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CASE REPORT

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A case report of diabetic ketoacidosis due to endocarditis of the mitral valve

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Key Clinical Message

In the context of diabetic ketoacidosis, clinicians should consider uncommon origins of infection, notably infective endocarditis. This is especially crucial when confronted with cases that recur persistently or exhibit resistance to treatment. This is a case of a diabetic patient with diabetic ketoacidosis admitted to our facility. A 35-year-old diabetic patient presented with DKA precipitated by mitral valve endocarditis. To our knowledge and according to the literature review, only one case of DKA precipitated by endocarditis has been reported in the past. This report highlights the importance of considering endocarditis as a possible etiology in patients presenting.

KEYWORDS

cutaneous presentation, diabetic ketoacidosis, infection, infective endocarditis, rare diagnosis

1 | INTRODUCTION

Diabetic ketoacidosis (DKA) is a potentially fatal complication of diabetes. In recent years, the incidence of DKA has risen, whereas the mortality rate of patients with DKA has declined due to improved diagnosis and treatment.[1] The rising global incidence of diabetes may be a contributing factor to this trend.[2] In light of this, it is critical to improve current knowledge in order to diagnose patients with DKA during its early stages.

A lowered diagnostic threshold for DKA in the hospital may be correlated with a higher mortality rate among diabetic patients.[3] Therefore, emerging methods for diagnosing these patients are crucial. DKA is a life-threatening acute complication of diabetes. Consequently, prompt identification and proactive management are essential for minimizing additional complications and mortality. Due to the rising incidence of diabetes and DKA, it is also important to be aware of rare etiological factors that can trigger DKA in order to improve clinical practice.

2 | CASE PRESENTATION

A 35-year-old woman arrived at the emergency department with complaints of generalized pain. She has a history of diabetes mellitus and poor glycemic control. No other symptoms were recorded. After conducting initial paraclinical tests, it was determined that the patient was experiencing acute DKA. As part of the DKA treatment,

the medical team also looked into the underlying cause of DKA. Unfortunately, the patient did not show any improvement despite receiving treatment for DKA, and the medical team was unable to determine the cause of the inflammation or infection.

3 | DIFFERENTIAL DIAGNOSIS, INVESTIGATIONS, AND TREATMENT

The patient was prescribed insulin to manage her diabetes for the past 2 years. The glycemic control in the past years was suboptimal and her compliance was lacking. There have been no previous episodes of DKA. Given her known history of diabetes, poor glycemic control, and widespread discomfort DKA was suspected when the patient was admitted. The patient was experiencing generalized pain and discomfort. Initial documentation in the emergency department revealed that her vital signs were normal. There were no notable findings during the cardiovascular examination. The examination of the respiratory system and abdomen did not reveal any notable findings.

To confirm the diagnosis of DKA, a venous blood gas (VBG) analysis was conducted. The VBG results indicated a pH level of 7.13, HCO3 level of 5 mEq/L, pCO_2 level of 15.7 mmHg (Table 1), and blood glucose level of 552 mg/dL. Based on the results, the patient was diagnosed with DKA and prescribed a fixed-dose insulin regimen following the treatment protocol guidelines. Despite achieving optimal glucose control, the acidosis remained unresponsive to treatments. Therefore, the necessary investigations were initiated to determine the possibility of an infection.

COVID-19 was considered as a possible source of infection. Both the nasopharyngeal test and the chest CT scan did not provide evidence for the diagnosis. Tests were conducted to rule out the possibility of a urinary tract infection as the underlying cause of her DKA. The urine analysis showed a moderate presence of glucose and ketones, but no other abnormalities were observed. No growth was observed in the urine culture. The possibility of a urinary tract infection was ruled out. A blood culture was conducted due to the possibility of sepsis. The blood culture yielded a positive result for staphylococcus aureus. Unfortunately, the cause of septicemia could not be identified. The infection was successfully treated using vancomycin and meropenem. Following the administration of antibiotics, blood cultures yielded negative results two times. Nevertheless, acidosis did not respond to the standard treatment for DKA as per the hospital protocols.

After a week, dermatological signs appeared (Figure 1). These cutaneous manifestations suggested the possibility of embolism. Hence, for cardiac investigations, the endocrinologist consulted the cardiology service. A transthoracic echocardiogram revealed the presence of a large, highly mobile mass attached to the posterior mitral valve leaflet in the left ventricle. This mass protruded into the left ventricular outflow tract and aortic root during systole, measuring approximately 30 × 15 mm. Another mass with increased echogenicity was discovered near the base inferoseptum, measuring 12 mm in size and located approximately 9 mm away from the aortic valve. This finding strongly indicated the presence of vegetation. No pericardial effusion, hematoma, or signs of pericardial tamponade were found in the transthoracic echocardiography. The ejection fraction of the left ventricle was measured to be between 50%–55%. The cardiothoracic surgery team recommended emergency cardiac surgery. Following the cardiac surgery, the presence of mitral valve rupture was

TABLE 1 Venous blood gas results.

Tests	Results (reference)
pH	7.13 mmHg (7.31–7.41)
pCO_2	15.7 mmHg (40–52)
pO_2	43.4 mmHg (30–50)
HCO_3	5.0 mEq/L (22–27)
BE	−24.1 mmol/L (−3 to +3)
O_2 saturation	73.2%

FIGURE 1 Arrows highlight cutaneous lesions.

confirmed, as shown in Figure 2. The specimen was sent to a pathologist for further examination. She mentioned the presence of mitral valve vegetation along with a fibrin exudate containing polymorphonuclear leukocytes and bacterial cocci, which suggests the possibility of bacterial endocarditis. It seems that the widespread inflammation resulted from infective endocarditis, leading to the development of DKA. Following the treatment for infective endocarditis, the patient positively responded to DKA treatment, effectively managing acidosis after undergoing cardiac surgery.

