

Acute Mescaline Intoxication Followed by Catatonia

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Abstract - The paper deals with a case report of a 41-year-old man who in search of the meaning of life in a so-called “shamanic ritual” drank tea made from the San Pedro cactus as well as paste made of the same plant. The hallucinations were postponed and started after 9.5 hours characterised by a psychotic reaction with symptoms of catatonia. He was admitted to our Department of Psychiatry where he was administered a second generation antipsychotic. The clinical presentation disappeared about 60 hours after the ingestion of mescaline mainly because of the antagonistic effect the antipsychotic has on the serotonergic 5-HT_{2A} receptors.

Keywords: mescaline; psychotic disorders; catatonia; hallucinogens

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Introduction

Mescaline (β -3,4,5-trimethoxyphenethylamine) is known as a substance with psychedelic properties. It is an alkaloid of the phenylethylamine group found in some exotic plants such as: cacti (peyote cactus or *Lophophora williamsi*), Peruvian torch (*Echinopsis peruviana*), San Pedro cactus (*Echinopsis pachanoi*), legume *Acacia berlandieri* (rarely used). The Witte Museum in San Antonio, Texas, exhibits the remains of a peyote “button” nearly 6,000 years old found in the Shumla Cave. Peyote is considered to be the oldest used psychoactive plant, older than caffeine (the oldest

found 1,600 years ago) and morphine (3,500 years ago) [1]. It was used mainly for religious purposes during spiritual ceremonies among North American Indians, as a medicine and as an amulet. Primitive tribes attributed the effects of mescaline to the supernatural or religious because of its psychedelic properties, as it leads to hallucinations, and in some cases reveals parts of the subconscious. It was chemically isolated and identified in 1897, and was first synthesized in 1919. Some authors believe that it may have modest benefits in the treatment of depression, anxiety, headaches, obsessive compulsive disorder, alcohol dependence, cocaine use disorder, etc. [2-4]. Today, it is used as part of the Native American Church for religious purposes, but also as a therapy of choice in alleviating the symptoms of psychological alcohol dependence [5]. In Croatia mescaline is on the List of drugs, psychotropic

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substances and plants from which drugs can be obtained and substances that can be used to make drugs [6].

Mescaline's biosynthesis in the peyote cactus begins with phenylalanine which is converted to tyrosine by the enzyme phenylalanine hydroxylase. After tyrosine is synthesised, there are two further possibilities, the first is that tyrosine with tyrosine decarboxylase forms tyramine, and the second is that tyrosine is converted to levodopa by hydroxylation. Levodopa is converted by decarboxylation to dopamine, which then uses catechol-O-methyltransferase (COMT) via the S-adenosyl methionine-dependent mechanism, and hydroxylation produces an intermediate that is methylated by the further action of COMT. The resulting intermediate by methylation of creosol-O-methyltransferase with S-adenosyl methionine-dependent mechanism produces mescaline [7].

Regarding pharmacokinetics: mescaline is most often consumed per os (less often by inhalation) as a tea made of the plant, less often as a thick paste, or even consumed raw. The average "serving" of mescaline averages 200 - 400 mg in the case of mescaline sulfate, or 178 - 356 mg in the case of mescaline hydrochloride. The concentration of mescaline depends on the type of cactus or plant, its age, geoclimatic conditions, method of cultivation, etc. After it's absorbed in the gastrointestinal tract, it has difficulty penetrating lipid membranes such as the blood-brain barrier, and higher doses are required to achieve a psychedelic effect than, for example, LSD, which is thousands of times more potent than mescaline. The effect occurs on average 30 minutes after oral ingestion, is highest after 2 hours and lasts 10 - 12 hours and the half-life is 6 hours [8,9]. About 81,4 % of mescaline is excreted unchanged in the urine, while 13,2 % is excreted as 3,4,5-trimethoxyphenylacetic acid (TMPA), with 87 % of TMPA being excreted in the first 24 hours and 96 % in the next 48 hours

[9]. Other metabolites include N-acetyl-3,4-dimethoxy-5-hydroxyphenylethylamine, 3,4,5-trimethoxybenzoic acid, 3,4-dimethoxy-5-hydroxyphenethylamine and 3,4-dihydroxy-5-methoxyphenacetylglutamine. After absorption, it undergoes first-phase reactions in the liver [10].

In terms of pharmacodynamics, mescaline is a nonselective agonist of serotonin 5-HT_{2A} receptors. The hallucinatory effect is achieved by binding to 5-HT_{2A} receptors and less to 5-HT_{1A} [8,11]. The main effect of mescaline is achieved by increasing the release, but also the re-intake of serotonin [12]. According to some data, low doses of mescaline lower the level of 5-hydroxyindoleacetic acid (5-HIAA), while higher doses increase it [12]. Other studies in experiments on cats have shown milder dopaminergic activity after mescaline intake [13]. There is currently no evidence of mescaline dependence, although a short-term increase in tolerance to the drug has been demonstrated [14].

