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Cannabinoid Hyperemesis Syndrome - case report

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Introduction

In 2018, research conducted by Kantar Polska and the National Bureau for Counteracting Drug Addiction showed that marijuana was the most commonly used drug in Poland among the general population[1,2]. Its usage rate was 12.1%. The age group most likely to use marijuana was 15-24 years old[3]. Marijuana use was more common among males. Despite promising results regarding the use of medicinal marijuana for certain conditions[4], easier access to this drug among the young population generates the problem of addiction and the occurrence of negative effects from its use[5,6]. The suspicion and diagnosis of the effects of cannabinoid intake – including cannabinoid hyperemesis syndrome – should be considered in the differential diagnosis of patients presenting to pediatric emergency departments, especially in cases with unclear etiology of symptoms, their recurrence, and the age

group typical for more frequent use of this drug.

Keywords

Cannabinoid Hyperemesis Syndrome, CHS, Adolescents, Vomiting, Cannabis Use, Diagnosis, Rome IV Criteria

Abbreviations

CHS – Cannabinoid Hyperemesis Syndrome
CVS – Cyclic Vomiting Syndrome
AKI – Acute Kidney Injury

Case Report:

Over a period of 5 weeks, a 17-year-old male patient was hospitalized three times in the Pediatric Department of the County Hospital, each time reporting severe abdominal pain and multiple episodes of vomiting[7]. Additionally, during the same period, he visited the Emergency Department of the University Children's Hospital twice for the same symptoms, where he was discharged by the guardians at their own request before the diagnostic and therapeutic process was completed. According to the medical history, the boy was not under the care of any specialist clinics, did not have chronic illnesses, and was not taking any long-term medications. He admitted to smoking cigarettes (10 per day)[8].

First hospital visit

The patient was admitted to the Pediatric Department due to a 4-day history of upper abdominal pain, multiple episodes of vomiting, vomiting after attempting to drink, eat or take oral medications. The pain was intermittent and was rated by the patient as 5 on the Numerical Rating Scale (NRS) at the time of admission. On the day of admission, he passed a small amount of constipated stool, and gas was being expelled. His body temperature was normal. He denied urinary symptoms, trauma, the use of intoxicants, alcohol, or dietary errors. He smokes cigarettes (about 10 cigarettes per day)[7]. Two days earlier, he had been evaluated in the Emergency Department for the same symptoms – severe abdominal pain and vomiting. An abdominal ultrasound and laboratory blood tests were performed, showing normal levels of lipase, pancreatic amylase, liver enzymes (AST and ALT), C-reactive protein (negative), and a slight increase in the white blood cell count (15.35 thousand/µl). In the Emergency

Department an enema was recommended, which the patient refused, and he left the department at his own request before a final diagnosis was made and treatment was initiated.

At admission to the Pediatric Department of the County Hospital, the patient was alert, circulatorily and respiratorily stable, but in pain. His abdomen was tender upon palpation, with palpable resistance on the left side of the abdomen (possible stool masses?), but no signs of peritonitis were present. Diagnostic tests were conducted: complete blood count, electrolytes, C-reactive protein, TSH, thyroid hormones, liver, kidney, and pancreas function tests, as well as a urinalysis – all returned within normal limits. An abdominal ultrasound showed a slightly thickened cortical layer in both kidneys (17-20mm), with no other significant abnormalities. An abdominal X-ray showed no evidence of fluid or air levels under the diaphragm. After completing the additional tests, the patient was administered intravenous fluids and probiotics. The following day, with symptom resolution and the patient's good condition, he was discharged home.

Second hospital stay

A month after his first hospitalization at the County Hospital, the patient was again admitted to the Pediatric Department due to severe left-sided abdominal pain. The pain was colicky in nature, non-radiating and began on the day of hospitalization. The patient again had multiple episodes of vomiting after attempts to drink, eat, or take oral medications. His body temperature remained normal. He denied trauma, dietary errors, the use of intoxicants and alcohol. He passed urine and stool normally. The patient’s mother reported that warm showers provided relief from the pain.

