

Olgu Sunumu

ORAL INTOXICATION BY FERTILIZER WITH AMMONIUM NITRATE AND AMMONIUM SULFATE: ATYPICAL INTAKE (CASE REPORT)*

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Abstract

Agricultural fertilizer intoxication is observed in agricultural workers during the process of spreading fertilizer. These types of poisonings are frequently through respiratory pathways, with the primary symptoms linked to methane gas intoxication. Acute oral fertilizer intoxication is frequently seen in large and small farm animals. These types of poisonings appear as nitrate intoxication and methemoglobinemia. In our case report a patient, with accompanying psychological disorder and dementia, ingested agricultural fertilizer containing ammonium nitrate and ammonium sulfate orally in a suicide attempt and the subsequent serious intoxication tableau and treatment is described.

Key Words: fertilizer, ammonium nitrate, ammonium sulfate, oral, intoxication

AMONYUM NİTRAT ve AMONYUM SÜLFAT İÇEREN GÜBRE İLE ORAL YOLLA ZEHİRLENME: ATİPİK BİR ALIM YOLU (OLGU SUNUMU)*

Özet

Zirai gübrelerle zehirlenmeler, tarım çalı-

şanlarında, gübreleme işlemi sırasında görülebilmektedir. Bu tip zehirlenmeler sıklıkla solunumsal yolla oluşmakta, önde giden semptomlar metan gazı zehirlenmesine bağlı olmaktadır. Akut olarak oral yolla gübre zehirlenmesine ise sıklıkla büyükbaş ve küçükbaş çiftlik hayvanlarında rastlanmakta, bu tip zehirlenmeler kendini nitrat zehirlenmesi ve methemoglobinemi şeklinde belli etmektedir. Olgu sunumumuzda, psikolojik rahatsızlıkların ve demansın da eşlik ettiği hastamızda, intihar amacıyla oral yolla amonyum nitrat ve amonyum sülfat içeren zirai gübre alınımı sonrası ortaya çıkan ciddi zehirlenme tablosu ve tedavisi gözden geçirilmiştir.

Anahtar kelimeler: gübre, amonyum nitrat, amonyum sülfat, oral, intoxication

Introduction

Agricultural fertilizer intoxication is observed in agricultural workers during the process of spreading fertilizer. These types of poisonings are frequently through respiratory pathways, with the primary symptoms linked to methane gas and hydrogen sulphide intoxication¹⁻⁴. Fertilizer intoxication through

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respiratory pathways is frequently observed in farm animals^{5,6}. Acute oral fertilizer intoxication is frequently seen in large and small farm animals. In animals this type of poisoning is due to ingesting contaminated feed or waters and presented as nitrate intoxication and methemoglobinemia⁷⁻¹⁰. In humans fertilizer intoxication through oral pathways is an extremely rare situation. In our case report a patient, with accompanying psychological disorder and dementia, ingested agricultural fertilizer containing ammonium nitrate and ammonium sulfate orally in a suicidal attempt and the subsequent serious intoxication tableau and treatment is described.

Case

A sixty-six year old male patient ingested 750 ml liquid agricultural fertilizer containing ammonium nitrate and ammonium sulfate with the aim of attempting suicide. Around 6 hours later he was brought to the hospital in an unconscious state by family. After gastric lavage, active charcoal and supportive treatment was administered, he was transferred to our hospital. On arrival at our emergency service about 8 hours post-ingestion agricultural fertilizer, the patient's physical status was; general situation bad, confused, Glasgow Coma Scale score (GCS) 9, arterial blood pressure 80/40 mmHg, heart rate 100 beats.min⁻¹, blood gas analysis pH 7.25, pO₂:72 mmHg, pCO₂:30mmHg, HCO₃: 13 mmol/L, and SpO₂: 90%. In blood gas analysis, the patient's Methemoglobin value was determined 52%. On physical examination tachycardia hypotension and arrhythmia were noteworthy. There was frequently atrial and ventricular premature extra-systole in the patient's ECG analysis. The renal and liver functions were normal. After evaluation by the emergency service, the patient was admitted to the intensive care unit. A nasogastric tube was inserted and active charcoal treatment continued (1 gr/kg). The patient had a urinary catheter and was urinating. An arterial cannula was inserted and blood pressure was invasively, continuously monitored. The patient's arterial blood was sent for gas investigation and plasmapheresis was administered to eliminate the nitrate in the patient's circulation. For methemog-

lobinemia treatment, the patient was given 100% FiO₂ oxygen through a reservoir mask and 300 mg.kg⁻¹ intravenous ascorbic acid was added. An emergency supply of methylene blue was obtained from the microbiology department. A dose of 1% methylene blue of 2 mg.kg⁻¹ in 500 cc 5% dextrose solution was given through a bacteria filter intravenously over 10 minutes. Methemoglobin values, normally 0.1%-1.5%, were 52% on admission to the intensive care unit and during treatment lowered to 22% and 11.3%. After treatment was completed the value did not raise above 0.5%. His neurological symptoms, hypotension and arrhythmias gradually resolved and arterial blood pressure rose to normal limits. Laboratory analysis showed renal function and liver function were within normal limits. He was diagnosed dementia, depression and paranoid delusions by psychiatrist. With no further complications developing during intensive care unit monitoring, when arterial blood gas showed methemoglobin levels were normal, and hypotension and arrhythmia had resolved the patient was discharged on the 5th day after admission to intensive care.

