



A CASE OF DIABETIC STRIATOPATHY DUE TO UNCONTROLLED T2DM

Endocrinology

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KEYWORDS

INTRODUCTION

Hemichorea–hemiballismus (HCHB) syndrome is a syndrome characterized by choreic movements which are irregular, nonrepetitive, and random movements, and ballismus which are spontaneous and violent movements. HCHB syndrome with a metabolic cause is a rare presentation that can be precipitated by uncontrolled diabetes. Presented here is a case of HCHB syndrome with right-sided neuroimaging findings and contralateral chorea due to uncontrolled type 2 diabetes mellitus. This patient was found to be obtunded with a blood glucose of greater than 500 mg/dL by EMS. After the administration of insulin, she was able to answer clarifying questions of noncompliance with her antihyperglycemic medications. She had a computed tomography without contrast of the head which showed hyperdense lesions in the right caudate nucleus and putamen consistent with HCHB syndrome. She was started on treatment for nonketotic hyperglycemia with insulin. As her mentation improved, she was able to cooperate with physical examination, which revealed irregular and violent movements in the left upper and lower extremities. Her hemichorea and hemiballismus improved with strict glycemic control, and she was able to be discharged to a skilled nursing facility for further rehabilitation. She would later have repeated hospitalizations for poor glycemic control, and repeat neuroimaging would reveal the resolution of hyperdensities after 4 months. HCHB syndrome due to uncontrolled diabetes has been termed diabetic striatopathy and is characterized by poor glycemic control, unilateral striatal hyperdensity on CT imaging, and contralateral choreic movements. Diabetic striatopathy remains a poorly understood disease, and the exact pathophysiologic mechanism has not been definitively elucidated.

Learning points

- Diabetic striatopathy is a relatively new term for metabolic etiology of hemichorea–hemiballismus syndrome and was coined in 2009.
- The triad for diabetic striatopathy is poor glycemic control, unilateral striatal hyperdensity on CT imaging, and contralateral choreic movements.
- Multiple etiologies have been suggested for the cause of diabetic striatopathy including petechial hemorrhage, mineral deposition, myelin destruction, and infarction with reactive astrocytosis; however, the exact mechanism has yet to be determined.
- Antidopaminergic medications may be used to control the choreic movements of diabetic striatopathy; however, the mainstay of treatment is glycemic control, often with insulin therapy.

Background

Hemichorea–hemiballismus (HCHB) syndrome is a neurologic condition characterized by unilateral movements of chorea or ballismus. Choreiform movements are irregular, nonrepetitive, and random, while ballismus movements are spontaneous and violent. HCHB may be either a primary neurologic disorder or secondary to metabolic causes, including uncontrolled diabetes, and may be referred to as diabetic striatopathy. This syndrome was first described by Bedwell in 1960 (1). It presents classically as a triad of unilateral involuntary movements, contralateral basal ganglia imaging findings, and hyperglycemia (2). These patients may present with nonketotic hyperglycemia, with diabetic striatopathy as the first sign of diabetes (3).

This disease is rare, with some reports showing an incidence rate of 1 out of 100000 patients (4). Due to its rarity, very few studies have been published identifying patients with this syndrome. The most recent meta-analysis in 2020 showed fewer than 200 cases had been reported across 72 articles (3). Patients with this syndrome are typically elderly, women, Asian, and with poorly controlled diabetes, with supporting labs showing elevations in blood glucose levels or glycated hemoglobin levels (2, 3).

Identification of these patients relies on laboratory testing and neuroimaging. Important laboratory testing includes serum glucose levels and glycated hemoglobin levels (A1C). Neuroimaging is important to characterize and identify the lesion and may be done with CT or MRI.

Here, we present a case of diabetic striatopathy with symptomatic and neuroradiographic imaging resolution with initiation of intensive insulin therapy.