Diagnostic tests were performed: venous blood glucose, complete blood count, procalcitonin, C-reactive protein, liver and kidney function tests, and urinalysis – all results were within normal limits[8]. An abdominal ultrasound showed no differences from the previous exam and the patient's condition was stable. An abdominal X-ray showed no evidence of fluid or air levels under the diaphragm, but a scoliosis of the lumbar spine was noted. A urine culture showed no significant bacteriuria. The patient was again given intravenous fluids and probiotics, and after symptom resolution, he was discharged home.

Third hospitalization

A week after his second hospitalization at the County Hospital, the patient returned to the Pediatric Emergency Department with complaints of abdominal pain, multiple episodes of vomiting with liquid and bile contents, and vomiting after attempts to eat, drink or take oral medications. He again denied trauma, the use of intoxicants, alcohol, and dietary errors.

Diagnostic tests: complete blood count, C-reactive protein, electrolytes, liver and kidney function tests, pancreatic enzymes, and urinalysis were all normal. Given the recurrent nature of the symptoms, further diagnostic tests were expanded. Tests for antibodies against HCV, CMV IgM and IgG, HAV, and Yersinia infection were negative. The patient refused the proposed gastroscopy. Despite the patient's denial of using intoxicants, psychoactive substances, and alcohol, a decision was made to expand the diagnostic workup to include a drug panel in the urine, also considering the patient's

nicotine addiction (he still reported smoking about 10 cigarettes per day despite repeated warnings about the harm of nicotine use in adolescents). The urine drug panel came back positive for the presence of marijuana[10]. The patient admitted to long-term, frequent (several times a day) recreational use of marijuana.

Diagnosis:

Based on the clinical picture, the conducted tests, and the evidence of symptom relief with the use of a warm shower, a suspicion of cannabinoid hyperemesis syndrome (CHS) was established according to the Rome IV criteria[11, 12, 13]. The patient and his parents were informed about the suspicion of CHS. They were advised to stop using cannabinoids and were referred to a pedagogical-psychological clinic for treatment of the harmful use of marijuana and nicotine addiction in the child[14]. The patient was discharged home in good general condition, without symptoms, with recommendations to cease the use of marijuana and other intoxicants, improve the supervision by parents and continue treatment for addiction.

Discussion:

Cannabinoids are a group of organic chemical compounds that interact with cannabinoid receptors. Initially, this term referred only to compounds found in cannabis, but now plant-based cannabinoids, endocannabinoids, and synthetic compounds from this group have been discovered. The most well-known group of these chemical compounds are plant alkaloids, such as tetrahydrocannabinol (the main psychoactive substance in marijuana), tetrahydrocannabivarin, and cannabinol. Other groups occur naturally in human and animal bodies (e.g., anandamide) or are synthetically produced and labeled with letters and numbers (e.g., CP-55940).

There are two types of cannabinoid receptors: CB1 and CB2. CB1 is mainly located in the central nervous system, such as in the cerebellum and basal ganglia, though small amounts are also present in other systems, e.g., in the intestines[15,16]. The primary effect of CB1 receptor activation by compatible ligands is appetite regulation and the development of addiction (associated with the presence of receptors in areas like the hippocampus). They can also affect pain perception, which is a reason why some researchers advocate for the use of so-called medical marijuana. It is possible that CB1 receptor activation also contributes to the initially antiemetic effect of cannabinoids, but excessive activation may lead to the opposite effect. CB2 receptors do not participate in the pathogenesis of cannabinoid hyperemesis syndrome, as their main biological function is involvement in immune response regulation.

