

Cannabis-Induced Catatonia in a 15-Year-Old Male: A Case Report

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ABSTRACT

Introduction: Catatonia is a syndrome of primarily psychomotor disturbances most common in psychiatric mood disorders but that also rarely has been described in association with cannabis use.

Case Presentation: A 15-year-old White male presented with left leg weakness, altered mental status, and chest pain, which then progressed to global weakness, minimal speech, and a fixed gaze. After ruling out organic causes of his symptoms, cannabis-induced catatonia was suspected, and the patient responded immediately and completely to lorazepam administration.

Discussion: Cannabis-induced catatonia has been described in several case reports worldwide, with a wide range and duration of symptoms reported. There is little known about the risk factors, treatment, and prognosis of cannabis-induced catatonia.

Conclusions: This report emphasizes the importance of clinicians maintaining a high index of suspicion to accurately diagnose and treat cannabis-induced neuropsychiatric conditions, which is especially important as the use of high-potency cannabis products in young people increases.

He had experienced vague symptoms of fatigue and weakness for approximately 1 month. He had been diagnosed with COVID-19 a month prior and then with influenza A shortly after that, so his symptoms had been attributed to those illnesses. During his 4-day admission for further workup, he progressed to having global weakness, minimal speech, and a fixed gaze with little visual scanning of the environment. Past medical history was notable for cannabis use disorder, mild depression, and a remote history of seizures. The patient's medication list included vitamins, cetirizine for seasonal allergies, and albuterol infrequently for mild asthma symptoms.

Lab workup was largely unremarkable,

with a normal complete blood cell count, comprehensive metabolic panel, C-reactive protein, erythrocyte sedimentation rate, troponin, and urine analysis. The only abnormal labs were an elevated D-dimer (926 ng/mL) and a urine drug screen positive for cannabinoids. Brain magnetic resonance imaging, extended electroencephalogram monitoring, and cerebrospinal fluid analysis all were unremarkable. In the absence of any evident organic cause of his condition, a psychiatric cause was suspected, and a diagnosis of catatonia was considered. The patient scored 3/69 on the Bush-Francis Catatonia Rating Scale, with symptoms of hypokinesia, minimal speech, and a partially fixed gaze. A lorazepam challenge test was administered to investigate a diagnosis of catatonia. Intravenous lorazepam 2 mg was administered and, within minutes, the patient's symptoms completely resolved.

Further history taken from the patient revealed that he had used marijuana approximately 3 to 4 times per week for the past 4 months and more recently had been vaping THC-O-acetate, a synthetic analog of tetrahydrocannabinol (THC) that is purport-

INTRODUCTION

Catatonia is a syndrome of primarily psychomotor disturbances most common in psychiatric mood disorders but that also rarely has been described in association with cannabis use. We report the case of an adolescent male experiencing cannabis-induced catatonia.

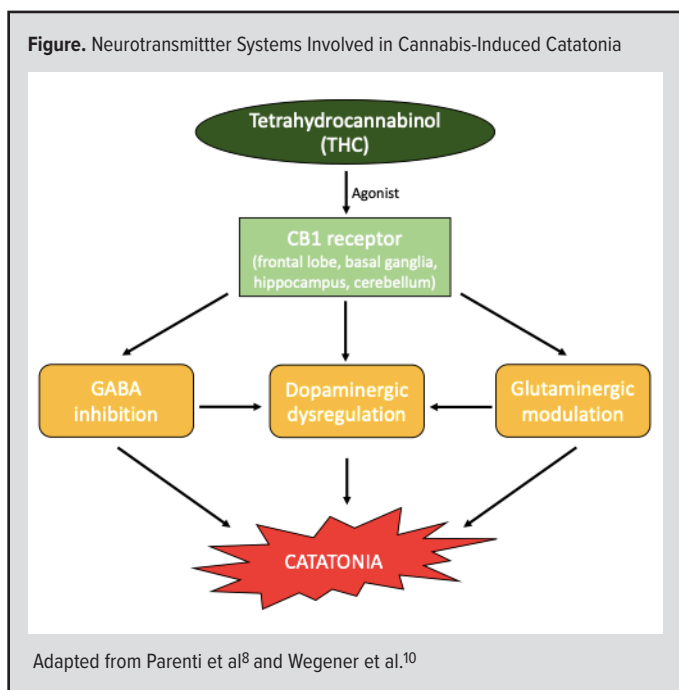
CASE PRESENTATION

A 15-year-old White male presented to the emergency department with left leg weakness, altered mental status, and chest pain.

