Case Report

Reversible supraventricular tachycardia complicating diabetic ketoacidosis in an adult patient: A case report

Uchenna Okechukwu Ugwuneji¹, Ifeanyi Ucha Julius², Yakubu Lawal³, Rifkatu Reng Sonnie², Ochai Attai Ateko¹, Felicia Ehusani Anumah³

From ¹Senior Registrar, ²Consultant Endocrinologist, ³Professor of Endocrinology, Department of Internal Medicine, College of Health Sciences, University of Abuja, Nigeria

ABSTRACT

Diabetic ketoacidosis (DKA) is a commonly encountered serious acute metabolic complication of diabetes mellitus (DM) in adolescents and young adults. It is traditionally associated with poorly treated or newly diagnosed type 1 DM, however, in the setting of type 2 DM, inadequate insulin treatment, non-compliance to treatment, newly diagnosed DM, acute illnesses, drugs, and extreme stress can precipitate DKA. We report the case of a 42-year-old known diabetic of 7 years duration with a family history of DM who presented with a two-week history of difficulty in breathing, polyuria, and vomiting. On further examination, pulse rate was 220 beats per minute, respiratory rate 40 cycles per minute, temperature 38.4°C. Random blood sugar was 18.1mmol/l with ketonuria ++. Severe acidosis and mild hypokalemia were noted with her electrocardiogram (ECG) showing supraventricular tachycardia. She was managed and discharged in stable condition with a normal ECG after 20 days on admission to continue basal and pre-meal insulin at home. Adequate diabetic education was conducted and follow-up with endocrinology and cardiology units was advised.

Key words: Electrocardiogram, Diabetic ketoacidosis, Supraventricular tachycardia, Beta-blockers

Diabetic ketoacidosis (DKA) is an acute life-threatening emergency of diabetes mellitus (DM) typically characterized by acidosis, ketosis, and usually hyperglycemia. It can be precipitated by acute illnesses (sepsis, acute myocardial infarction, and stroke), medications (sodium-glucose co-transporter 2 inhibitors), and non-adherence to therapy, or insulin [1-4]. The complications of DKA results from mainly severe dehydration, metabolic acidosis, and electrolyte derangement. Although electrolyte abnormalities are common in DKA, cardiac arrhythmias, however, are rare and are usually due to metabolic acidosis and dyselectrolytaemias such as hypokalemia and hypophosphatemia [5]. The effects of acidosis on the heart are variable and pH-dependent. Severe acidosis causes a depressing effect on the heart and may be associated with decreased contractility and a predisposition to cardiac arrhythmias. On the other hand, mild-to-moderate acidosis can lead to increased cardiac contractility and peripheral vascular resistance also predisposing to disturbances in cardiac rhythm. Disturbances in repolarization including early or delayed repolarization, atrioventricular nodal delay, and re-entry are commonly encountered cardiac electrical disturbances triggered by acidosis [6-10]. We report the case of a 42-year-old teacher; known diabetic for 7 years managed by the Endocrinology unit but was lost to follow-up for 4 years. The relevance of this case report is to raise awareness of physicians to the occurrence of arrhythmias as a complication of acidosis or electrolyte imbalances which are characteristic of DKA. Thus, highlighting the importance of performing an electrocardiogram in all patients who present with a hyperglycemic emergency. Detection of abnormal rhythms such as supraventricular tachycardia (SVT) and treating them appropriately might improve outcomes in DKA.

CASE REPORT

A 42-year-old female was brought into the medical emergency room with complaints of worsening difficulty in breathing on exertion and fever of two weeks duration. She also presented with vomiting for 2 days, about 10 episodes daily, and approximately 50 mls per episode composed of ingested food materials, non-bloody, and non-bilious. There was also associated increased urinary frequency with a day/night ratio of 4/5 as opposed to a previous 3/1 2 months previously. The estimated daily urine output was 3500 ml per day and there was an associate frothiness
of urine of a month duration. There were also features of peripheral neuropathy namely recurrent numbness and tingling sensation in the feet for about two years prior to presentation. The patient was a known diabetic for 7 years. There was also associated family history of diabetes in her mother and brother as well as hypertension in her mother.

At presentation, she was conscious but lethargic with a Glasgow Coma Score of 13/15 (EO-4, BVR-5, and BMR-4). She was febrile with a temperature of 38.4°C, tachypneic (40 cycles per minute) with associated acidic breathing, pulse rate was 220 beats per minute, and blood pressure was 124/78 mmHg.

