Unusual association of diseases/symptoms

Cannabis masks diabetic ketoacidosis

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This is the first series to identify that diabetic ketosis presenting in cannabis users has a different and conflicting acid base profile compared to non-cannabis users and can confuse the need for intensive or critical care in these at-risk patients. This association of drugtaking history and clinical presentation has implications for how the authors treat the drug using sector of the population with diabetes.

BACKGROUND

Although non-compliance among illicit drug users is identified as a risk factor for diabetic ketoacidosis (DKA), this case series identifies an abnormal presentation of cannabis users with ketosis: a higher pH than would be expected for the degree of symptoms and the extent of ketonuria. All patients responded to treatment with intravenous insulin and fluids for resolution of the ketonuria. Cannabis use can mask diabetic ketosis by causing an increase in the pH recorded at the time of presentation relative to non-cannabis users with DKA.

CASE PRESENTATION

A review of recurrent presentations with unexplained DKA at an outer metropolitan hospital in Australia revealed five

cannabis-using patients whose ketonuria was not associated with acidosis.

A teenage male with type 1 *diabetes* mellitus presented with vomiting and nausea and was noted to have ketonuria >160 mg/dl. His arterial pH was 7.335, serum bicarbonate 29.1 mmol/l and blood glucose 14.7 mmol/l. His HbA1c was 13.7%. His ketonuria responded within 24 h to intravenous insulin. Cannabis was identified in a urinary drug screen. Similarly, three other individuals in their thirties presented between one and four with unexplained ketonuria and a pH in the normal range. Two of these with a single presentation each presented with vomiting and had ketonuria in the absence of acidosis.

An additional patient with more complex history of polydrug use and a clear psychiatric diagnosis presented repeatedly with excessive showering, interscapular pain

Figure 1 Cannabis users versus non users.

and vomiting. The history of drug use included smoking (15 cigarettes/day), prior intravenous heroin, cocaine, amphetamine/meta-amphetamine, 3,4-methylenedioxymethamphetamine, intermittent heavy alcohol intake and cannabis use within 24 h of all but one presentation. At the time of each presentation to the emergency department, elevated urinary ketones were identified and responded rapidly to intravenous short-acting insulin.

There was no association ($p=0.4480$) between glucose concentration and pH or bicarbonate.

INVESTIGATIONS

Figure 1 demonstrates the bicarbonate and pH results for these five patients (17 events), compared to all other patients with DKA in our institution during this time. There was a highly significant difference (Mann–Whitney U test) between the pH (<0.0077) and bicarbonate concentration ($p<0.043$) for cannabis users and non-users.

OUTCOME AND FOLLOW-UP

In all cases, the ketonuria responded within 24 h to intravenous insulin and appropriate other supportive care usual for ketoacidosis.

DISCUSSION

There are multitude risk factors for DKA in type 1 diabetic patients including: myocardial infarction, cerebrovascular accident, pancreatitis, glucocorticoids, thiazide diuretics, sympathomimetics and second-generation antipsychotics and cocaine use.^{1 2} Psychological problems associated with eating disorders and purposeful insulin omission, particularly in young patients with type 1 diabetes, as well as poor compliance with the insulin regimen are common precipitants. Compliance issues, with substance abuse as a contributory factor, are a common cause of decompensated diabetes in urban African-Americans³ and in the UK.⁴

We have identified cannabis as another possible contributor to ketonaemia. The known dominant effect of cannabis with respect to acid base balance, is on the respiratory system with a change in respiratory rate and oxygen tension

and not pH,⁵ but in these diabetic cannabis users, the near normal or high pH would suggest an acute or chronic alkalaemia. The clinical presentation with vomiting adds the possibility of a compound acid base disturbance (with a metabolic alkalosis component) as has been described previously⁶ but vomiting was rarely present in these patients and was equally present in the acidotic patients. Ketosis required intravenous insulin as well as fluid replacement. Patients with unexplained or unusual acid base balance in diabetic ketosis or ketoacidosis should be assessed for illicit drug use, notably cannabis.

Learning points

- ▶ There are multitude risk factors for DKA in type 1 diabetic patients including: myocardial infarction, cerebrovascular accident, pancreatitis, glucocorticoids, thiazide diuretics, sympathomimetics and second-generation antipsychotics and cocaine use.
- ▶ Patients with unexplained or unusual acid base balance in diabetic ketosis or ketoacidosis should be assessed for illicit drug use, notably cannabis.

Competing interests None.

Patient consent Not obtained.

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Please cite this article as follows (you will need to access the article online to obtain the date of publication).

Hennessy A. Cannabis masks diabetic ketoacidosis. *BMJ Case Reports* 2011;**10**:1136/bcr.02.2010.2716, date of publication

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