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edly 2 to 3 times more potent than THC. He denied any affective or psychotic symptoms.

DISCUSSION

Catatonia is a syndrome of primarily psychomotor disturbances most common in psychiatric mood disorders, such as bipolar disorder, but also can occur from other psychiatric disorders, substance intoxication or withdrawal, or from medical or neurological causes.¹⁻³ Catatonia can manifest with a wide range of symptoms, regardless of the underlying cause.^{1,3} The severity of catatonia can be quantified using symptom rating scales, with the Bush-Francis Catatonia Rating Scale being the method most used in clinical scenarios to assess the severity of catatonia and monitor treatment response.⁴ To aid in diagnosis, a lorazepam challenge test can be performed, where 1 to 2 doses of 1 mg to 2 mg of lorazepam are administered; a positive response is a reduction in symptoms by 50% or more as measured by a symptom rating scale.^{2,4} While other benzodiazepines likely have some efficacy in the treatment of catatonia, lorazepam is the most studied treatment and is first-line therapy for catatonia due to any cause, with remission rates greater than 70%.^{1,2,4-6} The duration of lorazepam therapy in the treatment of catatonia is not clear, but it is important to ensure an adequate treatment time, as premature discontinuation of treatment can lead to catatonic symptoms reappearing.⁴ For catatonia that fails to respond to lorazepam, electroconvulsive therapy is often effective.^{1,3,6}

The neurobiology of catatonia has not yet been fully elucidated. The heterogeneity of the clinical manifestations of catatonia makes determination of its neural basis difficult, and because catatonia can cause both hypokinetic and hyperkinetic symptoms and can be triggered by many different causes, multiple neural

pathways are likely involved.⁵ Dysregulation of several neurotransmitter systems—particularly the dopaminergic, GABAergic, and glutaminergic systems—have been implicated in catatonia.^{1,7}

Northoff⁷ describes a model that refers to dysfunction of both “horizontal modulation” and “vertical modulation” in patients with catatonia. The horizontal (cortical-to-cortical) modulatory dysfunction refers to hyperactivity of the orbitofrontal cortex and other prefrontal cortex areas, with alterations in connections between these areas to motor and premotor areas of the cortex.^{5,7} The vertical (cortical-to-subcortical) modulatory dysfunction refers to dysfunction of cortical areas, mostly in the frontal and parietal lobes, leading to alterations in connections to subcortical motor areas in the basal ganglia.⁷ The cortical dysfunction seen in catatonia is related to decreased GABAergic tone, which explains the response to lorazepam.^{1,5,7} The use of N-methyl-D-aspartate (NMDA) antagonists (eg, amantadine) also has some efficacy in the treatment of catatonia, likely related to the relative glutaminergic hyperactivity seen in the condition.^{1,7} However, because the effect of NMDA antagonists in the treatment of catatonia is not as rapid and blatant as the effect of benzodiazepines, the relative excess of glutaminergic excitatory activity could be a result of impairment of the γ -aminobutyric acid (GABA) system, and not itself a direct cause of catatonia.⁷ Parenti et al⁸ describes these neurotransmitter disturbances in a neural excitatory/inhibitory imbalance model: an impairment in GABA inhibition and a relative excess of stimulatory glutaminergic action causes dysregulation of dopamine release, which could contribute to both the motor and psychotic symptoms of catatonia and explains the efficacy of benzodiazepines and NMDA antagonists in the treatment of catatonia.