Cannabinoid Hyperemesis Syndrome (CHS)[17,18] is a disorder of unclear etiology, primarily affecting teenagers and young adults who chronically use marijuana and its derivatives. The pathophysiology of the syndrome is difficult to explain based on current medical knowledge and requires further research. Considering the physiological effects of cannabinoids—such as stimulating intestinal CB1 receptors

and acting antiemetic—it is suspected that their prolonged and excessive use may paradoxically trigger nausea and vomiting. Another theory suggests that excessive use of cannabinoids may cause desensitization of CB1 receptors, making them less responsive to the antiemetic properties of compounds containing domains that bind to these receptors.

Symptoms and Disease Course

CHS is a recurring condition characterized by symptom-free intervals closely related to breaks in the use of intoxicating substances. The disease can be divided into three main phases: prodromal, hyperemetic, and recovery phases[19].

The prodromal phase can last for months or years. During this phase, the patient experiences morning nausea and abdominal discomfort. Appetite is usually not disturbed.

In the hyperemetic phase, persistent vomiting, severe nausea when eating or drinking and diffuse abdominal pain occur. The pain can sometimes be severe and requires differentiation from acute abdominal conditions. Interestingly, patients often experience relief by taking hot baths or showers for extended periods, which is a key clue in diagnosing CHS in unclear cases.

The recovery phase can last days, months, or years, depending on the complete cessation of cannabinoid use.

Phase of Illness	Characteristic Symptoms	Duration
Prodromal Phase	Morning nausea, abdominal discomfort, normal appetite	Difficult to determine—months or years
Hyperemetic Phase	Intense nausea, persistent vomiting, severe abdominal pain, relief with hot baths	Weeks
Recovery Phase	Withdrawal symptoms due to cessation of cannabinoid use, complete recovery	Dependent on the time to completely cease cannabinoid use

Diagnosis

Diagnosis of CHS is often preceded by multiple hospitalizations, numerous differential tests, imaging, and often endoscopic procedures, which typically do not provide a clear explanation of the symptoms and do not deviate from normal results[21,22]. When recurrent episodes of uncontrolled vomiting of unclear etiology occur, it is important to consider testing for cannabinoids in the patient's urine, especially in groups at risk for substance misuse, such as adolescent boys.

The definitive diagnosis of CHS is based on the Rome IV criteria[23], according to which, to diagnose cannabinoid hyperemesis syndrome, all of the following criteria must be met:

Rome IV Criteria:

1. Typical vomiting episodes resembling cyclical vomiting syndrome in terms of onset, duration and frequency.
2. Symptoms occur after prolonged excessive use of cannabinoids (3-5 times a day for at least 2

years).

3. Vomiting episodes resolve after permanent cessation of cannabinoid use.

The criteria must be met for at least three months, and the symptoms must begin at least six months before the diagnosis is made.

An interesting and confirming observation of the syndrome is pathological behavior related to bathing—very long hot baths or showers, during which the patient experiences relief from the symptoms[24].

Cyclical Vomiting Syndrome (CVS) vs. Cannabinoid Hyperemesis Syndrome (CHS)

Cyclical Vomiting Syndrome (CVS)	Cannabinoid Hyperemesis Syndrome (CHS)
≥2 episodes of intense, persistent nausea and vomiting lasting from hours to days, occurring within 6 months	Typical vomiting episodes resembling CVS in terms of onset, duration, and frequency
Symptoms and episodes are stereotypical for the patient	Episodes separated by weeks or months, with a return to complete health
after prolonged excessive use of natural cannabinoids (cannabis)	
Episodes of vomiting resolve after permanent cessation of cannabis use	Symptoms not resulting from another illness

Diagnosis of CHS in Pediatrics

CHS is a diagnostically challenging condition in the pediatric population. Early suspicion of CHS helps avoid unnecessary diagnostic tests. To identify an organic cause for the observed disorders, many laboratory, imaging, and endoscopic tests are performed, but their results are typically normal and fail to explain the symptoms. Laboratory tests usually show electrolyte disturbances and signs of dehydration, typically seen after multiple vomiting episodes. Abdominal imaging and endoscopy of the gastrointestinal tract usually show no abnormalities. Positive results for cannabinoids and negative findings on other tests, along with the clinical picture, are the primary clues for diagnosing CHS. While CHS usually progresses mildly and requires rehydration, correction of electrolyte disturbances, and observation, in extreme cases, it can lead to acute dehydration with acute kidney injury (AKI). There have been reports of two deaths related to AKI in CHS, though they involved adults[26,27]. The lack of awareness about the easy availability of intoxicating substances like marijuana and its derivatives for children among medical staff and parents often delays diagnosis.

