Case Report

Hemichorea caused by non-ketotic hyperglycemia in a Sri Lankan woman: A case report

P.P.B. Herath[1*], W.K.S. Kularatne[1]
[1] National Hospital, Kandy, Sri Lanka

Abstract

Chorea is a hyperkinetic movement disorder characterized by involuntary, short-lasting, random, and irregular contractions conveying a feeling of restlessness to the observer which may be caused by hereditary neurodegenerative diseases, damage to the deep brain structures, autoimmune disorders, metabolic derangements or certain drugs and hormones. Non-ketotic hyperglycemia is a well-described endocrine disturbance that can lead to hemichorea or generalized chorea where striatopathy is commonly found in imaging. Here we present a case of non-ketotic hyperglycemic hemichorea with typical striatopathy on neuroimaging. The choriform movements gradually resolved over two weeks after achieving blood sugar control and treatment with neuroleptics.

Keywords: Diabetes, Hyperglycemia, Chorea, Striatopathy

Funding: None
Competing interest: None
Received: 20.07.2021 **Accepted revised version:** 22.11.2021 **Published:** 31.12.2021

*✉ **Correspondence:** pasanbherath@gmail.com, https://orcid.org/0000-0002-5609-1701

Cite this article as: Herath P. P. B. *et al*, Hemichorea caused by non-ketotic hyperglycemia in a Sri Lankan woman: A case report. Anuradhapura Medical Journal 2021; 15 (2): 24-27, DOI: http://doi.org/10.4038/amj.v15i2.7695

Introduction

Chorea is a type of involuntary hyperkinetic movement disorder due to the dysfunction of circuits interconnecting basal ganglia and the frontal motor cortex. This is featured by involuntary brief, random and irregular contractions conveying a feeling of restlessness to the observer [1].

Basal ganglia are a subcortical set of nuclei, including the caudate nucleus, putamen, external and internal segments of globus pallidus, and associated structures including substantia nigra and subthalamic nucleus. Complex neuronal networks interconnect the basal ganglia and cortical motor areas. Chorea results due to a dysfunction within this neuronal network [1,2]. This disruption can occur as a result of direct structural damage, degeneration of selective sets of neurons, neurotransmitter receptor blockage, metabolic derangements, drug exposure, genetic mutations, and also due to underlying autoimmune conditions [1].

Chorea can be classified as primary (idiopathic, hereditary) or secondary (acquired). The most frequent cause of hereditary chorea is the Hungtington disease [3]. Ischaemic and haemorrhagic stroke are the most common causes of acquired chorea in the hospital population [4]. In children, Sydenham's chorea is the most common cause of acquired chorea [5]. According to a study by Piccolo et al., involving 51 cases, the most common aetiologies for chorea were vascular (40%), drug-induced (14%), Hungtington's disease

(10%), acquired immune deficiency syndrome (10%), and less than 5% accounts for other causes where only 2 out of 51 had non-ketotic hyperglycemia.

Though uncommon, hyperglycemia-induced movement disorders or chorea-ballism has been a well-described entity since the first reported case in 1960 [6]. Older diabetic patients, especially East Asian origin females, with non-ketotic hyperglycemia, were commonly reported developing this condition [7]. According to the available literature, unilateral chorea is more common than generalized chorea. Usually, patients have an acute presentation where chorea appears with the development of hyperglycaemia [7].

Case report

A 61-year-old Sri Lankan woman with type-2 diabetes mellitus for eight years, who had been on oral hypoglycaemics with poor drug compliance and sugar control, presented with gradual onset involuntary movements of the left upper limb and lower limb for five days. Examination revealed choriform movements of the tongue, left upper limb, and distal lower limb. She was found to have severe non-proliferative retinopathy on fundoscopy. The rest of the examination findings, including general, cardiovascular, and nervous systems, were unremarkable.

Her blood sugar level on admission was 459 mg/dL. Arterial blood gas analysis showed normal pH and bicarbonate levels. Urine for ketone bodies was negative. Her serum electrolytes, including sodium, calcium, and magnesium levels, were normal. Other investigations, including liver enzymes, liver function tests, thyroid profile, and blood picture, did not show any abnormality. Her serum creatinine level was at the upper margin (140 µmol/L), and urine analysis revealed a high albumin creatinine ratio (200 mg/g). Her non-contrast computerized tomography (CT) scan of the brain showed abnormal hyper-density in both caudate nuclei (right more than left) and the right lentiform nucleus. It was reported as suggestive of diabetic striatopathy (Figure 1). There was no CT evidence to suspect vascular causes (ischemic or haemorrhagic stroke) involving basal ganglia.

