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Case report

Clinical dilemma of DKA and Covid-19 infection: A case report

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ABSTRACT

A 52-year-old man with no significant past medical history was found to have diabetic ketoacidosis (DKA) in the setting of COVID-19 infection. He presented with hyperglycemia and an anion gap metabolic acidosis, but without a clear infectious precipitant. Inflammatory markers were subsequently checked, and found to be significantly elevated, raising the suspicion for COVID-19 as a possible etiology despite the lack of typical symptoms - a rapid COVID-19 PCR test checked afterwards was found to be positive. The patient's hospital course was uncomplicated, but the case highlights the possibility of COVID-19 serving as an infectious precipitant for DKA, even when a patient is otherwise asymptomatic in terms of having COVID-19.

Introduction

COVID-19 is a novel virus causing mild to moderate respiratory illness in the majority of individuals. However, those with underlying medical conditions, ranging from cardiovascular disease to diabetes, are at an increased risk of developing serious illness and complications. The virus was first discovered in the city of Wuhan, China. Since then, the infection has reached 213 countries, with 216,411 confirmed cases and 146,198 confirmed deaths as of April 17th, 2020 [1]. While it is known that adequate glucose control is paramount in acutely ill patients, there does not appear to be data correlating COVID-19 and the onset of DKA in adults with or without a prior diagnosis of diabetes [2]. We report a case of a 52 year-old male with COVID-19, who developed DKA with no prior diagnosis of diabetes mellitus.

Case report

A 52-year-old male with no significant past medical history presented with generalized abdominal pain that began five days prior to presentation. The patient described the abdominal pain as a constant ache, associated with polydipsia, polyuria, nausea, anorexia, and fatigue. The remainder of review of systems was negative. In the emergency department, the patient was hypertensive and tachycardic without hypoxia or fever. His risk factors for COVID-19 included a son, who visited him, and his continued work in a public setting.

Admission laboratory values were consistent with diabetic ketoacidosis with glucose of 360, anion gap of 20, serum lactate of 2.7, beta-hydroxybutyrate 2.67, and +3 ketones on urinalysis. A lymphocyte count of 0.91 was noted, which prompted the addition inflammatory markers, which were as follows (Fig. 1): CRP of 75.61 mg/L (<7.48 mg/L), LDH of 270 IU/L (98–129 IU/L) and ferritin of 1028 ng/mL (24–250 ng/mL). The patient subsequently tested positive for COVID-19. His chest x-ray showed: "decreased lung volumes, peri-bronchial interstitial thickening, central hilar regions of both lower lobes with indeterminate interstitial and airspace opacities within both lung bases; majority probably due to poor inspiratory effort and partial atelectasis (Image 1). The patient was initially treated for diabetic ketoacidosis with intravenous insulin and fluids, which later was clinically managed more judiciously when COVID-19 PCR resulted positive. He was transitioned to basal/bolus regimen with close diabetic education and endocrinology consultation. In terms of his COVID-19 infection, he was managed supportively and not started on hydroxychloroquine due to the lack of respiratory symptoms. He was evaluated by the infectious disease service and agreed that despite lack of usual symptoms for COVID-19, this infection likely precipitated DKA. The patient was discharged on hospital day three in stable condition on a new medication regimen for diabetes and close follow up with endocrinology.

Discussion

While there have been recommendations regarding inpatient glycemic control in critically ill adults with COVID-19, there is little information regarding COVID-19 as an infectious precipitant for DKA, which occurs in both type 1 and 2 diabetes [2–4]. The

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Lab	Reference range	Value (admission)
LDH	270 IU/L	98-192 IU/L
Ferritin	1,028 ng/mL	24-250 ng/mL
CRP	75.61 mg/L	<7.48 mg/L
D-Dimer	0.39 ug/mL	0.00-0.50 ug/mL

Fig. 1. Inflammatory markers.

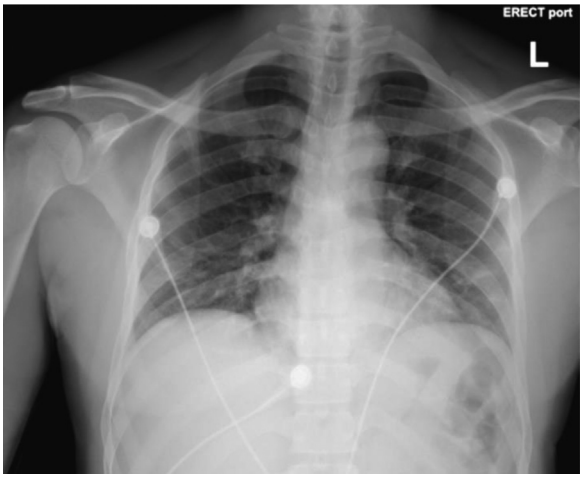

Image 1. Admission chest radiograph without acute changes.

patient's initial complaints of generalized abdominal pain, polydipsia, polyuria, anorexia and fatigue were consistent with his presentation of DKA. However, a clear trigger was not easily recognized on presentation. The patient's lack of focal infectious findings other than lymphopenia led to additional inflammatory marker testing, and subsequent diagnosis of COVID-19.

Part of the clinical dilemma though revolving around the value of inflammatory markers is those levels may be elevated in DKA. For example, elevated CRP and IL-6 levels have been shown to correlate with the degree of severity in DKA and may represent a "non-infectious form of SIRS" [5]. However, both CRP and IL-6, along with ferritin and LDH, can be significantly elevated in COVID-19 infections [6,7]. This makes interpreting the inflammatory markers somewhat difficult. This begs to question, that despite the lack of clinical severity of COVID-19 in this patient, was the stress of this infection severe enough to precipitate DKA in this patient whose diabetes mellitus had yet to declare itself? This patient has had viral infections in the past, but has neither been hospitalized nor diagnosed with diabetes previously. The question then follows, does COVID-19, cause a significant inflammatory response in patients that are clinically asymptomatic? Can this inflammatory response cause undiagnosed medical conditions to declare themselves?

Another challenge faced caring for this patient with COVID-19 and DKA was fluid management. Current recommendations for DKA by the American Diabetes Association consist of an insulin infusion and aggressive IV fluid replacement [3]. However, patients with COVID-19 who have respiratory symptoms are being treated cautiously with fluids due to risk of progression to ARDS [8]. Therefore, administering IV fluids for usual practice poses a dilemma with COVID-19. Another challenge was that the patient potentially could have exposed other providers had he not been tested. While being able to test all patients at the time of triage, regardless of symptoms, would be ideal, the lack of widely available testing does not yet make, this possible. We postulate if perhaps the presence of lymphopenia and elevated inflammatory markers could be used to help triage the use of COVID-19 testing, if necessary.

Without a clear precipitant for his presentation, the diagnosis was at least, in part, due to COVID-19. It is clear the novel nature of COVID-19 has created more questions from both a basic science and clinical application standpoint and requires continued observation and research. In the meantime, rigorous blood sugar control is warranted in any diabetic patient with an infection and maybe even more so, those with COVID-19.

CRediT authorship contribution statement

Margarita Gianniosis: Conceptualization, Writing - original draft, Writing - review & editing, Investigation. **Billy Zhang:** Writing - review & editing, Investigation. **Michael Choe:** Writing - review & editing, Supervision.

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