The scientific literature indicates the use of this hallucinogen throughout its long history with the rare occurrence of clinical manifestations of poisoning [15]. However, in some patients it is accompanied by clinical symptoms that require medical care. Symptoms correspond to those of other hallucinogenic poisonings and are accompanied by signs of sympathomimetic syndrome [8,16].

The aim of this paper is to show the prolonged duration of a psychotic episode after consuming mescaline during a shamanic ritual, in a middle-aged man.

Subjects and Methods

A 41-year-old male patient, employed in the IT sector, a father of one child, lives with his girlfriend and their child. The patient was in search of the meaning of life and consumed mescaline tea and a thick cactus paste during a "shamanic session". He was admitted and observed in the

Emergency Room at the University Hospital Centre Sestre Milosrdnice, Zagreb, about 41 hours after ingestion and was transferred to the Department of Psychiatry in a state of catatonia about 50 hours after ingestion.

Anamnestic data

Family health history is without any psychiatric disorders. Personal anamnesis: healthy to date, not suffering from somatic or psychiatric illnesses. He is not taking any medication. He does not smoke, consumes alcohol conveniently in smaller quantities, and consumes marijuana about one time every two weeks.

Current difficulties: due to dissatisfaction with professional life and the recent loss of his mother, he consulted numerous friends, acquaintances, read various books and other sources in search of life's purpose. After long-term research and the accumulation of frustration, he learned that "taking hallucinogens was the answer for many people in finding happiness and meaning of life". He did not intend to try different psychedelics, but just one that would "help" him. His first choice was psilocybin mushrooms, but they were hard to find on the "black market", so he inquired about a hallucinogenic substance - mescaline. He agreed on his place in the so-called "ritual" led by a shaman in a house about an hour's drive from Zagreb. On that day in August 2019 there were about 20 people in the house who came with the same intention, most of whom had used mescaline or another hallucinogen before. The ceremony began with a "shaman" singing and drumming, so a bowl of San Pedro cactus tea circled from hand to hand. The patient, like the other participants, drank about 2 dcl of tea and then 4 teaspoons of a thick paste of the cactus, as instructed by the shaman. The onset of psychedelic effect was expected 2 hours after ingestion, which was observed in other participants but not in himself. Again 2 hours from the first round he drank 2 dcl of tea but refused the paste. The ceremony lasted from 9 pm to 6 am, when all participants headed to the yard to enjoy the company and fruit and juices prepared by the organizers. Still feeling completely

sober and lucid, he headed out into the yard with the others, feeling betrayed and disappointed because he didn't feel any effects, unlike most of the others who were visibly intoxicated.

After half an hour (around 6:30 am) he began to feel sedated, experienced colors more intensely, had a distorted perception of time and occasional disorientation in space and time. He felt a strong sense of well-being, happiness and comfort. At one point he was lying on the grass facing the ground, when it seemed to him that a green snake was coming towards him (probably a hallucination), but was not alarmed. Socializing in the yard lasted until sunset, when most people were already completely sober, but not the patient who showed difficult contact and refused to leave. At the urging of the other guests, he was passively taken to the back seat of the car, without much resistance, and they set off for home. He remembers being overwhelmed by anxiety at the thought that the feeling of comfort would probably fade soon. During the ride, he lost contact with his surroundings with occasional actively closing his eyes for a few minutes. He did not know the people in the car, so as they did not know his home address so they took him to a mutual friend. At the friend's house he refused the offered food and water, was placed in the guest room where he was laid down to sleep, soon after the friend left, the patient sat on the edge of the bed where he was temporally and spatially disoriented and waited for dawn in the same position for hours. At dawn, his friend seeing him in an unchanged state, called his wife, and with her arrival, the patient began to communicate slightly nonverbally and ate a small amount of food, but soon returned to the same position of scarce contact. After a few hours, an ambulance was called by his wife, and according to further events, he was amnestied.

Clinical status at admission

Arriving at the United Emergency Room of the Clinic Hospital Center Sestre Milosrdnice at 2:40 pm (40 hours after ingestion), he was admitted to the emergency service of the Department of Internal Medicine. He was conscious, mobile,

disoriented, eupnoic, subfebrile (37.7° C, control temperature 37.2° C), normal circulated periphery, without verbal contact. Somatic status was within normal limits, RR was elevated: 150/100 mmHg (in control 132/90 mmHg), pulse was 90/min.

The course of the disease

He was observed, vital parameters were monitored and laboratory tests were performed in a blood sample: complete blood counts, CRP, coagulogram, and other biochemical findings. All parameters were within normal limits, except for elevated CK values (229 IU/L, which indicated in favor of catatonia). Acid-base status speaks in favor of reduced partial pressures of total CO₂, pO₂ and reduced O₂ saturation. Urgent CT brain scan with i.v. contrast did not show a deviation from normal. Two 500 ml bottles of saline NaCl were administered intravenously, paracetamol (1 g), and on two more occasions 500 ml of 5 % glucose solution i.v. In the evening, he was examined by a psychiatry resident doctor who found that the patient was conscious, eyes closed, responded to the name and touch with scanty facial expressions, did not follow orders, was blocked psychomotorily, and was actively resisting attempts to open lids and limb manipulations. He was transferred to the Intensive Psychiatric Care Unit (around 1 am). He received risperidone orally at a dose of 2 mg. A few hours after taking the drug there is a disappearance of motor inhibition, the patient opened his eyes spontaneously, became contactable with scanty spontaneous production, but was still disoriented in time and space, slowed thought, no productive delusions, but under the possible influence of hallucinations, amnesic towards the event of mescaline consumption and the events that preceded hospitalization.