With the above clinical, biochemical, and imaging findings, she was suspected of having hemichorea caused by non-ketotic hyperglycaemia. She was initially put on a trial of tight blood sugar control, and the clinical response was observed. Her blood sugar was managed with soluble insulin and later converted to mixtard insulin with the achievement of optimal fasting and postprandial glucose levels. Simultaneously she was started on oral haloperidol at 1.5 mg two times per day. With the control of blood sugar levels and neuroleptics treatment, her involuntary movements disappeared after two weeks. A final diagnosis of hyperglycemic non-ketotic hemichorea was made in retrospect. In the next six-month period, she had good glycemic control, and she did not develop any further episodes of hemichorea.

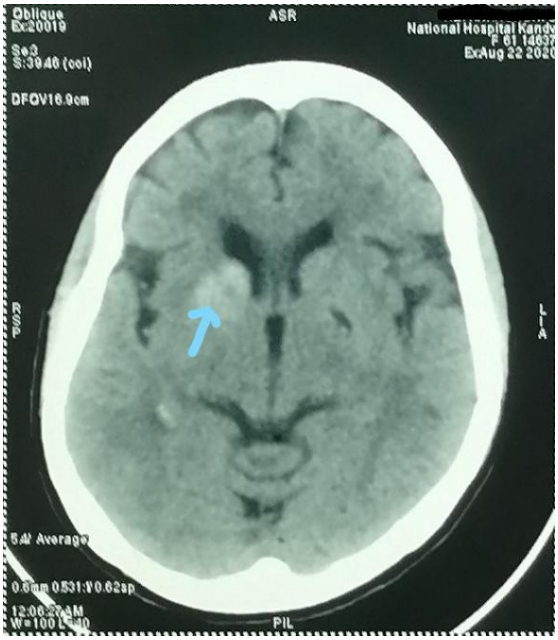

Figure 1: Hyperdensity in the right caudate nucleus and anterior putamen (Blue arrowhead). A slight hyperdensity in the left caudate nucleus is also visible.

Discussion

The patient in this case study presented with chorea confined to the left side of the body with poor blood sugar control. In the absence of other possible etiologies such as cerebrovascular events or other metabolic and electrolyte abnormalities and with the characteristic appearance in her brain imaging, a diagnosis of hemichorea caused by non-ketotic hyperglycemia was made. The diagnosis was further confirmed retrospectively as her symptoms had resolved with the achievement of adequate sugar control.

Chorea is an uncommon clinical entity encountered in general medical practice. Most of the acquired types of chorea are seen in the paediatric population due to the higher prevalence of Sydenham chorea associated with rheumatic fever. In the older population, chorea results from acquired insults to the basal ganglia [1]. Poorly-controlled blood sugar levels may present in this manner as diabetes is common in the local population.

Various nomenclature is used in describing the hyperglycemia associated movement disorders or the chorea-ballism such as hyperglycemic non-ketotic hemichorea, chorea or hemichorea associated with non-ketotic hyperglycemia, diabetic hemichorea, diabetic hemiballism, chorea hyperglycemia, and basal ganglia syndrome [8,9]. The occurrence of chorea following hyperglycaemia is uncommon, and it is 1 per 100,000 population [9]. Females are affected more commonly with a female to male ratio of 1.8, and older individuals are more likely to develop this condition [8,10]. The onset of chorea may be acute or subacute with the common involvement of the arm and leg. Involvement of the face is only about 25%, and isolated leg and face involvement is rare. Only about 10% of the patients develop bilateral movement disorder. At presentation, the blood glucose level is usually greater than 300 mg/dL. Though the serum osmolality may be high, ketone levels and pH are normal in almost all cases. Therefore, all patients must have hyperglycemia by definition. This may be previously diagnosed or, in the majority of cases, new-onset hyperglycemia presenting with chorea. Previously it has been observed that although the improvement of chorea occurs in around 80% of cases in a few days after the correction of serum glucose, in some cases, it may last for months or years till further intervention [9,10].