4 | OUTCOME AND FOLLOW-UP

The patient was discharged without any complaints and with glycemic control. The physician prescribed warfarin for prosthetic valves. Her glycemic control was suboptimal again due to her lack of compliance. So she came back with cerebral hemorrhage in the context of DKA which led to craniotomy surgery.

5 | DISCUSSION

We report a patient with DKA who was resistant to standard treatment. Infection is the most common cause of DKA.[4] The incidence of DKA in patients with type 1 diabetes is approximately 35.6/100000 per year. In type 2 diabetes, the incidence of DKA is lower. Although DKA is uncommon, it is still diagnosed on a daily basis in clinical practice and may be the initial manifestation of diabetes.[5] Identifying the precipitating factor is necessary for an effective treatment of DKA. One of the most prevalent causes is infection. In order to enhance clinical results, it is necessary to determine the etiology of the infection if it is to be treated as the underlying cause of DKA.

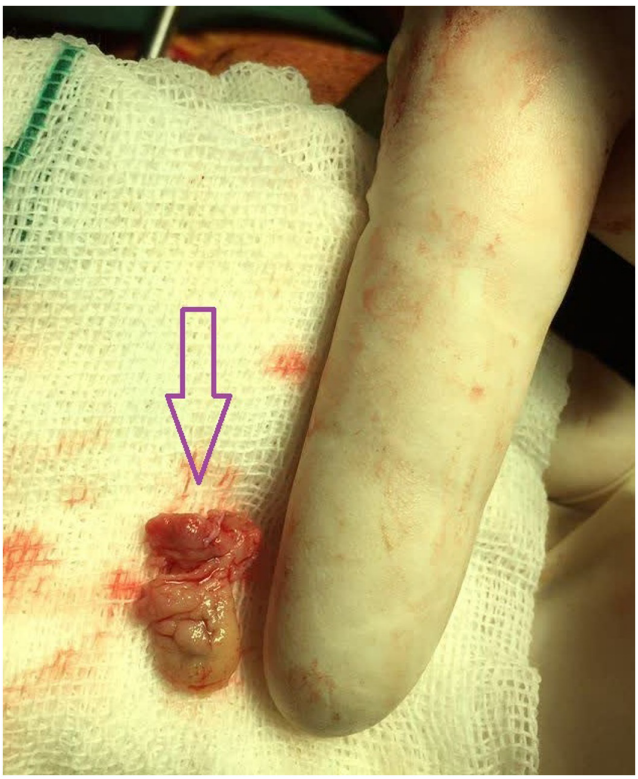

FIGURE 2 Arrow highlights ruptured valve.

Infective endocarditis is a challenge in clinical practice. Early detection of this disease is crucial for preventing mortality. Without treatment, infective endocarditis is associated with a high mortality rate and vascular complications including stroke. However, because of its rarity, clinical suspicion and diagnosis may be delayed, resulting in severe complications. Certain risk factors for infectious endocarditis, including prosthetic valves are better understood.[6] However, diabetes may be overlooked as a risk factor for infective endocarditis. Recent reports indicate that the prevalence of diabetes among patients with infectious endocarditis is not only greater than 30 percent but is also on the rise.[7] Considering the increasing incidence of diabetes, this may be a cause for concern. It has affected approximately 500 million people, and its prevalence is expected to rise by 50% by 2050.[2] As the prevalence of diabetes increases, so will the prevalence of its complications. Infective endocarditis will not deviate from these trends. This might result in a connection in both directions between diabetes and infectious endocarditis. On the one hand, diabetes is a risk factor for infective endocarditis, and its prevalence is rising.[7] On the other hand, infective endocarditis is an infection that can cause diabetes complications such as DKA.[8] Therefore, it is essential to evaluate infective endocarditis as a source of infection-causing DKA during initial investigations.

6 | CONCLUSION

DKA is a serious diabetic complication requiring immediate treatment. DKA may also indicate the presence of a severe underlying disease. To determine if an infection is the cause of DKA, an early cardiac investigation should be performed. Although cardiac infection in DKA patients is uncommon, it is associated with a poor prognosis and high mortality. So it can be considered during evaluations. Recurrent DKA or DKA that is resistant to treatment are warning indicator that should draw attention to uncommon sources of infection, such as cardiac sources, which include infective endocarditis. This case also highlights the importance of considering the complications of uncommon sources of infective endocarditis, such as cerebrovascular embolism. Patients with recurrent DKA or DKA that is resistant to treatment may require a chest CT

scan and echocardiography to prevent mortality and persistent complications such as stroke.

AUTHOR CONTRIBUTIONS

Fatemeh Omidi: Data curation; formal analysis; investigation; methodology; writing – original draft; writing – review and editing. **Soheila Sadeghi:** Data curation; formal analysis; investigation; methodology; writing – original draft. **Naser Kachoueian:** Data curation; investigation; methodology; writing – original draft. **Moein Ebrahimi:** Data curation; formal analysis; investigation; methodology; writing – original draft.

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CONFLICT OF INTEREST STATEMENT

All authors declare that they have no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy. The ethics committee approved this consent and publication of this paper (Ethical code: IR.SBMU.RETECH.REC.1402.537).

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