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Case Report

Hemichorea-Hemiballismus Revealing Diabetes Mellitus

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Abstract

Nonketotic hyperglycemia is a rare cause of hemichorea-hemiballismus. We report a case hemichorea-hemiballismus secondary to nonketotic hyperglycemia revealing an inaugural diabetes mellitus. A 55 year-old woman, admitted for subacute-onset of continuous involuntary movements in the right upper and lower limb since three days ago. The movements increased with action, decreased with relaxation, and disappeared during sleep. As the condition did not affect her trunk, other limbs, or her face and no other conditions were evident. At admission, the right upper and lower limb was moving involuntarily. The movement was wild, flailing, and repetitive with varied amplitudes and frequencies. No tremor and rigidity were elucidated and cerebellar signs were negative. Laboratory tests revealed diabetes mellitus, with a fasting blood glucose level of 4,60 g/L and a hemoglobin A1C level of 14.0%. The urine examination was negative for ketones. CT of the brain showed left pallidum hyperdensity. The brain MRI revealed hyperintense signal in the left pallidum on T1-weighted images and isointensity on T2-weighted images. Other laboratory results were within the normal range. A diagnosis of hyperglycemia-associated hemichorea-hemiballismus was made. An insulin treatment and oral antidiabetics were instored. She was subsequently discharged after 14 days of hospital stay with improved glycemic control. Three months after, her chorea-ballismus was completely resolved. A control of brain MRI six month after showed marked improvement in the putaminal changes. Vigilance for this cause of hemichorea-hemiballism is important, since the movement disorder may be the presentation of potentially dangerous underlying hyperglycemia.

Keywords: Hemichorea, Hemiballismus, Movement disorders, Inaugural Diabetes Mellitus, hyperglycemia, MRI.

INTRODUCTION

Hemichorea-Hemiballismus is characterized by unilateral, brief, unpredictable involuntary movements of one side of the body (upper and lower limbs and sometimes also affecting the face). It is usually associated with a contralateral lesion in the central nervous system affecting specially the basal ganglia. The most common causes for this condition are strokes, infection, genetic mutation, neoplasms, neurodegeneration, drug-exposure, autoimmune disease and metabolic disease [1, 2]. Rarely, it is associated with non-ketotic hyperglycemia wich is a complication of diabetes mellitus [3]. Movements disorders caused by hyperglycemia was first described in 1960 [4] and is characterized by unilateral involuntary choreiform movements, and contralateral basal ganglia, particularly the putamen, hyper-intensity on T1-weighted MR images or high density on CT scans [5]. We report a case of diabetic patient presenting hemichorea-hemiballismus secondary to nonketotic hyperglycemia.

CASE REPORT

A 55 year-old woman, admitted on December 7, 2020, for subacute-onset of continuous involuntary movements in the right upper and lower limb since three days ago. The movements increased with action, decreased with relaxation, and disappeared during sleep. As the condition did not affect her trunk, other limbs, or her face and no other conditions were evident such as visual complaints, giddiness, limb weakness, facial deviation, slurred speech, squinting, or double vision. The patient's medical history included diabetes mellitus type 2 only. No history of parkinsonism or other neurologic disorders was reported. Furthermore, the patient had no prior history of dopamine antagonist or any other medication or toxic use. At admission, she was fully alert and oriented. A neurological examination revealed her muscle tone and strength were normal on both sides. The deep tendon reflexes were normal. There was no clonus and the Babinski sign was negative. Nonetheless, the right upper and lower limb was moving involuntarily. The movement was wild,

flailing, and repetitive with varied amplitudes and frequencies. The abnormal movement was more marked at the distal part of the limb. No tremor and rigidity were elucidated and cerebellar signs were negative. However, she reported transient weakness in the right limbs. There was no evidence of sensory impairment, and cranial nerves examination was normal. Clinical examination of other systems revealed no abnormalities. Laboratory tests revealed poorly controlled diabetes mellitus, with a fasting blood glucose level of 4,60 g/L (….mmol/L) and a hemoglobin A1C level of 14.0%. The urine examination was negative for ketones. Full blood count was normal. Her thyroid status, was biochemically normal. Both liver and renal profiles were within the normal range. Similar negative results were observed for collagen disease, serum ceruloplasmin, tumor markers, inflammatory markers, antinuclear antibodies, antiphospholipid antibody, AIDS antibody, and TPPA. Electrocardiogram showed normal axis with sinus rhythm. CT of the brain showed left pallidum hyperdensity (Figure 1).

