

Ataxia Which Develops Due to Freeze Spray Abuse: A Case Study

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Abstract

Inhalant abuse is a common occurrence and is facilitated by the widespread availability of volatile solvents with legitimate commercial and household uses. Freeze sprays containing chlorinated hydrocarbons such as ethyl chloride are commonly abused by either sniffing directly from containers or huffing from paper or plastic bags that have been sprayed into. Most inhalants are central nervous system (CNS) depressants. This study presents the case of a 24-year-old woman who was diagnosed with changes in her mental status, cerebellar signs, and gait deficit after the inhalation of a refrigerant containing ethyl chloride.

Keywords: Volatile substance • Ethyl chloride • Neurotoxicity • Ataxia • Inhalant abuse

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Volatile substance abuse has increasingly become a chronic problem among youths and adults worldwide in recent years. Organic volatile compounds are chemical substances that are easily accessible and can change the functioning of the mind. Treatment during an acute crisis after the abuse of these kinds of substances is mostly in terms of supportive care.

Chlorinated hydrocarbons such as ethyl chloride are volatile compounds which can be misused by inhaling directly in through the nose or from within a plastic bag, and they are capable of forming a clinical condition similar to alcohol intoxication by creating depressive effects on the central nervous system (Tormoehlen, Tekulve, & Nanagas, 2014). These substances are used in legitimate commercial products, in medical products, and in industries. As a medical example, freeze sprays are frequently applied for acute pain-relief spray on sports injuries. These substances, which are being used by inhaling while squeezing a bag or container more than being abused by squeezing directly into the mouth or nose, can easily cross the blood-brain barrier because they are lipophilic (Demarest, Torgovnick, Sethi, Arsura, & Sethi, 2011). After exposure to ethyl chloride compounds through acute inhalation, neurological and psychiatric symptoms may occur such as confusion, dizziness, loss of coordination, ataxia, hallucinations, impaired concentration and memory, as well as intoxicated motor skills and behaviors (Lubman, Yucel, & Lawrence, 2008).

The Case Report

A 24-year-old female patient who works as a hairdresser was admitted to our clinic with complaints of gait abnormality, ataxia, blurred vision, and shaky hands. She noted that for the past few days she had felt dizzy, her speech had changed, she was sluggish, and her legs were weak. The patient was anxious and in a state of panic due to substance abuse. She directly told her history of abuse with the substance “Chloroethyl Freeze Spray” not hiding the fact that she had used three or four tubes of the substance daily, four times a week for the last two months. The patient said she felt as if she had drunk alcohol, especially after using the substance. The patient stated that she had used it three years ago and had quit for a long time, but had recently started using it again. She said that previously she had also used cannabis with this substance, and in the

last month she had been using the spray with cannabis. Her medical records showed no history of any chronic diseases.

In the physical examination, no pathological findings were detected in the patient; mild confusion, dysarthric speech, gaze-evoked nystagmus bilaterally directed in the quick phase, and ataxia of the trunk and gait were detected in the neurological examination. No characteristics were detected in the blood count, serum biochemistry, or urine toxicology analyses. No evidence in support of lesions, hemorrhages, or ischemic infarctions was detected in the patient's cranial tomography scan. Her cranial MRI, including diffusion-imaging, did not reveal any acute intracranial abnormalities.

The patient, who had been administered supportive therapy with hydration, was observed a few days later to be in remission from her clinical symptoms and speech problems. The patient was later directed to the outpatient drug and alcohol addiction treatment and training center in order to control her problem.

Discussion

Volatile substances are volatile anesthetics or chemical solvents that have legitimate commercial, medical, and industrial uses. Ethyl chloride (C_2H_5Cl), or chloroethane, is a colorless, halogenated, hydrocarbon gas. It is a volatile compound that can be found in many commercial products. It is a chemical solvent and can be abused. Chlorinated hydrocarbons such as ethyl chloride can be abused by being inhaled, generally drawn through the mouth or nose. Volatile chemical compounds can be easily obtained as there is a wide network of use. The abuse of these substances through inhalation constitutes an important health issue (Garland & Howard, 2012). Studies have shown that this problem, which has become widespread throughout the world, is higher among minorities and individuals that seem to be marginalized (Baydala, 2010; Dell & Hopkins, 2011; Williams & Storck, 2007). Although low socioeconomic levels, males, and ethnicity have been reported as risk factors for abuse of volatile compounds, its ease of access is why volatile compound abuse has also become widespread in middle-income youths (Williams & Storck, 2007).

