Short communication

https://doi.org/10.23934/2223-9022-2022-11-2-364-367

Features of Diagnosis and Intensive Care of Drotaverine Poisoning at the Prehospital Stage (on the Example of a Case Study)

***V.Yu. Pikovsky*[1] ✉, *V.I. Barklaya*[1, 2]**

Department of Emergency Medicine
[1] A.I. Yevdokimov Moscow State University of Medicine and Dentistry
20, bldg. 1, Delegatskaya St.,Moscow, 127473, Russian Federation
Moscow Territorial Scientific and Practical Center of Disaster Medicine (CEMP)
5/1, bldg. 1, B. Sukharevskaya Sq., Moscow, 129090, Russian Federation

✉ **Contacts:** Vadim Yu. Pikovsky, Candidate of Medical Sciences, Associate Professor of the Department of Emergency Medicine, A.I. Yevdokimov Moscow State University of Medicine and Dentistry. Email: pikovskyvadim@rambler.ru

SUMMARY The article presents a case study with a detailed solution, reflecting the features of the clinical features of drotaverine poisoning, the principles of diagnosis and treatment of this condition at the prehospital stage. This type of educational technology is applicable both for practical training with elements of simulation training and for monitoring the level of training of medical personnel.

Keywords: drotaverine, no-shpa, poisoning, cardiotoxic effect, gastric lavage, prehospital stage, postgraduate education

For citation Pikovsky VYu, Barklaya VI. Features of Diagnosis and Intensive Care of Drotaverine Poisoning at the Prehospital Stage (on the Example of a Case Study). *Russian Sklifosovsky Journal of Emergency Medical Care.* 2022;11(2):364–367. https://doi.org/10.23934/2223-9022-2022-11-1-364-367 (in Russ.)

Conflict of interest Authors declare lack of the conflicts of interests

Acknowledgments, sponsorship The study has no sponsorship

Affiliations

Vadim Yu. Pikovsky	Candidate of Medical Sciences, Associate Professor of the Department of Emergency Medicine, A.I. Yevdokimov Moscow State University of Medicine and Dentistry; https://orcid.org/0000-0002-6879-5378, pikovskyvadim@rambler.ru; 55%, general management, writing, literary sources
Vadim I. Barklaya	Candidate of Medical Sciences, Associate Professor of the Department of Emergency Medicine, A.I. Yevdokimov Moscow State University of Medicine and Dentistry; Head of the Educational Department, Moscow Territorial Scientific and Practical Center for Disaster Medicine; https://orcid.org/0000-0002-8399-0796, barklaya@rambler.ru; 45%, text writing, design

CPR – cardiopulmonary resuscitation
EMC – emergency medical care

Acute exogenous poisoning is one of the most dangerous conditions in which complex intensive care should be started immediately at the prehospital stage.

According to the Ministry of Health of the Russian Federation Reports, 44.4-49.1% of cases in the structure of hospital admissions associated with acute poisoning, account for poisoning with medicinal drugs (of groups T36-T50, according to ICD-10). This is consistent with the data of the A.S. Puchkov Ambulance and Emergency Medical Care Station in Moscow, according to which medicinal drug poisoning accounts for 34.4–37.7% of all doctor visits to patients with acute poisoning [1].

In particular, according to the N.V. Sklifosovsky Research Institute for Emergency Medicine in Moscow, a 24-hour mortality rate of poisoning with medicinal drugs affecting the cardiovascular system reached 18.6% in 2017-2018 [2].

We should note that drotaverine (No-Spa®) widely used as an available and popular antispasmodic has a cardiotoxic effect in overdose. Unfortunately, in the available literature and pharmacological reference books, information about the toxic effects of drotaverine is insufficient or completely absent [3], which can lead to the underestimation of the drug's effect on the poisoning course severity, errors in the treatment and diagnostic tactics when providing outside a medical facility.

In our opinion, the aim of training the EMC field staff to render medical care for acute exogenous poisoning is to develop and implement the algorithms for the diagnostic and treatment measures, which would allow minimizing erroneous actions in typical situations. One of the most effective tools for achieving this goal in basic and permanent professional training is the solution of situational clinical problems (cases).