For the diagnosis of hyperglycemic hemichorea (HH) or diabetic striatopathy, imaging plays a key role. Importantly it's useful in excluding other common aetiologies for acquired chorea such as vascular pathologies. Both CT and magnetic resonance imaging (MRI) are useful. CT often shows hyperdensities in the striatum. In T1 MRI, hyperdensities are seen in the contralateral side in almost all cases that are being considered diagnostic. Ipsilateral smaller, less dense lesions may also be seen, or even symmetric bilateral lesions could be seen although the patient has unilateral symptoms. Our patient had bilateral striatopathy but more in the right, where unilateral movements affected the left side of the body. Regarding the basal ganglia involvement, the putamen is almost always involved but, the involvement of the caudate nucleus and the globus pallidus may vary [8,10]. Usually, the lesions do not follow vascular distribution or resemble typical ischaemia and are well-demarcated. These lesions also do not enhance with gadolinium. Typically these lesions resolve over time, leaving a normal MRI [8,10].

The single most important treatment modality is glycaemic control, both short and long-term. There is no evidence regarding the natural course of disease without hyperglycaemic correction. Symptomatic therapy is usually initiated when chorea is disabling or uncomfortable. Though there is no standard therapy for hyperglycaemic hemichorea to date, haloperidol - a dopamine antagonist - is commonly used. All medications which block dopamine type-two receptors reportedly have a similar response. Other drugs such as benzodiazepines, sodium valproate, and carbamazepine are also reported to be beneficial. Tetrabenazine, a vesicular monoamine transporter-2 inhibitor, can improve chorea in severe refractory cases. In other refractory cases, ventral lateral thalamotomy could be attempted [9-12]. It has been previously observed that the success rate of treatment by sugar control only and by addition of anti-chorea medications is 25.7% and 76.2%, respectively. The recurrence rate of hyperglycaemic hemichorea is around 18.2% [8]. In our patient, we observed the disappearance of choriform movements gradually over two weeks after achieving blood sugar control and a small dose of neuroleptics.

References

1. Cardoso F, Seppi K, Mair KJ, Wenning GK, Poewe W. Seminar on choreas. *Lancet Neurol.* 2006;5(7):589-602. doi: 10.1016/S1474-4422(06)70494-X.

2. Lee MS, Marsden CD. Movement disorders following lesions of the thalamus or subthalamic region. *Mov Disord.* 1994;9(5):493-507. doi: 10.1002/mds.870090502.
3. Harper PS. The epidemiology of Huntington's disease. *Hum Genet.* 1992;89(4):365-76. doi: 10.1007/BF00194305.
4. Ghika-Schmid F, Ghika J, Regli F, Bogousslavsky J. Hyperkinetic movement disorders during and after acute stroke: the Lausanne Stroke Registry. *J Neurol Sci.* 1997;146(2):109-16. doi: 10.1016/s0022-510x(96)00290-0.
5. Zomorrodi A, Wald ER. Sydenham's chorea in western Pennsylvania. *Pediatrics.* 2006;117(4):e675-9. doi: 10.1542/peds.2005-1573.
6. Bedwell SF**.** Some observations on hemiballismus. *Neurology.* 1960;10:619-22. doi: 10.1212/wnl.10.6.619.
7. Chang CV, Felicio AC, Godeiro Cde O Jr, Matsubara LS, Duarte DR, Ferraz HB, et al. Chorea-ballism as a manifestation of decompensated type 2 diabetes mellitus. *Am J Med Sci.* 2007;333(3):175-7. doi: 10.1097/MAJ.0b013e3180318e34.
8. Chua CB, Sun CK, Hsu CW, Tai YC, Liang CY, Tsai IT. "Diabetic striatopathy": clinical presentations, controversy, pathogenesis, treatments, and outcomes. *Sci Rep.* 2020;10:1594. doi: 10.1038/s41598-020-58555-w.
9. Ondo WG. Hyperglycemic non-ketotic states and other metabolic imbalances. *Handb Clin Neurol.* 2011;100:287–91. DOI: 10.1016/B978-0-444-52014-2.00021-5.
10. Oh SH, Lee KY, Im J, 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(1-2):57-62. doi: 10.1016/s0022-510x(02)00133-8.
11. Abe Y, Yamamoto T, Soeda T, Kumagai T, Tanno Y, Kubo J, et al. Diabetic striatal disease: clinical presentation, neuroimaging, and pathology. *Intern Med.* 2009;48(13):1135–41. doi: 10.2169/internalmedicine.48.1996.
12. Sitburana O, Ondo WG. Tetrabenazine for hyperglycemic-induced hemichorea-hemiballismus. *Mov Disord.*2006;21(11): 2023–5. doi: 10.1002/mds.21100.