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Severe Ketoacidosis Complicated by 'Ecstasy' Ingestion and Prolonged Exercise

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Ecstasy (3,4-methylenedioxymethamphetamine or MDMA) is used with increasing frequency as a recreational drug. Accumulated evidence over recent years indicates a growing demand for the drug with a corresponding increase in number of reports of adverse effects from its use. There are reported metabolic disturbances due to MDMA use. These, in addition to the prolonged exercise involved in dancing at 'raves' where MDMA may be used, may exacerbate ketoacidosis. We report two cases of ketoacidosis complicated by MDMA ingestion.

KEY WORDS **Diabetes mellitus Ecstasy Education Exercise Ketoacidosis**

Introduction

Ecstasy (3,4-methylenedioxymethamphetamine or MDMA) is a synthetic amphetamine derivative originally patented in 1914 as an appetite suppressant. Half a century later its potential in psychotherapy was explored without much success. It was only in the 1980s that MDMA became a drug of misuse and achieved its class A status. MDMA is reported as having a mild amphetamine-like stimulant effect, associated with a happy relaxed state and mild euphoria, but with low hallucinogenic potential.[1]

Recently recreational use has become widespread and in the UK is particularly associated with the dance culture and all night 'raves'.[2] This increased use has led to a wider understanding and experience of the potential risks of MDMA use and has been reflected by increasing reports of adverse reactions and fatalities in both medical and non-medical press.[3,4]

However, MDMA is still viewed by young adults as a safe recreational drug. We report two patients with insulin-dependent (Type 1) diabetes mellitus (IDDM) who developed life-threatening metabolic decompensation following prolonged exercise and the use of MDMA.

Case 1

A 19-year-old female with a 13-year history of IDDM presented in ketoacidosis. She was drowsy but gave a history of vomiting for 12 hours and omitting insulin for 24 hours prior to admission. She had attended a 'rave' the night before admission, dancing for several hours. She initially denied drug and alcohol use. Her friends were unhelpful with information relating to substance abuse. On examination she was profoundly dehydrated, with an initial central venous pressure of −10 cm. She was markedly ketotic with glycosuria and ketonuria. Her initial biochemistry is recorded in Table 1.

Treatment included intravenous saline, bicarbonate, insulin, and potassium. She became hypotensive with worsening hypoxia and required inotropic support, intubation, and ventilation. A subsequent chest radiograph confirmed a clinical impression of bronchopneumonia and she was treated with broad spectrum antibiotics. She required admission to the intensive therapy unit for 10 days, after which time she was extubated and admitted to MDMA use. She remains well at follow-up.

Case 2

A 15-year-old girl with a 7-year history of IDDM presented in ketoacidosis following a 'rave'. She gave a prior history of nausea and diarrhoea, but had felt well enough to go 'clubbing'. She had also omitted insulin for 12 hours prior to admission. She described dancing continuously for several hours after which time she had collapsed and been brought to hospital. On examination she was also profoundly dehydrated, with marked ketonuria and glycosuria. Her initial biochemistry is

Table 1. Biochemical values at presentation

	Case 1	Case 2
pH	6.79	6.92
pCO_2 (kPa)	1.9	1.2
pO_2 (kPa)	17.8	20.9
Bicarbonate (mmol L^{-1})	6	1.8
Sodium (mmol L^{-1})	124	132
Potassium (mmol L^{-1})	5.3	5.6
Urea (mmol L^{-1})	10.7	6.5
Glucose (mmol L^{-1})	48.6	33.5

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shown in Table 1. She responded promptly to intravenous saline, potassium, and insulin and one day following admission admitted to MDMA use. She too remains well at follow-up.

Discussion

MDMA has been reported to be associated with acute metabolic and physiological disturbances such as hyponatremia, acute renal failure, convulsions, disseminated intravascular coagulation, and hyperthermia, as well as with possible longer term effects of hepatotoxicity and psychiatric disturbances.[4,5] The complications may multiply if treatment is not received promptly. Most MDMA-related deaths are thought to be due to hyperthermia, possibly mediated via serotonergic mechanisms. Animal studies have shown excessive heat production due to such mechanisms.[1] Prolonged exercise such as dancing may compound this pharmacological effect and, with high ambient temperatures and inadequate fluid replacement, cause further dehydration and hyperthermia. In these two cases apparent dehydration and hypotension, in addition to acidosis and hyperglycemia, suggested a diagnosis of diabetic ketoacidosis. However, in response to high ambient temperatures seen at raves, water drinking becomes prominent and this may be reflected by the incongruity of the hyponatremia and relatively low serum urea seen in their presentation biochemical profiles. Severe reactions such as these were virtually undocumented in American literature, reflecting a different pattern of usage not associated with the dance culture and prolonged periods of exercise.[2]

The current misconception that MDMA is a safe recreational drug is erroneous. A recent inquiry into the deaths of three men in Ayrshire concluded that these were MDMA-related.[3] Both our patients had poorly controlled diabetes prior to admission and had defaulted from clinic. People carrying a diagnosis of brittle diabetes are thought to have a higher risk of death, and up to 50% show evidence of psychosocial disruption[6] which may include drug use. Over the past 5 years young people's exposure to illicit drugs has increased dramatically.[7]

MDMA use may seriously complicate severe ketoacidosis in those individuals with a predisposition for metabolic disturbance. In addition prolonged periods of exercise may compound this problem. These young patients were unaware of the harmful effects of MDMA use. We believe that patients, particularly in this young and vulnerable age group, and medical personnel caring for them, should be educated to the potential risks of MDMA ingestion.

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