"High" on Muscle Spray – Ethyl Chloride Abuse

Dear Editor,

Volatile substance abuse (VSA) is intentional inhalation of volatile substances for psychoactive effects. As volatile substances have lawful commercial, household and medical uses, it is easily accessible. VSA is recognised to occur more frequently in marginalised societies, in people with low socioeconomic levels and in males.[1] Despite the prevalence of VSA in most countries—especially among young adults and youth—it is often overlooked. In Great Britain, there have been 834 VSA-related deaths since 2001, and 64 recorded in 2016 alone.[2] The harms of VSA addiction and adverse effects of ethyl chloride is often underappreciated due to the poor knowledge on VSA and the general perception that VSA is not a "true form" of drug abuse. There is limited medical literature on ethyl chloride abuse, most of them from the 1980s and 1990s. While there are reports on other VSAs, reports on ethyl chloride abuse are few. Ethyl chloride abuse has been reported in the mainstream media in Singapore[3] but awareness among the general public and health care professionals remains poor.

Case Report

A 24-year-old Singaporean Chinese gentleman presented to a local hospital with a 2-day history of nausea, vomiting and abdominal cramps. He did not have any past medical history and was not taking any medications. He admitted to abusing a "muscle spray" a few times a week for the past 2 months. He explained that the substance is sprayed onto a piece cloth and the fumes are inhaled.

On examination, he had an unsteady gait, intention tremors and bilateral nystagmus on horizontal gaze. The rest of his physical examination was normal.

Electrocardiogram, arterial blood gas, full blood count, renal profile, electrolytes and liver profile were unremarkable. Urine toxicology screen was negative. Computed tomography (CT) scan of the brain was normal. The content of the "muscle spray" was checked and it was found to contain ethyl chloride. A diagnosis of ethyl chloride poisoning was made. He was started on intravenous hydration and monitored in hospital.

On day 2 of admission, his symptoms improved but he still had unsteady gait. A contrasted magnetic resonance imaging (MRI) of the brain was performed; the results of which were normal.

He was discharged on day 4 of admission after being seen by the neurologist who concurred with the diagnosis of ethyl chloride poisoning. He was seen in the outpatient clinic 2 weeks after discharge, at which point his symptoms had completely resolved.

Discussion

There are a few case reports—as early as 1985—on ethyl chloride misuse. There have also been 2 case reports of ethyl chloride inhalation causing death.[4,5]

Ethyl chloride (C_2H_5Cl) or chloroethane is a colourless, halogenated, hydrocarbon gas which was first discovered in 1759 and widely used as a general anaesthetic in the late 19th and early 20th centuries.[6] However, its use as general anaesthesia declined due to its controversial safety profile, unpleasant recovery period and the revelation of other superior agents.[7] From as early as the 1890s, ethyl chloride has been used as topical anaesthesia. It condenses under slight pressure—so when sprayed to the skin, it produces an intense cold sensation as it rapidly evaporates due to its low boiling point. Due to this property, till date, it has been used extensively in products to induce local anaesthesia and relieve muscle pain. Ethyl chloride has also been used as a solvent, refrigerant and in the manufacturing of dyes and chemicals.

Ethyl chloride inhalation produces a temporary sensation of intoxication and at higher levels, causes incoordination and unconsciousness. Other features of inhalation include stomach cramps, eye irritation, nausea and vomiting. Long-term inhalation can lead to neurological effects such as incoordination, giddiness, dysarthria, unsteady gait, disorientation, short-term memory loss and hallucinations.[8]

There are limited studies on the longer term sequelae of ethyl chloride poisoning. There is some evidence of depression of cardiac tissues due to vagal stimulation. There are also studies showing mildly deranged liver function tests and impaired leukocyte phagocytosis with ethyl chloride inhalation.[3] Animal studies have shown associations with fetotoxicity and carcinogenicity mainly involving the skin, brain, liver, lung, uterus and endometrium.[9]

Ethyl chloride is rapidly absorbed by the lungs and is lipophilic, enabling easy access to the central nervous system which can explain the neurological symptoms.[10] Also, lipophilicity may lead to delayed clearance from the body.

The diagnosis of ethyl chloride poisoning is based on history and clinical examination. There are currently no modalities to check for ethyl chloride levels in serum or urine in Singapore. However, there are studies on detection of ethyl chloride levels from urine which have shown favourable results.[11]

Management options for ethyl chloride poisoning are limited. The mainstay of treatment is removal of the patient from further exposure and supportive care. Patients need to be monitored for cardiac arrhythmias and neurological progression. Patients who are unconscious or develop respiratory depression will require respiratory support. Progression of symptoms and signs should prompt further investigations and consideration of alternative diagnoses as effects of ethyl chloride generally clear rapidly.[12] The neurological effects usually improve within a week following cessation of ethyl chloride inhalation.[13]

Concomitant abuse of other substances needs to be always considered. Some patients may experience worsening of symptoms as a result of withdrawal effects.[13]

Conclusion

There is high propensity for abuse due to the easy availability of muscle analgesic sprays as over-the-counter drugs making ethyl chloride readily available. A check on online shopping websites in Singapore revealed that muscle analgesic sprays containing ethyl chloride produced by Walter Ritter GmbH + Co.KG and Gebauer Company can be liberally purchased. The harms of VSA must be highlighted and awareness among the general public and health care professionals needs to be raised to curb its abuse.

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