Inhalants quickly cross the blood-brain barrier because of their influence as CNS depressants and they are very lipophilic. After exposure to ethyl-chlorides

through acute inhalation, neurological and psychiatric symptoms may occur such as confusion, dizziness, loss of coordination, ataxia, hallucinations, impaired concentration and memory, and intoxicated motor skills and behaviors. Finch and Lobo (2005) reported acute neurological deficits characterized by restlessness, ataxia, and dysarthria as a result of ethyl-chloride abuse in a 41-year-old, HIV-positive, African-American patient. This patient had intermittently used ethyl-chloride compounds from a commercial household cleaning product for two years. This patient was reported to have been heavily using this substance by way of inhalation the two weeks before he came to the clinic. The patient in our current case also developed acute gait disturbance and cerebellar signs after freeze spray inhalation. Cerebellar signs have been reported after ethyl-chloride inhalant abuse in the literature, too, just like in our case with the 24-year old who had been admitted to the clinic with complaints of gait disturbance, blurred vision, and shaky hands resulting from the previous two months of four-times-a-week, three- or four-tubes-a-day, freeze-spray inhalation abuse and who was diagnosed with dysarthric speech, cerebellar signs, and ataxia in her neurological exam (Hes, Cohn, & Streifleri 1979; Soult & Walker, 1993). Demarest et al. (2011) reported a 47-year-old HIV-positive male patient had been attended to with an acute neurological disorder in the form of a gait deficit and speech disorder after inhaling ethyl chloride.

Cases have also been reported to lead to neurological toxicity as well as serious morbidity and mortality. Although rare, death has been observed in both acute and chronic exposure. Two cases of death attributable to ethyl-chloride abuse are available (Yacoub, Robinson et al., 1993; Broussard, Broussard et al., 2000). Fetal solvent syndrome and toluene embryopathy, which form teratogens, were displayed after a woman had abused volatile compounds during her reproductive period (Win-Shwe & Fujimaki, 2010).

The first method in the fight against ethyl-chloride intoxication is terminating exposure to these substances. The intoxication involves CNS depressants that are described by altered mental states analogous to alcohol (ethanol) poisoning, ataxia, and horizontal nystagmus. As respiratory arrest develops, oxygen support or advanced life support may also become necessary. However, CNS depressants generally act quickly and their effects quickly end (Senussi & Chalise, 2013). The usage of additional toxic substances or drugs together (“cocktails”) should

always be kept in mind. For example, the patient in our case stated that she had used ethyl chloride along with cannabis. In this situation, the compounds' effects on the CNS were more pronounced. Patients must always be monitored in the acute exposure period, as cardiac arrhythmias along with ethyl-chloride toxicity may occur. In therapy, the neurological symptoms that follow termination of exposure to a toxic substance are expected to improve within a week. Methods that have been traditionally used in other substance addictions such as cognitive behavioral therapy, family therapy, and motivational expansion techniques are recommended, especially in extreme cases (Williams & Storck, 2007).

In the differential diagnosis of patients who are being attended to with an acute change of mental status and neurological symptoms, volatile-compound inhalation abuse should always be considered. In particular, volatile compounds use should come to mind. The arrival of a negative toxicological urine analysis should always create high clinical suspicion.

Result

Abuses of volatile chlorinated hydrocarbons such as ethyl chloride are encountered so often anymore because of how easy they are to access. As a result of the neurotoxicity of ethyl chloride which develops after exposure, non-localized, non-specific, and transient neurological symptoms may occur. Lab work and neuroimaging tests are not pathognomonic in the case of neurotoxicity observed after exposure to ethyl chloride; diagnosis is placed mainly through clinical suspicion. Clinicians should take into account the possibility of volatile compound substance abuse in patients who exhibit confusion, hallucinations, ataxia, dysarthria, weakness, and tremors that can't be explained by other medical reasons or drugs.

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