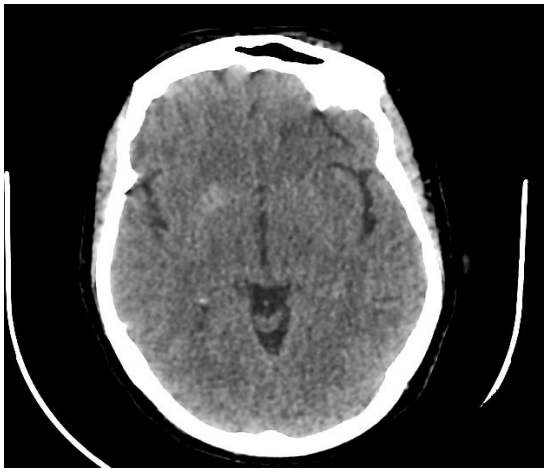

Figure 1: Axial CT of the brain showed left pallidum hyperdensity

The brain MRI revealed asymmetrical abnormally hyperintense signal in the left pallidum on T1-weighted images (Figure 2a) and isointensity on T2 Flair-weighted images (Figure 2b). Diffusion-weighted images revealed normal signal intensity in the left pallidum (Figure 2c).

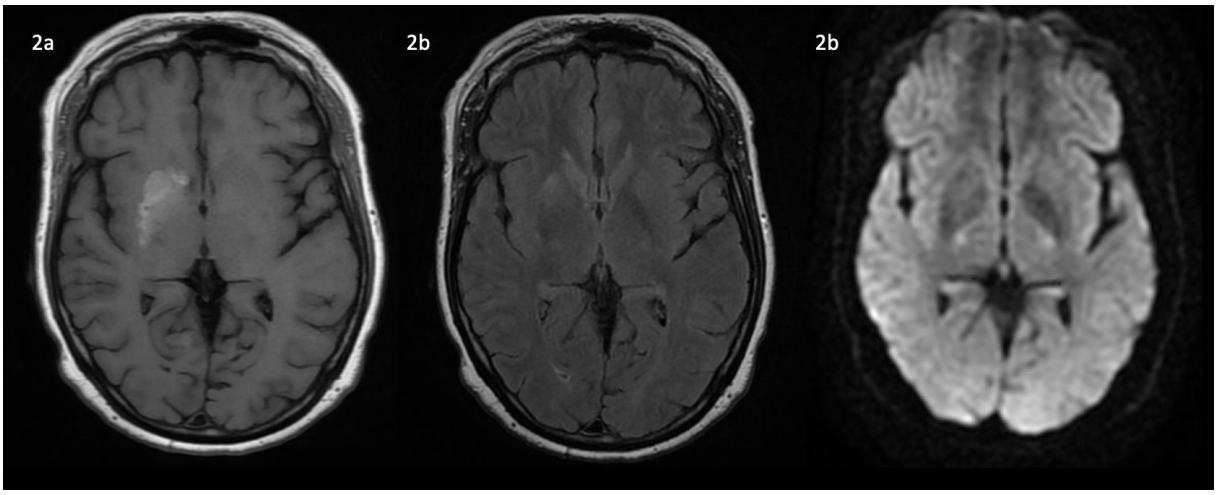

Figure 2: Brain MRI revealed asymmetrical abnormally hyperintense signal in the left pallidum on T1-weighted images (Figure 2a) and isointensity on T2 Flair-weighted images (Figure 2b). Diffusion-weighted images revealed normal signal intensity in the left pallidum (Figure 2c)

