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Case Report: Induced Abortion by Vaginal Use of Aluminum Phosphide in a 44-Year-Old Woman: A Case Report

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ABSTRACT

Aluminum phosphide (AlP) is an efficient and toxic pesticide that is easily available in many Asian countries such as Iran. Many cases of unintentional or suicidal use of AlP have been reported in these countries, and these statistics are rising rapidly. We aim to present a case of abortion induced by vaginal use of AlP. We report a 44-year-old gravid woman who self-administered one-quarter of a 3-g AlP tablet intravaginally. Ultrasound at 6 hours post-admission showed no fetal movement or heart motion. Intravaginal administration of AlP can lead to fetal death and abortion. There is concern about the spread of vaginal use of these agents in pregnant women, as the number of illegal abortions is increasing.

1. Introduction

Aluminum phosphide (AlP) is a very toxic and effective fumigant pesticide that is widely used in many countries such as Iran because of its efficacy, low cost, and easy usage [1-4]. The toxin is absorbed by respiration, ingestion, and dermal contact. It is very reactive, and any contact with moisture causes its decomposition to phosphine gas:

$$AlP+3H_2O \rightarrow AL\ (OH)3+PH_3$$

Inhalation of phosphine gas happens when AlP is exposed to moisture in stored grain, which is also the most common form of exposure. Oral exposure ranges from the deliberate suicidal attempts to unintentional ingestions [5].

Ingesting 500 mg or more AlP could result in death. Upon ingestion, gastric acid converts phosphides to phosphine gas [6]. Subsequently, phosphine gas is absorbed from the gastrointestinal tract into the bloodstream. Human exposure to AlP can be through inhalation or absorption through the skin.

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Phostoxin is a highly acute toxic substance. Phostoxin gassing tablets contain AlP, which reacts with normal atmospheric moisture to liberate phosphine (hydrogen phosphide) gas. Exposure to even small amounts of phosphine can cause headache, dizziness, nausea, vomiting, diarrhea, drowsiness, cough, and chest tightness. More severe exposure can cause shock, convulsions, coma, irregular heartbeat, and liver and kidney damage [5].

Several mechanisms of toxicity have been proposed, including inhibition of cytochrome oxidase C, electron transport chain blocking, and cellular respiratory disruption that causes inhibition of acute thrombocytopenic purpura. It produces oxygen free radicals and cholinesterase inhibition [4, 6-8].

Death results from refractory cardiogenic shock due to myocardial dysfunction [9-11]. The symptomatology is brutal with the appearance of digestive signs and cardiovascular anomalies. The immediate prognosis is determined by the presence of acute pulmonary edema or cardiogenic shock [12]. In pregnant women, oral usage of AlP for abortifacient purposes has been very little reported, and the direct fetal effect of this product remains uncertain [13]. This paper reports an unusual case of intravaginal use of AlP for illegal abortion in a 44-year-old woman.

2. Case Presentation

A 44-year-old woman with the gestational age of 11 weeks and 6 days was admitted to the maternity ward of Taleghani Hospital, Ilam, Iran (4 PM) after vaginal usage of one-quarter of a 3-g AlP tablet. After about 3.5 hours of toxin usage, she fell unconscious. It has been speculated that the changes in consciousness could be due to weakness and lethargy. About 30 minutes later, her husband brought her to the hospital. On admission, she was conscious. She was alert and oriented to time, person, place, and situation. The patient was examined after hospital admission and had the blood pressure of 100/70 mm Hg, respiration of 16 breaths/min, pulse rate of 84 beats/min, and body temperature of 37.10°C. The patient vital signs during hospital stay were recorded (Table 1).

Abdominal pain, nausea, and vomiting were not present. Gynecological examination showed no abdominal swelling, no sign of irregular contraction of the uterus, and a small amount of vaginal bleeding. In the vaginal examination, no tablet remnants were seen or palpated. Other examinations were normal. There is no description of vaginal bleeding or abdominal pain over the past week. The patient denied having a history of previous illness, allergy, medication use, smoking, or any substance abuse, food, or drug sensitivity. Six and half hours later, she was admitted to the poisoning ward. In physical examination, her pupils were midsize, symmetrical, and reactive to light.

Cardiovascular and respiratory examinations were unremarkable. Additional laboratory tests and fetal ultrasound evaluations were performed as directed by the gynecologist. Table 2 presents the laboratory results. All laboratory findings were normal except for a mild decrease in Alanine Aminotransferase (ALT) levels. The possible explanation could be the toxic necroinflammatory response followed by the vaginal administration of AlP. The reduction of ALT levels is an expression of healing.

The patient was admitted to the clinical toxicologist service and transferred to the poisoning ward. On admission to the poisoning ward, she was conscious, had no complication, and her physical examination was normal. The patient remained on cardiac monitoring during recovery, and her vital signs were recorded. One liter of normal saline was charted over 12 hours. Results of the arterial blood gas are presented in Table 3. The ABG results on admission indicated a partially compensated respiratory alkalosis, which is induced by hyperventilation.

