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NEUROPSYCHIATRIC MANIFESTATIONS FOLLOWING THE USE OF 3, 4-METHYLENEDIOXYMETHAMPHETAMINE (MDMA; "ECSTASY")

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Abstract

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1. The recurring side-effects associated with MDMA consumption are reviewed.
2. The recreational use of "Ecstasy" has been implicated in the onset of various psychological, neurological, and organic complications. A table has been employed to depict the deleterious reactions that have occurred following MDMA ingestion.
3. An original case report is presented in which an individual developed perpetual neuropsychiatric symptomatology after having consumed MDMA. This case indicates that MDMA may induce long lasting effects, even after one exposure.

Keywords: case report, Ecstasy, 3,4-methylenedioxymeth-amphetamine, MDMA, serotonin, side-effects.

Abbreviations: brain electron activity mapping (BEAM), Drug Enforcement Administration (DEA), disseminated intravascular coagulation (DIC), 3,4-methylenedioxymethamphetamine (MDMA, Ecstasy).

Introduction

(±)3,4-Methylenedioxymethamphetamine (MDMA) is a popularly consumed substance worldwide. The substance is most commonly referred to by its nickname Ecstasy, or simply 'E' to denote Ecstasy. MDMA was originally synthesized in 1912, and shortly thereafter patented to E. Merck in 1914 (Shulgin 1990). Although the substance had been manufactured as having properties that may be therapeutically useful, Ecstasy is currently reaching epidemic proportions as a recreational street drug. In 1986, after the drug had been purported to be widely distributed within recreational settings, the Drug Enforcement Administration (DEA) intervened and ordered that the substance be placed within the most restrictive drug category, Schedule I (Lawn 1986). Despite its prohibition, Ecstasy continues to be consumed illegally in bars, nightclubs, and at increasingly popular 'rave' events (McDowell 1993, Cohen 1995).

There have been various reports documented within the literature that have attributed MDMA to precipitating the onset of a wide range of adverse reactions. The constellation of adverse symptomatology associated with Ecstasy use include panic (Whitaker-Azmitia and Aronson 1991, Pallanti and Mazzi 1992), depression, suicidal ideation, flashbacks, rage reactions, psychosis, and severe paranoia (Hayner and McKinney 1986, McGuire and Fahy 1991, Series et al 1994). MDMA use has also been implicated with various organic complications including rhabdomyolysis, disseminated intravascular coagulation, renal failure, hepatitis, intracranial hemorrhage, coma, and deaths in some instances (Henry et al 1992). Suicidal ideation, as well as actual suicides, have also been attributed to Ecstasy use (Ellis and Schimmel 1989, Cohen 1996).

Neuropathological consequences following MDMA intake have been reported. According to various reports within the literature,

MDMA consumption has resulted in hemorrhaging and cerebral infarction, or stroke (Gledhill et al 1993, Manchanda and Connolly 1993, Hanyu et al 1995). MDMA-induced cerebral venous sinus thrombosis has also followed MDMA use (Rothwell and Grant 1993). Table 1 displays the MDMA-induced effects that have been documented within the scientific literature.

Table 1

Symptomatology and Organic Complications Associated with MDMA Use

Acute Reactions	Psychological/Behavioral Manifestations	Organic Complications
Pupillary Dilation	Anxiety	Acute Renal Failure
Headaches	Panic Attacks	Hemorrhage
Nystagmus	Disorientation	Convulsions/Seizures
Shortness of Breath	Psychosis	Hepatitis
Nausea/Vomiting	Paranoia	Rhabdomyolysis
Tachycardia	Depression	Hyperthermia
Blurred Vision	Delusions	Hypertension
Lower Back Ache	Suicidal Ideations	Stroke
Trismus/Bruxism	Mood Swings	Incontinence
Hypertonicity	Catatonic Stupor	Coma
Diaphoresis	Depersonalization	DIC
Xerostomia	Derealization	Aplastic Anemia

* DIC = disseminated intravascular coagulation

In the following report, an individual is described who developed neuropsychiatric complications following MDMA use. This case further suggests that MDMA may induce transient neuropsychiatric effects that present as behavioral and thought disturbances. Furthermore, this case indicates that MDMA may cause psychological, neurological, and psychiatric disturbances, even after minimum exposure.

Case Report

A 17 year-old-male, with no previous physical or psychiatric illness, openly admitted to having taken Ecstasy on a single occasion while away at college. The subject ingested an MDMA tablet prior to attending a 'rave' event. Within 30 minutes following ingestion, the subject experienced impending doom and had extreme discomfort in his lower back area. The subject reported to have encountered a wide range of sympathomimetic symptoms including pupil dilation, bruxism, tachycardia, lower back ache, headache and hypertonicity. Following these acute reactions, the subject felt no other discomfort (i.e. headache, nausea, panic) throughout the remaining part of that evening.

