consequent damage, in addition to infiltration by polymorphonuclear that with its release reaction worsens pneumonitis, there may be improvement of this and some organs, however the appearance of pulmonary fibrosis leads to lack of response to oxygen administration and death from respiratory failure in a few days to weeks (Konthonbut, *et al.*, 2018), the literature reports that oxygen is only indicated if the patient has an oxygen blood pressure of less than 50 mmHg, In our case, oxygen was administered cautiously, taking care of the binomial, progressively withdrawing with a good evolution.

In terms of treatment, corticosteroid-based regimens have been proposed at different doses, cyclophosphamide, desferrioxamine, radiation, vitamin E, vitamin C, N-acetyl cysteine, anoxic environments, and extracorporeal elimination therapies such as hemodialysis, continuous veno-venous hemofiltration and hemoperfusion; with varying degrees of success (Ramos-Gutiérrez, *et al.*, 2019), intravenous and inhaled corticosteroid doses were administered in our patient with a good response.

In conclusion, this case review reaffirms the need for a comprehensive and multidisciplinary approach to increase patient survival, and in the face of the scarce evidence in pregnant adolescents intoxicated by paraquat, it was undoubtedly a critical component of the patient's recovery. Treatment with cautious O₂ and corticosteroids led to the satisfactory evolution of the mother and baby. We recommend the application of the official Mexican standard NOM-047-SSA2-2015 and encourage positive parenting practices.

Ethical Statements and Considerations

A) Informed consent

Informed consent was obtained from all subjects involved in the study.

B) Conflicts of interest and relevance

The authors declare that they have no conflict of interest.

Thanks

We express our sincere thanks to all those who contributed significantly to the elaboration and development of this work. First of all, we deeply thank the medical and nursing team of the Civil Hospital of Tepic, Dr. Antonio González Guevara, whose commitment and professionalism were fundamental for the successful management of this clinical case.

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References

- Chandra, A., Shah, K. A., Mahato, S., Bhattacharjee, M. S., & Mandal, T. (2021). Paraquat poisoning. *BMJ Case Reports*, 14(11), e246585. <https://doi.org/10.1136/bcr-2021-246585>
- Diario oficial de la Federación [DOF] (2015). NOM-047-SSA2-2015, Para la atención a la salud del grupo etario de 10 a 19 años de edad, <https://www.cedhnl.org.mx/bs/vih/secciones/normatividad/NOM-047-SSA2-2015.pdf>
- Khazraei, S., Marashi, S. M., & Sanaei-Zadeh, H. (2019). Ventilator settings and outcome of respiratory failure in paraquat-induced pulmonary injury. *Scientific Reports*, 9(1), 16541. <https://doi.org/10.1038/s41598-019-52939-3>
- Konthonbut, P., Kongtip, P., Nankongnab, N., Tipayamongkholgul, M., Yoosook, W., & Woskie, S. (2018). Paraquat exposure of pregnant women and neonates in agricultural areas in

- Thailand. *International Journal of Environmental Research and Public Health*, 15(6), 1163. <https://doi.org/10.3390/ijerph15061163>
- Li, Q., & Deng, Y. (2019). Paraquat poisoning in children: A 5-year review. *Pediatric Emergency Care*, 00(00), 1-4. <https://doi.org/10.1097/PEC.000000000000186>
- Marín-Cuartas, M., & Berrouet-Mejía, M. C. (2016). Intoxicación por paraquat. *Revista CES Medicina*, 30(1), 114-121. <https://revistas.ces.edu.co/index.php/medicina>
- Ramos-Gutiérrez, R. Y., Real-Ornelas, G. A., González Ruiz, H. A., Lona-Reyes, J. C., Acuña-Chávez, N., & Barriga-Marín, J. A. (2019). Tratamiento tardío de la intoxicación por paraquat en pacientes pediátricos: Reporte de dos casos. *Acta Toxicológica Argentina*, 27(3), 101-108. <https://actatoxicolargent.org>
- Secretaría de Salud. (2022). Lineamiento técnico para la atención del aborto seguro en México, Edición 2022. Gobierno de México. https://www.gob.mx/cms/uploads/attachment/file/779301/V2-FINAL_Interactivo_22NOV_22-Lineamiento_te_cnico_aborto.pdf