Discussion

In the United States of America around 2000 intoxication patients apply to emergency services every day. While the most frequent cause of death in adults from 35-54 years of age is motor vehicle accidents, drug intoxication is among the most important causes of mortality¹¹.

In countries with high levels of agriculture and animal husbandry intoxication by pesticide is among the important causes of intoxication. In the United States of America poisoning linked to pesticides form 3.26% of all poisonings and 4.10% of single-agent intoxication and is 6th place among the most common factors in intoxication. When only adult intoxication cases are examined, intoxication due to pesticides is 5th place forming 5.38% of poisonings¹².

Pesticide intoxication may be an occupational intoxication for workers in agriculture and animal husbandry^{13,14}, but it may occur as mistaken ingestion in children¹⁵ and in some cases as suicide attempts¹⁶.

Fertilizer is an important element in farming economy and holds an important place among pesticide intoxications. Of the 7594 acute pesticide intoxication cases referred to a Milan poison center from 1995-1998 fertilizer was responsible for 19% of them¹⁷. Fertilizer is an important element in farming economy. However fertilizer storage and use involves important risks. The most important of these risks is intoxication¹⁸. Fertilizer intoxication is frequently through respiratory pathways. The primary serious complication is hypoxia linked to methane or hydrogen sulphide gas intoxication^{1-4,19}. In a case report by Zaba et al.¹, 5 workers were intoxicated and 2 died from hypoxia in fertilizer storage tank. They reported this intoxication was due to reduced oxygen concentration within the tank. Hagley et al.² reported a case of liquid fertilizer gas inhalation that ended in death. Claudet et al.³ presented an intoxication case due to severe hydrogen sulfide inhalation again in a fertilizer tank. The 13-year old boy developed acute respiratory distress syndrome and myocardial infarction. After intensive care treatment he fully recovered³. In a broad-ranging study in Switzerland, there were 61 accidents linked to fertilizer. Of these accidents 44 were linked to fertilizer gas inhalation. Eleven accidents were linked to overturning fertilizer containers and 6 were the result of methane explosion. A total of 49 patients died, 12 of them while trying to save the primary victims. It was determined that 37 cases exposed to gas intoxication were saved¹⁸. Fertilizer intoxication through respiratory pathways is not only seen in humans but may be seen in farm animals^{5, 6}. Acute oral fertilizer intoxication is frequently seen in large and small farm animals. In animals this type of poisoning is due to ingesting contaminated feed or waters and shows as nitrate intoxication and methemoglobinemia⁷⁻¹⁰. In humans ingestion of fertilizer through oral pathways is an extremely rare situation. This type of intoxication may occur as chronic situations due to fertilizer and products contaminating plants, vegetables, underground and surface waters. Due to increasing fertilizing activities involving nitrate and its derivatives in the last two decades, the nitrate levels in waters are continuously increasing. After ingestion the nitrates in the fertilizer are converted to

nitrites. Nitrites then convert hemoglobin to methemoglobin, increasing methemoglobin levels and thereby reducing the capacity to carry oxygen. Infants are more susceptible to nitrate intoxication due to the presence of fetal hemoglobin. Infants develop this type of intoxication due to infant food made from contaminated water. Intoxication appears as asymptomatic cyanosis, progressive dyspnea, lethargy and coma and cases have high concentrations of methemoglobin in blood. Treatment is oxygen administration, intravenous ascorbic acid and methylene blue administration, and for advanced cases exchange transfusion^{20,21}.

Acute intoxication by oral intake of agricultural fertilizer is rare in the literature. The characteristics of the tableau are linked to the content of the fertilizer and in treatment the contents of the orally-ingested fertilizer should be considered as there are points to be careful of. Intensive care treatment for acute intoxication by oral intake of fertilizers with ammonium nitrate should be made for a tableau of arrhythmia caused by nitrates, hypotension, methemoglobinemia and metabolic acidosis. The treatment options are methylene blue, ascorbic acid, exchange transfusion and hyperbaric oxygen treatment. Supply of methylene blue may not be possible for all cases, so ascorbic acid treatment may have to be used^{20,21,22}. In our case treatment methylene blue was supplied by the microbiology department and was passed through a bacteria filter before infusion. The rapid and appropriate treatment with methylene blue was resolved our patient's symptoms in a dramatic fashion. In our literature analysis it is striking that our case is the first case of oral intake of fertilizer containing ammonium nitrate and ammonium sulfate.

Case reports with toxicology tableau forming after oral intake of fertilizers of different composition are very limited. Acute intoxication by oral intake of liquid fertilizers including calcium may cause life-threatening hyperacute hypercalcemia. The treatment of these cases should be appropriate for hyperacute hypercalcemia²³. Intoxication with fertilizer including magnesium may cause an acute renal failure tableau. In these cases treatment approaches should be planned according to the severity of renal fai-

lure in the case²⁴. Poisoning with fertilizers containing ammonium sulfate has resulted in mydriasis, irregular respiratory rhythm, respiratory depression, local and general convulsions and cardiac arrest may be observed. In these cases the tableau may be appropriate for hyperammonemia. Previous studies of cases where suspected intoxication have resulted in death have emphasized that gastric contents and blood be examined for metals and compounds related to fertilizer intoxication²⁵.

In conclusion, in countries with intense agricultural activity as agricultural fertilizer intoxication may occur we believe increased information about treatments for this type of intoxication and sharing of this knowledge is required.

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