Case presentation

A 63-year-old Caucasian woman presented to the emergency room for evaluation of confusion and slurred speech. She has a medical history of uncontrolled hypertension, uncontrolled diabetes, obstructive sleep apnea and being noncompliant with continuous positive airway pressure, chronic obstructive pulmonary disease with chronic oxygen use, and coronary artery disease. Her last known well was 24 h prior to presentation in the emergency room. She was accompanied by her significant other, who reported she had had slurred speech and had fallen multiple times. They report she had bilateral lower extremity weakness and decreased sensation on the left side of her body. She did not have a history of prior cerebrovascular accidents, transient ischemic attacks, or neurologic deficits. She denied complaints of generalized weakness or changes in her routine. She did not have systemic symptoms for infectious causes. She denied any complaints of respiratory or cardiac symptoms.

She reports she did not have any recent EDM Case Reports (2024) 2024 e230082 <https://doi.org/10.1530/EDM-23-0082> changes to her medications and has been taking them as prescribed. Notably, she was prescribed insulin for her diabetic control which she was reportedly taking. She was brought in by Emergency Medical Services to the emergency room and during transit, a blood glucose level revealed a glucose level of greater than 500 mg/dL. Presenting vitals revealed an elevated blood pressure at 169/73 mm Hg and she was maintaining an SPO2 of 100% on her baseline oxygen. A thorough neurologic examination could not be performed on presentation due to her inability to follow commands but a brief exam revealed slight dysarthria and rapid jerking of the left upper and lower extremity. Neurologic examination after improvement in her encephalopathy revealed 4/5, 4+/5, and 4+/5 strength to shoulder abduction, elbow flexion and extension, and wrist flexion and extension on the right, respectively. She had 3+/5, 4/5, and 4/5 strength to shoulder abduction, elbow flexion and extension, and wrist flexion and extension on the left, respectively. The left upper extremity had rhythmic movements with occasional rapid jerking laterally most consistent with chorea. The lower extremity exam showed 3/5, 3+/5, and 3+/5 strength to hip flexion, knee extension, and ankle plantarflexion and dorsiflexion, respectively. Deep tendon reflexes could not be adequately tested due

to her body habitus. Cranial nerves III–VIII and X–XII were intact bilaterally.

Investigation

Due to her encephalopathy and extremity weakness, a code stroke was called, and she had a CT head without contrast which revealed no acute intracranial hemorrhage, a remote right frontal lobe white matter infarct, and a hyperdense right caudate nucleus and putamen (Fig. 1). A CT angiogram of the head and neck was obtained, which did not show any focal stenosis or occlusion of the arteries. An initial metabolic panel revealed a normal bicarbonate level with an anion gap of 9 and hyperkalemia of potassium 5.2 mmol/L (reference range: 3.5–5.1 mmol/L). The initial complete blood count revealed normal hemoglobin without leukocytosis. Diabetic ketoacidosis (DKA) was considered in the initial work-up due to reported noncompliance with insulin therapy by her significant other. A β -hydroxybutyrate was obtained with the initial labs and was mildly elevated at 0.49 mmol/L (reference range: 0.02–0.4 mmol/L), but with a normal bicarbonate level, was non-diagnostic for DKA.

She was admitted to the hospital for concern of subacute stroke. Neurology consultation was obtained with concern for possible hemorrhagic transformation of ischemic stroke. She did not require vasoactive medications to control her blood pressure (BP) as she maintained a systolic BP between 130 and 140. Diagnostic work-up with an MRI brain, transthoracic echocardiogram with bubble study, physical therapy, speech therapy evaluation, and treatment with aspirin and high-intensity statin was initiated. An echocardiogram with bubble study was unable to be obtained due to difficulty with IV access from her body habitus, and she was unable to have an MRI due to limitations with implanted hardware.

During her hospitalization, she continued to have left upper and lower extremity jerking movements. DKA was ruled out early during her hospitalization due to a lack of acidosis and only a mildly elevated β -hydroxybutyrate; however, hyperosmolar hyperglycemic state remained on the differential as a possible cause for her acute change in mentation. Her neuroimaging findings, physical examination findings, and hyperglycemia were consistent with diabetic striatopathy, and further work-up with A1C was obtained. She was found to have an A1C of 13.4%. The next course of action was starting an aggressive insulin regimen to control her hyperglycemia. During her hospitalization, her left-sided jerking movements started to improve but did not fully resolve by hospital day 10 when she was discharged.