Random blood sugar at presentation was 18.1 mmol/L with HbA1c 9.3%. The urine dipstick revealed ketones ++, glucose ++, and blood ++ while effective osmolality was 306 mosm/kg with an anion gap of 20.2 mmol/L. Electrolytes, urea, and creatinine (E/U/Cr) on admission and following recovery are shown in Table 1. Blood culture, urine, sputum, stool microscopy, and culture, showed no bacterial growth; cardiac troponin was I: 0.16 (normal); and fasting lipid profile was within normal limits. Electrocardiogram (ECG) showed SVT (Fig. 1). A clinical assessment of diabetic ketoacidosis (DKA) precipitated by sepsis

SVT occurring in the background of DKA is uncommon. The occurrence of SVT in DKA is rare as there are a few case reports published by Faruqi et al. in 2015 [11], Finn et al. [12] and Ayon-Aguilar et al. in 2018 [13], and Thomas et al. in 2007 [14].

DISCUSSION

In DKA, the types of cardiac arrhythmias seen are variable and include re-entry, atrial fibrillation, ventricular and supraventricular tachycardia, premature atrial, and ventricular complexes. The occurrence of SVT in DKA is rare as there are a few case reports published by Faruqi et al. in 2015 [11], Finn et al. [12] and Ayon-Aguilar et al. in 2018 [13], and Thomas et al. in 2007 [14].

SVT occurring in the background of DKA is uncommon. All the cases identified so far, except for the case report by Finn et al. [12], occurred in females. Concerning the age of occurrence, most reported cases were between ages 12 and 14 years and only one incidence at age 29 years was described by Ayon-Aguilar et al. [13]. This contrasts our index case who was a 42-years-old, representing the oldest person described in the literature searched. The index case had a family history of DM, in addition to the treatment history, consistent with type 2 DM which is similar to the case reported by Ayon-Aguilar et al. [13] However, the majority of other cases reported in the literature had type 1 DM.

The index case had both severe acidosis and mild hypokalaemia. This can predispose to SVT via early or delayed repolarization, atroventricular nodal delay, or re-entry [6,7]. This is in keeping with some of the rare reports of DKA causing cardiac dysrhythmias [11-14]. Four out of these five cases from previous reports presented initially with bicarbonate of <10 meq/l, while three out of the five had hypokalaemia and pH of <7.2 with only Finn et al. [12] reporting hyperkalaemia (5.2 mmol/l) [11-14].

Concerning treatment, cardioversion was most commonly achieved with intravenous adenosine, however, Faruqi et al. [11] reported a case that responded to vagal maneuvers, while Ayon-Aguilar et al. [13] documented a case that received flecainide to restore sinus rhythm. This is in contrast to the index case where bisoprolol and digoxin were used. In all cases, management of the hyperglycemic emergency with electrolyte correction and synchronized cardioversion caused resolution of SVT.

These reports of SVT and other arrhythmias in DKA leave some unanswered questions. Despite the widespread electrolyte abnormalities that are known causes of arrhythmias, why do only a few individuals encounter this? Are there particular predisposing factors to the development of these electrical disturbances such as early cardiac autonomic neuropathy? The answer to these questions lies in more research into this area.

**Table 1: Electrolytes, urea, and creatinine of the patient on admission and following recovery**

<table>
<thead>
<tr>
<th>Normal ranges</th>
<th>Na (136-148) mmol/L</th>
<th>K (3.5-5.0) mmol/L</th>
<th>Cl (98-110) mmol/L</th>
<th>HCO₃ (20-30) mmol/L</th>
<th>Urea (2.1-7.1) mmol/L</th>
<th>Creatinine (49-90) umol/L</th>
<th>eGFR (ml/min/1.73m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>On admission</td>
<td>149</td>
<td>3.4</td>
<td>114</td>
<td>&lt;10</td>
<td>9.0</td>
<td>66</td>
<td>114.32</td>
</tr>
<tr>
<td>4 days post-admission</td>
<td>142</td>
<td>4.2</td>
<td>103</td>
<td>23</td>
<td>6.5</td>
<td>44</td>
<td>138.26</td>
</tr>
</tbody>
</table>
CONCLUSION

Clinicians should be on high alert to recognize any form of arrhythmia including SVT in persons presenting with DKA. Electrocardiography should be routinely performed so as to recognize any form of arrhythmia early and appropriately intervene. Diligent resuscitation of persons with DKA can assist in early recovery from SVT.

REFERENCES


Funding: None; Conflicts of Interest: None Stated.

How to cite this article: Ugwuneji UO, Julius IU, Lawal Y, Sonnie RR, Ateko OA, Anumah FE. Reversible supraventricular tachycardia complicating diabetic ketoacidosis in an adult patient: A case report. Indian J Case Reports. 2021; September 24 [Epub ahead of print].