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"Ecstasy" and Sudden Cardiac Death

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A case of an apparently natural death in association with the use of an MDMA (3,4-methylenedioxymethamphetamine) is reported. The pathophysiology of the death and the pharmacology of the drug are presented. An overview of the certification of such cases is briefly presented.

Key Words: MDMA—Sudden death—Cardiac death—Wolff-Parkinson-White syndrome.

Sudden "natural" death is not always what it seems to be. Frequently, investigation reveals the existence of contributory factors. When these factors include the use of drugs, the death is no longer categorized as purely natural. If the drug is relatively unknown to medico-legal practitioners and has a reputation among many clinicians for being harmless, the investigation becomes more difficult and the consideration of all elements related to the death is critical.

We present herein a case of an apparently natural death in a patient with a cardiac disorder, that occurred in association with ingestion of MDMA—a relatively unusual drug of abuse with a reputation as a safe, effective psychotherapeutic adjunct.

CASE REPORT

A 34-year-old white man with a history of Wolff-Parkinson-White (WPW) syndrome, for which he took no medications, complained to his girl friend one evening of palpitations but refused to seek medical attention. At approximately 5:30 the following morning, his girl friend awoke to find him "gasping and convulsing." She summoned an ambulance. Upon arrival of the medical team, the patient was found to be in ventricular fibrillation. Despite exhaustive resuscitative efforts, the patient died in the emergency room of a hospital.

The patient was a user of MDMA (3,4-methylenedioxymethamphetamine) and was known to have taken it early on the day prior to his death.

At autopsy, the major finding was in the 394 gm heart, where a 1.5 × 1.2 cm area of flecklike fibrosis was found on the upper-third of the lateral wall of the left ventricle. The coronary arteries were thin-walled, widely patent, and had a right predominant distribution. Microscopically, the area of fibrosis was found to consist of acellular connective tissue distributed in a patchy manner among residual intact myocardial fibers.

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— died
— CPR done
— no medication
— after blood drawn

TOXICOLOGIC STUDIES

Specimens of blood and urine were analyzed for acidic, basic, and neutral drugs. No drugs other than MDMA were identified. The blood and urine MDMA levels were 0.2 mg% and 5mg%, respectively. No MDA (3,4-methylenedioxyamphetamine) was identified in either case.

Quantitation of MDMA in the urine was achieved by recording ultraviolet spectra on a Hewlett-Packard model 8450A diode array spectrophotometer; for quantitation in the blood, a Hewlett-Packard 5890 gas chromatograph was used.

DISCUSSION

MDMA (3,4-methylenedioxymethamphetamine), known on the street as "Ecstasy," "XTC," or "Adam," is one of the hallucinogenic amphetamines. These are semi-synthetic compounds related to both amphetamine and mescaline. The most popular of these are MDMA, MDA (3,4-methylenedioxyamphetamine), and MDM (N-methyl-MDA).

MDMA has been described as a consciousness-altering drug with effects comparable to those from a mild dose of mescaline. It gives the user a feeling of calm, peace, and heightened sensitivity while producing fewer of the visual, auditory, and tactile hallucination generally associated with more potent and longer-lasting psychedelics such as LSD.

MDMA was developed in Germany in 1914 by E. Merck and Company as an appetite suppressant but was never marketed. Although legal, it was virtually unknown to the street drug scene until the 1970s, when an upsurge of use of hallucinogenic amphetamines took place. Following its appearance on the street, enthusiastic reports about MDMA led to its study as a tool for the treatment of alcoholism and depression. It was touted as an excellent adjunct to psychotherapy. Therapists who endorsed this tool alleged that in controlled dosages it could neutralize emotional defenses and help patients to resolve painful psychic crises.

In 1985, however, the Drug Enforcement Administration placed MDMA in Schedule I of the Controlled Substance Act. The widespread use of the drug in both the street drug culture and in legitimate therapeutics surprised both its critics and advocates. In addition, because of several reported overdose cases in which MDMA was implicated (1), the DEA was compelled to take regulatory action.

MDMA is chemically related to both mescaline and the amphetamines. It is structurally but not pharmacologically related to MDA. Pharmacologic studies (1)

suggest that the degree of toxicity of MDMA falls somewhere between that of MDA and mescaline. Within 25-30 min after administration, MDMA triggers effects that may last up to an hour. These effects are described as sensations of both stimulation and relaxation. The sympathomimetic properties of the drug dominate its physical effects, persisting for several hours.

It is these properties that are most important in the pathophysiology of the present case. Amphetamines, like other sympathomimetics, have a well-documented propensity for producing multiple cardiac effects including palpitations, tachycardia, and elevation of blood pressure. Increased heart rate is the result of action by the drug on the sinoatrial (SA) node, enhanced conduction through the atrioventricular (AV) node, and increased ectopic activity (1).

Wolff-Parkinson-White syndrome is the most common of a variety of conditions, classified as a group as pre-excitation syndromes, whereby an accessory pathway "bypasses" some portion of the normal conduction system with two important consequences: (a) The presence of the accessory pathway may allow the normal delaying action of the AV node to be bypassed, and (b) it may provide a route for re-entry. As a result of these events, patients with WPW are subject to palpitations characterized by paroxysmal atrial tachycardia or atrial fibrillation associated with a rapid ventricular response, at times resulting in ventricular fibrillation. Such ventricular fibrillation accounts for reports of sudden death in persons with the pre-excitation syndromes (3).

It is evident that patients with WPW are at increased risk for dying suddenly. It is also painfully clear that the use of MDMA by these patients can only serve to further compound the risk for sudden cardiac death.

Thus, what presented originally as a sudden, "natural" death, turned out instead to be a "drug-related" death in which there was a clear temporal relationship between ingestion of the drug (i.e., MDMA) and the development of signs and symptoms of a cardiac nature. The cardiac effects of the MDMA must be considered a factor in the cause of death, thereby removing it from the realm of "natural" deaths.

The approach to the investigation and certification of such deaths has been clearly set forth by Mittleman and Wetli (4). It must include a consideration of all circumstances surrounding the death, the environment, past medical and social history, the autopsy findings, and the toxicologic results. In our drug-oriented society, therefore, the investigation of sudden, apparently natural deaths, especially in people under the age of 40

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years (4), should include a thorough toxicologic study in addition to the other essential elements of medico-legal investigation.

The present case involves a substance that, like other drugs of abuse, has been misrepresented as being harmless. Indeed, it is not. Furthermore, besides its ability to cause morbidity by direct overdosage, it can lead to sudden death in users with a pre-existing natural disease that is incompatible with the pharmacologic properties of the drug. □

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