The subject sought medical assistance 2 months following his MDMA experience, after the deleterious symptoms had failed to dissipate. The subject, with the assistance of his parents, described a wide range of manifesting symptomatology that incapacitated this individual as a result of MDMA ingestion. The patient had experienced lapses in memory and sporadic episodes characterized by depersonalization. Some of the more salient residual symptoms reported included paranoia, depression, chronic headaches, blurred vision, derealization, visceral sensations, deja vu, panic and suicidal ideations. The subject also reported occasional instances of uncontrolled anger, sudden bursts of energy and photosensitivity. The subject, along with verification from his parents, recounted instances in which his pupils would become extremely dilated for as long as two hours, with little reactivity to direct light. It was also noted by the subject's parents that their son would drift into what were described as "trance-like" states.

The patient stated that this was the first time that he had ingested MDMA and denied previous use of other illicit or licit

recreational substances. In order to rule out potential underlying anomalies, several tests were ordered. Physical examination, blood chemistry, blood count, urinalysis, and a urine drug screen were all normal. Because the patient had openly declared feeling suicidal and often depressed, sertraline HCl at 25 mg/day was prescribed.

During a follow-up consultation at 2-months, the subject admitted that he no longer experienced depression, but had continued to experience symptoms that were characterized by panic, derealization, visceral sensations, photosensitivity, headaches and intermittent instances of pupil dilation.

Being that EEG evaluations measure only a small fraction of the electrical activity in the outer one-third of the brain, the brain electrical activity mapping (BEAM) test was ordered to give a more accurate brain wave reading of the temporal cortex. The BEAM test revealed abnormal electrical discharges arising from within the posterior temporal region, particularly during the evoked-potential analysis. Also, hypercoherence measures were detected in the left posterior temporal area with concomitant hypocoherence in the right frontal region. During the administration of the BEAM, the patient reported that the photostimulation component of evoked potential had triggered the onset of a headache.

In addition to sertraline HCl, clonazepam was prescribed. After one month, the patient reported that many of the MDMA-induced side effects had been ameliorated. Although clonazepam was effective in treating nearly all of the presenting symptomatology, the patient reported increased depressive episodes that were characterized by lethargy, oppressive thoughts, and decreased libido. An increased dosage of sertraline HCL was then prescribed to combat the exacerbated symptomatology. The daily regimen of clonazepam 3 mg/daily and sertraline HCl 50 mg/daily has been the medication combination that has kept the burdensome symptoms in remission.

Discussion

Temporal lobe epilepsy has been characterized by visceral sensations, deja vu, derealization, panic, headaches and pupillary dilation (Niedermeyer 1984). These symptoms were all incurred by this individual both immediately following and long after MDMA ingestion. Epileptic conditions straddle both neurological and psychiatric disturbances in their clinical presentation. There remains the possibility that Ecstasy may have been epileptogenic in this particular individual, possibly via a neuronal kindling process. It is also possible that this individual had a pre-existing condition (e.g. chemical imbalance), which may have made this patient susceptible to further brain complications after consuming MDMA. It is very difficult to make a diagnosis in such cases, being that various symptoms tend to overlap in their presentations.

It is often arduous to draw a true causal relation between drug use and subsequent presenting symptomatology; however, in this case, Ecstasy ingestion seems to be the cause of these neuropsychiatric manifestations because: 1) the patient did not have a personal or family history of mental illness, and 2) a temporal relationship existed between MDMA ingestion and when this individual began experiencing various recurring symptomatology. These factors strongly support a cause-and-effect relation. It is also noteworthy that the patient did not have prior exposure to Ecstasy or any other illicit substance.

The BEAM test is not, in itself, sufficient as a diagnostic tool. Also, the BEAM is subject to artifactual contamination and therefore its findings should not be overinterpretated. Extreme caution must be taken when making interpretations of the BEAM analysis; however, considering the symptomatology reported by this individual, as well as the evoked-potential findings of the BEAM, there remains strong evidence suggestive of epileptiform activity. In this case, MDMA either kindled or exacerbated a

neurological condition, perhaps temporal lobe epilepsy. It is also possible that MDMA may have had an effect on the serotonergic system in the brain, as suggested by the presenting symptoms, as well as the efficacy of sertraline HCl, a psychotropic medication primarily known to restore the regulation of serotonergic functioning.

Although it is impossible at this time to determine the specific physiological effect that MDMA had on this individual, this case is a reminder of the potential dangers associated with Ecstasy, and other 'social drugs' sold on the illicit market.

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