Chorea Hyperglycemia Basal Ganglia Syndrome—A Rare Case of Bilateral Chorea-Ballismus in Acute Non-Ketotic Hyperglycemia

Sir,

Hemichorea and hemiballismus are involuntary, non-patterned movement disorders caused by lesions of the contralateral striatum and subthalamic nucleus, respectively.\(^1,^2\)

Hyperosmolar, non-ketotic hyperglycemia (NKH) consists of severe hyperglycemia with intracellular dehydration but without ketoacidosis and presents with typical lesions in the contralateral subthalamic nucleus and pallido-subthalamic pathways, with the spectrum of neurological deficit.\(^3\) Chorea hyperglycemia basal ganglia syndrome (C-H-BG) was initially described in 1960\(^4\) and is defined by the sudden occurrence of hemichorea and in the more severe cases, hemiballismus. Typically, it affects older adults with poor control of type 2 diabetes mellitus, often expressing a contralateral striatal hyperdensity on non-contrast CT brain scans or striatal hyperintense signal changes on MRI of the brain.\(^2\)

We present a rare case of an 83-year-old Caucasian female with acute, bilateral chorea-ballismus movement disorder, with initially high glucose levels and uremia at the admission. Involuntary movements started five days before she presented herself to the ER, with the trend of progression over time. Past medical history was remarkable for mildly elevated blood sugar level months ago, up to the 10 mmol/L, while taking none of the antidiabetic drugs. Besides, her past medical history included hypertension, myocardial infarction with coronary angioplasty and stent insertion six months ago, and implantation of pacemaker 3 years ago, without previous neurological disorders or trauma. Initial neurological examination revealed severe bilateral chorea-ballismus of arms and legs with dysarthria and the tongue’s twisting in the manner of “Harlequin’s tongue” sign [Video 1]. Involuntary movements occurred while the patient was awake and disappeared during sleep. The rest of the neurological exam was unremarkable. Laboratory work-up at the admission revealed non-ketotic hyperglycemia (20.1 mmol/L), and uremia (10.3 mmol/L) with elevated creatinine level (170 µmol/L). Other laboratory tests showed mild anemia (erythrocytes \(3.7 \times 10^{12}/L\), hemoglobin 108 g/L, hematocrit 0.335) and slightly elevated C-reactive protein (21.5 mg/L), without other abnormalities. Urine
Analysis revealed high levels of glucose, while ketones were negative. Non-contrast head CT scan showed bilateral hyperdense changes in the lentiform nucleus [Figure 1a]. A lumbar puncture was performed at the admission, clear, and colorless spinal fluid was collected, which contained slightly elevated proteins (0.550 g/L) and markedly increased level of glucose (9.2 mmol/L). Over the next two days, laboratory studies were repeated, and levels of urea and creatinine gradually decreased. During hospitalization levels of electrolytes, ammonium ion, thyroid hormones, and parathyroid hormone were normal, and serum values of urea (4.0 mmol/L) and creatinine (70 µmol/L) showed normalization. MRI of the brain was contraindicated because of the heart pacemaker she had. After the administration of long-acting insulin and risperidone (3 × 1 mg, daily) her blood sugar level returned to normal value with subsequent clinical improvement and gradual decrease and final resolution of involuntary movements after three weeks [Video 2]. During hospitalization, the risperidone dose has been successively decreased and finally stopped. Repeated non-contrast head CT scan revealed less clear hyperdensity of both lentiform nuclei [Figure 1b], and our patient was discharged 26 days after the admission with complete cessation of involuntary movements. Her medical therapy included long-acting insulin, dual antiplatelet drugs due to the coronary stent she had, as well as beta-blocking agents, hypolipidemic, diuretic, and gastroprotective drugs.

Typical C-H-BG patient has clinical manifestations of unilateral chorea, high blood glucose level with absence of ketones, and characteristic neuroimaging findings on CT or MRI of the brain. It is a rare condition, with very few case series published so far. Oh and coauthors published a meta-analysis of 53 cases, which showed that it commonly occurs in elderly Asian women with poorly controlled diabetes mellitus. Female predisposition is probably related to the postmenopausal decline of estrogen, which results in the depletion of gamma-aminobutyric acid (GABA) or dopamine receptors hypersensitivity and enhancement of the system. However, other authors reported similar case-series of 20 Peruvian patients, equally distributed among genders, in which 17 patients had unilateral symptoms, and 3 had the bilateral disorder. Almost half of the patients had new-onset hyperglycemia, and the diagnosis of diabetes mellitus has been established after discharge. At the same time, the average period of complete resolution of involuntary movements was approximately 2 weeks.