The situational task.

A call for EMC from the apartment of a 53-year-old woman was received from her husband. The reason for the call was "poisoned with pills." Less than 1 hour ago, she had taken 100 drotaverine tablets (0.04 g each) for suicidal purposes. There was no vomiting prior to the arrival of the EMC ambulance team. Two empty vials of the No-Spa® drug were on the floor. On the initial examination, the condition is relatively satisfactory. The patient is sitting in a chair, conscious, slowed down, crying. Complains of weakness, nausea, pronounced dizziness. Skin and visible mucous membranes are of normal color and humidity. Pupils are symmetrical, not dilated. Blood pressure is 100/60 mm Hg (the usual blood pressure is 140/90 mm Hg, does not receive antihypertensive therapy), pulse is rhythmic, 56 beats per minute. Resipratory rate is 14 per minute. Vesicular breathing, no wheezing at auscultation. The abdomen is soft and painless on palpation. The liver is not enlarged. There are no acute neurological symptoms. Blood saturation by pulse oximetry is 96%. Blood glucose is 6.6 mmol/L. During the examination, a single vomiting of mucus without admixture was noted.

The patient was diagnosed with "Drotaverine poisoning". Tube gastric lavage was started in the sitting position with a total volume of 6 liters of fluid. The washing water is clear, light yellow in color, without impurities. During gastric lavage, the patient lost consciousness, tonic convulsions were observed. Attempts to catheterize the peripheral vein were unsuccessful. Intraosseous access was provided to the proximal right tibia, where diazepam, 10 mg, was administered. The cramps stopped. There was a lack of spontaneous breathing and pulsation on the carotid arteries of the patient. An electrical defibrillator monitor showed asystole. A complex of advanced cardiopulmonary resuscitation (CPR) measures was initiated, including chest compressions, masked ventilation of the lungs, intraosseous epinephrine administration, tracheal intubation, and mechanical lung ventilation. Resuscitation measures produce no effect against the presence of persistent asystole for 30 minutes. Biological death was ascertained.

Questions to the task:

1. Give a justification for making the diagnosis of "Drotaverine poisoning".
2. Explain the lack of pills in the flushing water and the patient's sudden breakdown.
3. List the errors made by the ambulance EMC team.
4. Determine the correct sequence of therapeutic and diagnostic measures in this clinical situation.

Reference answers:

Answer #1. To make a diagnosis of acute exogenous poisoning at the prehospital stage, it is necessary to identify the following conditions that make up the so-called "toxicological diagnostic triad": the presence of toxicological history, toxicological situation, and a typical clinical presentation. The absence of even one of them casts doubt on the reliability of the toxicological diagnosis [4].

The statement of the given situational problem contains all three components necessary for making a reliable toxicological diagnosis of "Drotaverine poisoning":

1. According to her husband, the patient took 100 drotaverine tablets (0.04 g each) about 1 hour before the arrival of the EMC team (toxicological history);

2. Medical history data were confirmed by the presence of 2 empty vials of the No-Spa® drug on the floor next to the patient (toxicological situation);

3. On initial examination: the patient is slowed down, complains of weakness, nausea, pronounced dizziness. There is a tendency to bradycardia, arterial hypotension (clinical presentation).

Answer # 2. There are several possible reasons for the absence of drotaverine tablets in vomit and wash water. There may have been demonstrative behavior of the patient (imitation of a suicide attempt), which was not accompanied by taking the drug at all. This version is doubtful, because the examination reveals the initial clinical signs of drotaverine poisoning, including lethargy, a tendency to bradycardia and arterial hypotension. Although the absorption and bioavailability of drotaverine with enteral administration is high [5], the complete absorption of tablets is unlikely in this clinical situation, since with such a toxic dose (4 g), the clinical manifestations of poisoning would have been catastrophic at the time of examination. It is most likely to assume the gluing of tablets in the stomach into a conglomerate with a slowdown in their simultaneous absorption, which may explain the delay in the detailed clinical presentation of poisoning. Dilution of the tablet conglomerate during the tube gastric lavage accompanied by the yellow coloration of the rinsing water led to an acceleration of No-Spa® absorption and the progression of the toxic effect. Drotaverine poisoning is characterized by an impairment of cardiac conduction (weakness of the sinus node, sinoatrial block, rhythm from the AV connection)

with a decreased threshold for ventricular extrasystoles and ventricular fibrillation. Tonic seizures were most likely an early manifestation of advanced ventricular fibrillation, i.e. circulatory arrest.