GABAergic and glutaminergic system dysfunction are not only related to catatonia itself but are also related to cannabis use. Some evidence suggests that THC, the psychoactive compound in marijuana, causes alterations in the physiologic control that the endogenous cannabinoid system has on GABA and glutamate release.^{9,10} THC is a partial agonist of CB1 and CB2 receptors, with CB1 being found mostly in the brain causing the psychoactive effects and CB2 located in the periphery.^{10,11} CB1 receptor distribution in the brain is largely concentrated in areas of the cortex and basal ganglia that also are implicated in the neurobiology of catatonia, psychosis, and substance use disorder.^{5,11,12} A framework for how THC agonism of CB1 receptors influences the neurotransmitter systems involved in catatonia is found in the Figure.

A recent review of catatonia related to cannabis and synthetic cannabinoids performed by Palma-Álvarez et al¹² analyzed the case reports and case series available on the topic. The review showcased the wide range of symptoms manifested in patients with cannabis-induced catatonia, as well as a wide range of the duration of symptoms—in some cases with symptoms continuing longer than would be expected given the half-life of THC. Half of the cases included in the review were patients with no previous psychiatric

history. Most of the cases involved cannabis-induced psychosis in addition to catatonic symptoms. In fact, the authors suggested that this could lead to an underreporting of cannabis-induced catatonia, with the motor symptoms of catatonia being overshadowed by more prominent positive psychotic symptoms. In cases analyzed that involved long-term use of marijuana, an increase in the frequency of use and/or the potency of the product preceded the onset of catatonia, as was the scenario in the case presented here. All cases were treated with lorazepam, with some also including the addition of antipsychotic medication, electroconvulsive therapy, or other psychiatric medications. However, the authors noted that most of the studies on catatonia are performed on people without a substance use disorder, so there is a poor knowledge base for the risk factors, treatment, and prognosis of substance-induced, or specifically cannabis-induced, catatonia.¹²

The landscape of cannabis consumption in the United States has changed greatly in recent years. States and localities have progressively made moves toward the legalization of marijuana for recreational use. The US has seen an increase in the number of people using cannabis, the frequency of use, and the amount consumed. The prevalence of daily or near-daily use has doubled in the US in the past decade.¹³ The potency of cannabis products—as reflected by the concentration of THC—also has increased significantly in recent years,¹⁴ with the availability today of high-potency resin oils having up to 90% THC.¹⁵ Even as the potency of cannabis products continues to increase, there is an inverse relationship between the use of cannabis by American adolescents and the perception of cannabis as harmful—that is, as youth have perceived cannabis as being less harmful, the use of it among them has increased.¹³

The patient in this case was younger than any patient included in the review by Palma-Álvarez et al.¹² However, if this relatively newly described phenomenon is underdiagnosed and underreported, it is possible that the prevalence of this condition may be more common than currently understood in the pediatric population and in the larger population more generally. Because the prognosis, treatment duration, and long-term sequelae of this condition are poorly understood, it is important for these patients to maintain extended follow-up to monitor for recurrence and/or the development of additional neuropsychiatric symptoms.

CONCLUSIONS

This case report describes an adolescent male gradually developing catatonic symptoms of hypokinesia, minimal speech, and a partially fixed gaze after an extended period of frequent THC use with a recent switch to consumption of high-potency synthetic THC. This case adds to the limited but growing literature on cannabis-induced neuropsychiatric conditions in pediatric populations; to our knowledge, the patient described in this case is younger than any other previously described case of cannabis-induced catatonia.

This report highlights the need for further investigation into the neuropsychiatric effects of cannabis and synthetic cannabi-

noids that have been associated with the development of catatonia and other psychiatric conditions. It also emphasizes the importance of clinicians maintaining a high index of suspicion to correctly diagnose and treat cannabis-induced catatonia and other cannabis-induced psychiatric conditions and stresses the importance of pediatricians and primary care clinicians recognizing signs of cannabis abuse in patients and intervening before neuropsychiatric sequelae develop.

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