CHS Diagnosis:

Laboratory Tests	Findings
Electrolyte levels	Non-specific disturbances indicating dehydration, hypoglycemia, otherwise normal
Imaging Tests	Abdominal ultrasound, X-ray, CT scan – normal
Endoscopic Tests	Normal
Cannabinoid Testing (e.g., urine)	Positive

Treatment

The treatment of CHS in the hyperemetic phase is symptomatic. It involves rehydration either orally or intravenously, depending on the severity of dehydration and the patient's tolerance. Electrolyte imbalances should be corrected, and blood glucose levels should be normalized. Monitoring of electrolyte concentrations, blood gas analysis with pH and electrolyte levels, as well as glucose levels, should be the primary tests used to monitor the patient's condition[28].

In the treatment of vomiting and nausea, antiemetic drugs such as ondansetron, promethazine, metoclopramide, and lorazepam are ineffective, and their use does not provide the expected relief to patients. There are indications that tricyclic antidepressants may be effective, but their use carries the risk of developing dependency. There are also reports suggesting the beneficial effects of capsaicin in reducing symptoms associated with nausea. In 2017, a study was published in which 13 patients with CHS were treated symptomatically with topical capsaicin preparations (creams), which reduced symptoms[29]. In Poland, multi-component preparations containing capsaicin are available, but their use may cause irritation to the skin and mucous membranes, so caution should be exercised when attempting to use them. In the study, small thin layers of a 0.075% capsaicin preparation were applied to the patient's skin up to three times a day, which was intended to reduce nausea and prevent vomiting[30]. Further research on the use of such treatments needs to be conducted to better establish the therapeutic effects of this substance in the condition described.

In severe cases of dehydration leading to acute kidney injury (AKI), treatment should follow the guidelines for pre-renal AKI (due to dehydration and electrolyte disturbances)[31]. As mentioned earlier, literature reports two fatal cases of CHS resulting in AKI in previously healthy 27-year-old adults, which occurred in the United States. As of the time of writing this article, no fatal cases related to cannabinoid hyperemesis syndrome have been reported in Poland.

The only definitive treatment for CHS is the cessation of cannabinoid use, which can be difficult to achieve due to their addictive properties. The patient should be referred to an addiction treatment center for professional advice, and the family of a minor should be informed of the need for increased parental supervision over the adolescent's addiction.

Complications

Possible complications of CHS include dehydration, ranging from mild to severe, weight loss of 5-10 kg during a single episode, and potential esophageal rupture with subsequent complications[32,33]. The most severe complication of the disease is acute kidney injury (AKI) due to massive dehydration, electrolyte imbalances, and hypoglycemia, which can present a life-threatening condition. Other, less dangerous complications include burns caused by hot baths.

Conclusions

Cannabinoid Hyperemesis Syndrome (CHS) is a rare cause of nausea, vomiting, and abdominal pain in the pediatric population. CHS should be considered as a cause of recurrent nausea, vomiting, and abdominal pain of unclear etiology in populations at higher risk for risky behaviors related to marijuana use, such as adolescent boys.

CHS should be differentiated from Cyclic Vomiting Syndrome (CVS), with the use of hot baths for relief and a positive test for cannabinoids in the body being indicators pointing to CHS.

Discontinuing marijuana use—essential for the definitive confirmation of the described condition—is a complex issue that requires the willingness and cooperation of the patient, which is often difficult in the case of long-term addiction. The help of an interdisciplinary team of specialists in this area is necessary.

Disclousure

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