Despite a few theories, the pathophysiological mechanism of this disorder has not been defined entirely yet. Shifting of cerebral metabolism to the anaerobic pathway, lack of ketones for GABA synthesis, and its rapid depletion along with reduced levels of acetylcholine in basal ganglia in non-ketotic hyperglycemic metabolic acidosis were proposed as a plausible mechanisms which cause cellular dysfunction. In addition to that, hyperglycemia causes hyperviscosity of blood, which leads to damage to the blood-brain barrier and transitory ischemia of striatal neurons. However, this hypothesis doesn’t explain the persistence of chorea after blood sugar level is normalized and in the condition of hypoglycemia and ketotic hyperglycemia.

Most patients with C-H-BG develop hemichorea, while bilateral involvement occurs in less than 10% of cases. Characteristic findings in neuroimaging are hyperdense changes in putamen or caudate nucleus contralateral to the side of the patient’s extrapyramidal symptoms registered on non-contrast head CT examination, and high signal intensity on MRI T1-weighted and low signal intensity on MRI T2-weighted sequences of the contralateral striatum. Despite the elevated level of urea in our patient, uremia was excluded as the cause of chorea since changes in neuroimaging in uremia-associated chorea present as hypodense areas on CT scans. The time frame during which these patients improve their condition may range from several days up to several months. Most patients with this syndrome have a good prognosis, and tight control of blood glucose levels is the most crucial treatment for them. For those patients with severe motor impairment, dopamine receptor antagonists (haloperidol, risperidone) can be used to control chorea, with the addition of clonazepam if necessary. Although C-H-BG is a rare cause of chorea, it can be a presenting sign of unknown diabetes and should raise attention since early diagnosis and proper management can lead to a good outcome in these patients.

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Conflicts of interest
There are no conflicts of interest.

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References

1. Roy U, Das S, Mukherjee A, Biswas D, Pan K, Biswas A, et al. Irreversible hemichorea-hemiballism in a case of nonketotic hyperglycemia presenting as the initial manifestation of diabetes mellitus. Tremor Other Hyperkinet Mov 2016;6:393.

2. Oh SH, Lee KY, Im JH, Lee MS. Chorea associated with non-ketotic hyperglycemia and hyperintensity basal ganglia lesion on T1-weighted brain MRI study: A meta-analysis of 53 cases including four present cases. J Neurol Sci 2002;200:57-62.

3. Bedwell SF. Some observations on hemiballismus. Neurology 1960;10:619-22.

4. Zaitout Z. CT and MRI findings in the basal ganglia in non-ketotic hyperglycemia associated hemichorea and hemi-ballismus (HC-HB). Neuroradiology 2012;54:1119-20.

5. Chen C, Zheng H, Yang L, Hu Z. Chorea-ballism associated with ketotic hyperglycemia. Neurol Sci 2014;35:1851-5.

6. Cosentino C, Torres L, Nunez Y, Suarez R, Velez M, Flores M. Hemichorea/hemiballism associated with hyperglycemia: report of 20 cases. Tremor Other Hyperkinet Mov 2016;6:402. doi: 10.7916/D8DN454P.

7. Slabu H, Savedia-Cayabyab S, Senior P, Arnason T. Permanent hemichorea associated with transient hyperglycemia. BMJ Case Rep 2011;2011:bcr0820114641. doi: 10.1136/bcr.08.2011.4641.

8. Wang HC, Cheng JC. The syndrome of acute bilateral basal ganglia lesions in diabetic uremic patients. J Neurol 2003;250:948-55.

9. Mehta S, Kumar A, Takkar A, Goyal MK, Lal V. An unusual cause of reversible parkinsonism. Ann Indian Acad Neurol 2017;20:82-3.

10. Pinsker JE, Shalieh K, Rooks VJ, Pinsker RW. Hemichorea-hemiballism secondary to non-ketotic hyperglycemia. J Clin Med Res 2015;7:729-30.

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