Answer #3. An overdose of drotaverine is characterized by a marked cardiotoxic effect, which manifests itself as the myocardial contractility inhibition, an impaired conduction and heart rhythm [6]. The critical error of the EMC team was the failure to make electrocardiography (ECG) during diagnostic measures and, most importantly, cardiac monitoring was not provided, which did not allow a timely detection of the increase in the life-threatening cardiac conduction and rhythm disorders characteristic of this pathology. In particular, the resulting tonic seizures were mistakenly regarded as a convulsive seizure. This led to administering the anticonvulsants and a delayed diagnosis of the circulatory arrest and a delay in an immediate start of cardiopulmonary resuscitation, including an early electrical defibrillation for ventricular fibrillation. The delayed diagnosis of the cardiac electrical activity revealed the secondary asystole, which inevitably worsened the prognosis of resuscitation measures [7].

The EMC team did not provide a preventive vascular access, which did not allow for prompt correction of the complications that occurred. In this clinical situation, despite the known toxicological history (taking 100 tablets of No-Spa® about 1 hour before the EMC team arrival) and the already clearly developing clinical manifestations of acute poisoning (lethargy, tendency to bradycardia and arterial hypotension), the risks of the progression of the underlying pathological condition were not taken into account. It had also been necessary to consider the need for immediate pharmacological intervention, given the potential for iatrogenic complications when performing tube gastric lavage.

It is important to note that the tube gastric lavage in a sitting position is technically unacceptable, since some part of the flushing water with the dissolved toxicant is not evacuated, but enters the duodenum with an increased absorption and progression of the toxic effect. The required position of the patient during the tube gastric lavage is lying on the left side for the correct location of the tube distal end along the large curvature of the stomach for maximum evacuation of flushing water. If tablets are suspected of sticking together in the stomach (the absence of tablets in vomit and flushing waters, the delay in the detailed clinical presentation of poisoning during the initial examination, despite the obviously high toxic dose of the supposed drug), it is advisable to discontinue tube gastric lavage at the pre-hospital stage in order to avoid dissolution of the tablet conglomerate with accelerated adsorption of the tablets and an increase in the toxic effect.

One of the mechanisms of the drotaverine spasmolytic effect is the blockade of slow calcium channels [8, 9]. In clinical death associated with a drotaverine overdose, this mechanism may be account for the refractory response of circulatory arrest to the standard CPR complex. The update concept of the effective advanced resuscitation measures implies a mandatory correction of reversible causes of circulatory arrest. In the clinical situation reflected in conditions of the situational task, the CPR complex should have been supplemented with the administration of calcium medications [7].

Answer # 4. When the information about poisoning with a drug possessing a cardiotoxic effect (drotaverine) has been obtained, it is necessary to undertake the ECG recording and provide cardiac monitoring throughout the entire prehospital stage of rendering emergency medical care.

Providing vascular access in this case should precede other therapeutic measures.

Despite the ambiguous opinion regarding the routine use of the tube gastric lavage in toxicological practice of foreign countries [10], the clinical guidelines in Russia propose using it at the pre-hospital stage in cases of clinical manifestations of acute poisoning, especially taking into account the exposure to and specificity of the toxic agent [11]. Meantime, the rules of implementing the tube gastric lavage should be strictly followed, including the patient's position on the left side, compliance with the correct depth of the tube insertion, a necessary and sufficient amount of fluid for washing, taking into account the fluid balance [12].

The drotaverine pharmacodynamics requires the use of calcium medications in case of clinical and electrocardiographic manifestations of a drotaverine overdose.

An immediate medical evacuation of the patient to a specialized toxicology center or the hospital intensive care unit is required.