Treatment

As DKA was ruled out, she was not started on a continuous IV insulin infusion. Consideration for continuous IV insulin infusion was considered but was ultimately not pursued as her repeat blood glucose level had decreased from greater than 500 mg/dL to 209 mg/dL. She was started on subcutaneous insulin and aggressively titrated during her hospitalization. Her final insulin regimen was 25 units of insulin detemir subcutaneously twice per day and 20 units of insulin lispro subcutaneously with meals. She would be discharged with metformin 500 mg twice per day in addition to her insulin. During her initial hospitalization, antichoreic medications were not considered due to her improving symptoms with better glycemic control. If she did not show improving left-sided chorea, then antipsychotics with oral haloperidol would have been considered as an adjunct to her medications.

Outcome and follow-up

Over the course of the next 4 months, she would have multiple hospitalizations for similar presenting chief complaints. She was continued on intensive insulin therapy, and her insulin was able to be weaned with dietary modifications to a final insulin regimen of 10 units of insulin detemir subcutaneously nightly and five units of insulin lispro subcutaneously with meals. Over this time, her left-sided movements would improve and ultimately resolve as her glycemia improved. Her A1C decreased from 13.3% to 6.9%. She would have multiple CT head examinations performed, which showed progressively improving right basal ganglia hyperdensity until she had complete resolution of the hyperdensity (Fig. 2).

DISCUSSION

HCHB syndrome is a rare complication of uncontrolled diabetes. This disease has been understudied due to the few cases that have been reported (2, 3, 5, 6). Further investigation is important to elucidate the

pathophysiologic mechanism for this disease and optimization of treatment modalities.

Common identification of this disease relies on neuroimaging with either CT or MRI of the brain revealing contralateral basal ganglia lesions (7). These modalities have a sensitivity of 78% and 95%, respectively, for detecting diabetic striatopathy (3). The most common finding is the involvement of the putamen either independently or in conjunction with the caudate nucleus (3). MRI findings are best demonstrated on T1-weighted imaging showing a contralateral striatum lesion to the affected limb (8). The pathognomonic finding is striatal hyperintensity without mass effect and sparing of the internal capsule (3). Imaging resolution may be as quick as 10 days for CT or 60 days for MRI, but the median duration to neuroimaging resolution is 60 days for CT and 180 days for MRI.

Treatment of diabetic striatopathy involves two pillars: attaining euglycemia and choreic resolution. Symptom resolution may be as quick as 2–14 days with glycemic control and anti-choreic treatment (3). Symptoms may improve while glycemic control is improving. The common agents for anti-choreic treatment include antipsychotics, dopamine-depleting agents, GABA- receptor agonists, and selective serotonin reuptake inhibitors (9). The most common agent for monotherapy was haloperidol according to Chua et al. (3). When treated with antihyperglycemic agents alone, the resolution of symptoms occurs in only 25% of patients, while the addition of anti-choreic medications increased symptomatic resolution to 76% (3).

Several etiologies have been proposed as the mechanism for diabetic striatopathy: petechial hemorrhage, mineral deposition, myelin destruction, and infarction with reactive astrocytosis (3, 10). One study suggests that non- ketotic hyperglycemia depletes GABA levels, thereby decreasing acetylcholine levels and leading to basal ganglia dysfunction and chorea (5). One diagnosis that should be considered is acute ischemic stroke with spontaneous recanalization, which has been shown in a previous case report (11). Ultimately, this was ruled out due to the persistent hyperdensity on subsequent CT scans. Another study suggested that ischemic injury to the area in the setting of poorly controlled diabetes could lead to a patient's symptoms (12). A final study identified a case with neurodegeneration in the setting of high osmotic pressures as a plausible mechanism (13). Despite multiple theories being suggested, the true mechanism is poorly understood and remains an area for further investigation.

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