In the current study, central sources are toxin usage, fear, stress, and anxiety-hyperventilation. Hypoxic stimulation leads to hyperventilation in an attempt to correct hypoxia at the expense of CO_2 loss [14]. Respiratory alkalosis in itself is not life-threatening. Interventions to reduce pH directly are typically not necessary as there are no mortality benefits to this therapy [14]. The ABG results on 6 hours post-admission indicated compensated respiratory alkalosis.

Six hours post-admission, an ultrasound was carried out. On ultrasonography, a hypoechoic area (11*38 mm) appeared, which consisted of the retained product of conception. The fetal heartbeat was not detected. Two hours later, spontaneous expulsion of the fetus (miscarriage) following abnormal bleeding occurred. After the abortion, her vital signs and bleedings were monitored continuously. Her vital signs were normal, and no other complications occurred. The patient was discharged after 12 hours in the hospital. The physician scheduled a follow-up a week after the discharge. She did not address any complications.

3. Discussion

Here, we presented a rare case of intravaginal use of aluminum phosphide to induce abortion. To the best of our knowledge, there is no reliable data on the outcome of aluminum phosphide exposure on pregnancy.

Table 1. Vital signs of the patient during the hospital stay

Stage	BP	PR	RR	T
Vital sign on admission	100/70 mm Hg	84 b/m	16 br/m	37.1°C
6.5 hours post-admission	139/78 mm Hg	92b/m	16 br/m	37.1°C
7.5 hours post-admission	128/79 mm Hg	96b/m	16br/m	37.2°C
8.5 hours post-admission	105/75 mm Hg	100 b/m	16 br/m	37.1°C
13 hours post-admission	105/75 mm Hg	105 b/m	15 br/m	37°C

BP: blood pressure; PR: pulse rate; RR: respiratory rate; T: Temperature

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Table 2. Laboratory results

Factors	Values	Normal Ranges
White blood cells	8300*10^3/µL (poly 80%, lymph 20%)	5,000 to 10,000 µL of blood
Hemoglobin	12.1 g/dL (MCV79)	12-15.5 g/dL
Platelet	221*10^3/L	150,000- 450,000 10^3/L
Urea	16 mg/dL	5 to 20 mg/dL
Creatinine	0.97 mg/dL	0.7 to 1.2 mg/dL
Alkaline Phosphatase	120 IU/L	44 to 147 IU/L
Aspartate Aminotransferase (AST)	11 U/L	10 to 40 units per liter
Alanine Aminotransferase (ALT)	13 IU/L	20-60 IU/L

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Table 3. Blood gas analysis of the patient during the hospital stay

Analysis	pH	PCO_2	PO_2	HCO_3	Base Excess (BE)
Blood Gas Analysis on Admission	7.46	24 mm Hg	31 mm Hg	17.7mmol/L	-4.5 mmol/L
Blood Gas Analysis 6 Hours Post Admission	7.43	25 mm Hg	23 mm Hg	16.6 mmol/L	-6.1 mmol/L

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The toxicity of the AlP is mainly due to the phosphine gas liberated in contact with moisture. Phosphine gas, the active form of AlP, is rapidly absorbed by ingestion, inhalation, skin, or musical contacts. In this case, phosphine gas could be the main cause of abortion.

Czeizel AE, Tímár L, Susanszky E (2017) conducted a population-based prospective study to examine the timing and consequences of suicide attempts by self-poisoning during pregnancy [15]. The result of this study indicated that 61% of suicide attempts occurred before the third post-conceptual month. Most suicidal attempts occurred after the early recognition of unwanted pregnancies and most resulted in a very early fetal loss [15].

These findings are comparable with the present results, in which the suicidal attempt in our case occurred before the third post-conceptual month and resulted in a very early fetal loss. These findings can highlight the importance of screening for the early detection of suicidal behaviors, especially in pregnant women in the first trimester.

To the best of our knowledge, few studies reported the aluminum phosphide poisoning and its effect on pregnancy. To date, evidence on the impact of AlP on

abortion is not enough. The death of a pregnant woman following exposure to aluminum phosphide has already been reported [16]. In pregnant women, the vaginal use of AlP for abortion has not been reported, and the direct fetal effect of this product has remained uncertain. There is no study on the specific impact of AlP on the course of pregnancy and, in particular, its teratogenic effect. The harmful effect of AlP on the fetus is probably exerted through both systemic maternal complications (acute circulatory insufficiency, hypoxemia) and transplacental transfer of the hydrogen phosphorus [13].

The researchers planned to perform the anatomopathological examination to investigate the exact cause of fetal death, but the patient did not consent to it. The previously conducted study reported that transplacental transfer of the hydrogen phosphorus is probably the main cause of fetal death. They hypothesized that the mixture of aluminum phosphide and ammonium carbonate might regulate the shift in phosphorus hydrogen [13].

Based on our observation, in this case, there were no systemic effects on mother, and serum toxicology was negative. It was ideal to measure the toxin level in the fetus tissue, but as we mentioned earlier, the patient did not consent to proceed with the procedure. Further studies are needed to determine the exact mechanism of action for vaginal usage of AlP on induced abortion and fetal death. Furthermore, there are concerns about the increase of using AlP for abortion, as the patient believed that her action was successful.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles were considered in this article. The participants were informed about the purpose of the research and its implementation stages; they were also assured about the confidentiality of their information

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Author's contributions

All authors contributed in preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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