Such examples of prehospital treatment and diagnostic measures for acute exogenous poisoning in the form of situational tasks contribute to the formation of an algorithmic approach in the emergency medical service personnel to the management of patients in critical conditions, and allow for the staged and final monitoring of postgraduate training level, including that in the framework of continuing medical education.

It is also important that the conditions of such situational tasks can serve as a structural basis to work-up the seminars and practical training with elements of simulation training.

REFERENCES

1. Ostapenko YuN, Sidorov AM, Kadyshev VA. Differentsial'naya diagnostika otravleniy lekarstvennymi preparatami i optimizatsiya kachestva lecheniya s ispol'zovaniem algoritma okazaniya meditsinskoy pomoshchi postradavshim pri ostrykh khimicheskikh otravleniyakh na dogospital'nom etape. *Moscow Medicine Journal*. 2019;4(32):78. (in Russ.).
2. Sukhodolova GN, Il'yashenko KK, Potskhveriya MM, Klyuev AE. Rol' dogospital'nogo etapa v «dosutochnoy letal'nosti» u patsientov s ostrymi otravleniyami. *Moscow Medicine Journal.* 2019;4(32):87. (in Russ.).
3. Ugleva EM, Bezverkhniy MYu. Klinicheskiy sluchay otravleniya drotaverinom s suitsidal'noy tsel'yu. *Russkiy meditsinskiy zhurnal*. 2001; 9(25):1210. (in Russ.).
4. Orlova GM, Saraeva NO, Khamnueva LYu, Eniseeva ES, Panferova RD, Pacherkikh FN, et al. (comp.). *Neotlozhnye sostoyaniya v praktike vracha-terapevta.* 4th ed. Irkutsk; 2012. (in Russ.).
5. Afonin AV, Drapkina OM, Kolbin AS, Pchelintsev MV, Ivashkin VT. Kliniko-ekonomicheskiy analiz spazmolitikov dlya kupirovaniya abdominal'noy boli, vyzvannoy spazmom kishki. *Russkiy meditsinskiy zhurnal*. 2010;18(13):845–849. (in Russ.).
6. Venichenko NN. *Kliniko-patogeneticheskie aspekty ostrykh otravleniy no-shpoy (voprosy patogeneza, diagnostiki i lecheniya). Cand. Med. Sci. Diss. Synopsis.* Ekaterinburg; 2004. (in Russ.) Available at: https://static.freereferats.ru/_avtoreferats/01004297711.pdf [Accessed Apr 19, 2022]
7. Perkins G, Nolan J. European Resuscitation Council Guidelines for Resuscitation 2021. *Resuscitation*. 2021;161:1–432. Available at: https://www.sciencedirect.com/journal/resuscitation/vol/161/suppl/C [Accessed Apr 19, 2022]
8. Leonova MV. Mesto drotaverina sredi sovremennykh spazmolitikov. *Russkiy meditsinskiy zhurnal*. 2011;19(17):1100–1106. (in Russ.).
9. Patai Z, Guttman A, Mikus EG. Potential L-Type Voltage-Operated Calcium Channel Blocking Effect of Drotaverine on Functional Models. *J Pharmacol Exp Ther*. 2016;359(3):442–451. PMID: 27738091 https://doi.org/10.1124/jpet.116.237271
10. Orlov YuP. Modern First Aid Tactics and New Techniques in Acute Poisoning Intensive Therapy. *Intensive Care Herald.* 2017;3:58–62. (in Russ.) https://doi.org/10.21320/1818-474X-2017-3-58-62
11. Bagnenko SF (ed). *Skoraya meditsinskaya pomoshch'. Klinicheskie rekomendatsii*. Moscow: GEOTAR-Media Publ.; 2019. (in Russ.).
12. Ostapenko YuN. *Promyvanie zheludka na dogospital'nom etape (pokazaniya, protivopokazaniya, oslozhneniya i profilaktika oslozhneniy)*. Moscow; 2009. 26 p. (in Russ.).

Received on 19.01.2022

Review completed on 02.02.2022

Accepted on 29.03.2022