On the day of transfer to the Intensive Psychiatric Care Unit, the urine toxicology test was positive for tetrahydrocannabinol (THC), and all other tests were negative (amphetamine, benzodiazepine, buprenorphine, cocaine, heroine, methylenedioxymethamphetamine, methadone, methamphetamine, phencyclidine, synthetic cannabinoids). Two days after admission, the concen-

tration of serotonin in platelets was reduced to 182 ng/mL (ref. values: 201.5 - 940.2). The EEG testing was within normal limits.

During the threatment the medicaments were altered to aripiprazole and clozapine with diazepam which further improved the gradual recovery of memory and reconstruction of events before the admission. After a total of 14 days spent in the Department of Psychiatry, of which 7 days in the Department of Intensive Psychiatric Care and 7 days in the open department of the Department of Biological Psychiatry and Psychopharmacotherapy, he was discharged into home care. At the moment of discharge the patient was psychomotor calm, orderly, without any elements of psychosis, euthymic with accompanying affect, cognitively preserved, with a critical and good insight into his condition. He was discharged with medication advice: aripiprazole of 10 mg to take twice a day, clozapine of 25 mg three tablets a day and diazepam of 5 mg taken in the evening in case of anxiety or sleep disturbances. He continued treatment on the recommendation of specialists at the Day Hospital for Schizophrenia and Disorders of the Schizophrenia Spectrum for 16 days. He then regularly went to outpatient check-ups where psychopharmacotherapy was gradually omitted. In a check-up after two monts from the discharge there were no psychotic exacerbations, the patient was properly functional, abstained from hallucinogens and other drugs, but still in search of meaning in life.

Discussion

The symptoms of mescaline intoxication are similar to those of other hallucinogens. There is a distorted perception of time characterized by a sense of slower passage of time, colors and light are perceived brighter and more intense. Synesthesia with listening to music and distortions of other senses have been reported. One of the characteristic effects of mescaline is the so-called "geometrization" in which the individual perceives three-dimensional shapes as two-dimensional

with sharp and accentuated edges reminiscent of the artistic direction of cubism. Hallucinations are also not uncommon, hallucinations that represent the „supreme being“ are common or are mystical in nature which is why native Americans used mescaline for religious purposes [8]. Symptoms are present for an average of 10 - 12 hours from the onset of the effect.

Mescaline poisoning manifested by sympathomimetic syndrome characterized by tachycardia, hyperthermia, mydriasis, hyperreflexia, sialorrhea, ataxia, muscle stiffness, paresthesias, nystagmus, epileptic seizures and others has also been described [8]. In the study of mescaline intoxication Carstairs and Cantrella highlights a case in which symptoms of arterial hypertension, tachycardia and agitation lasted up to 3 days after consumption, but without recorded psychotic elements [16].

Relatively common side effects are nausea and vomiting resulting from the bitter taste of cactus and in individuals who have taken smaller amounts of the substance. Mescaline poisoning is less common compared to other psychoactive substances, accounting for 0,004 % of all mescaline ingestion. Deaths whose direct cause was a distorted perception of the environment and a hallucinatory experience that caused the person to have an accident have also been reported [17]. Then, a fatal outcome was recorded as a result of the bitter taste of cactus, namely the patient suffered from alcohol dependence, and when vomiting after ingestion of cactus, caused rupture and bleeding of esophageal variceal veins [18].

In this review, we have described a unique case of prolonged course of mescaline poisoning with a clinical picture of catatonia and an elimination half-life of 6 hours [9,19]. In the present case the effect was delayed and

the duration of poisoning symptoms was prolonged for 60 hours. The symptoms of poisoning, in addition to a pronounced psychotic episode included more intense perception of colors and contrasts, showed distorted perception of time, disorientation in space and time, delusions, visual hallucinations and severe psychomotor retardation, and signs of sympathomimetic syndrome. The patient's condition improved soon after the use of the antipsychotic risperidone.

Although mescaline intoxication is relatively rare and symptoms are usually mild to moderate and present for 10 - 12 hours, in the presented patient the symptoms started after 9.5 hours and lasted for about 40 hours. The patient was admitted to the Department of Psychiatry in catatonic state about 50 hours after consumption, and about 60 hours after the use of 2 mg of risperidone, there was psychomotor calmness, disappearance of motor inhibition. He was contactable, but still under the possible influence of sensory delusion. amnestic according to the event of mescaline consumption and the events that preceded hospitalization. By dosing aripiprazole, clozapine and diazepam, the memory was restored. The report suggests that during mescaline intoxication psychotic episodes could be prolonged.

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Conflict of interest

None to declare.

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