A diagnosis of hyperglycemia-associated hemichorea-hemiballismus was made. She was given 1.5 mg haloperidol at night, which was gradually titrated up to 1.5 mg in the morning and 3 mg at night for symptomatic control, and an insulin treatment was instored. She was subsequently discharged after 14 days of hospital stay with improved glycemic control. At this time, she was able to stand with support but still had some difficulty walking. She returned to the clinic for review, her chorea-ballismus completely resolved three months after the initial symptom onset. Therefore, her haloperidol dosage was reduced and then stopped. There was no recurrence of the right-sided hemichorea-

hemiballismus, and a repeat brain MRI six month after showed marked improvement in the putaminal changes.

DISCUSSION

Hemiballism-hemichorea is a rare hyperkinetic movement disorder characterized by continuous involuntary movements of an entire limb or of multiple limbs on one side of the body. These movements are irregular, of variable amplitude, and poorly patterned, usually involving the arm and leg together [1]. The acute onset of hemiballism- hemichorea is caused by focal lesions in contralateral basal ganglia, particularly the striatum; however, two cases of hemiballism caused by ipsilateral lesions have been described [1]. Ischemic or hemorrhagic stroke represents the most common cause of disease; nonketotic hyperglycemia is the next most common cause [1–3]. Hemiballism-hemichorea associated with hyperglicemia was first reported by Bedwell in 1960. He described the case of a 65-year-old woman with hemiballism that resolved as the blood-glucose abnormality was corrected, only to recur episodically as the patient experienced lapses in diabetic control [1, 2]. Subsequently, other authors observed advanced age of onset and female predominance, especially in Asian subjects [1–4]. Although this syndrome usually occurs in elderly patients with diabetes, it could also be an initial manifestation of diabetes [3].

The pathophysiology of hemiballism-hemichorea triggered by hyperglycemia is controversial and poorly understood. In a few histopathologic studies, researchers have found gliosis, gemistocyte accumulation, and selective loss of neurons, without evidence of hemorrhage or infarction [5–7].

Characteristic MR and CT findings in the basal ganglia have been documented in almost all cases of hemiballism-hemichorea associated with hyperglycemia [1–9]. High-attenuation changes involving the contralateral basal ganglia are common at head CT, although CT scans have been normal in some cases [1]. Brain MR imaging typically shows T1 hyperintensity and T2 hypointensity in the basal ganglia contralateral to the movements, although T2 isointensity has been described in one-third of cases and was present in this patient [4]. The putamen is more frequently involved than other basal ganglia.

Similar to other researchers [5, 6], we found a mismatch between the size of lesions detected on CT scans and the size of lesions detected on T1-weighted MR images, suggesting that two different pathophysiologic mechanisms underlie the CT and T1-weighted MR imaging findings [6]. Various theories have been proposed to explain the imaging findings, including acute infarct, petechial hemorrhage, myelinolysis, calcium deposition, decreased synthesis of γ- aminobutyric acid and acetylcholine secondary to metabolic changes, or injury secondary to hyperviscosity and vasogenic edema [1–6]. Petechial hemorrhage with blood-brain barrier breakdown in the striatum has been suggested as the most plausible mechanism [3]. However, MR findings suggest that petechial hemorrhage cannot be responsible for the lesions since if the striatal T1 hyperintensity represents methemoglobin (at the subacute stage of hemorrhage), T2 hyperintensity should also be present; this was not the case in this patient or in most previously reported cases [6]. Other authors proposed that the high-signal-intensity lesions on T1-weighted MR images could be related to manganese accumulation in gemistocytes, which would result from an increase in the activity of manganese superoxide dismutase. This enzyme induction in gemistocytes (reactive astrocytes containing a rich protein content that usually appear during acute injury but later gradually shrink) can be triggered by multiple stimuli, including brain ischemia and hyperglycemia [8, 9]. Hence, the authors assumed that the acute putaminal dysfunction secondary to hyperglycemic or hyperosmolar insult could be associated with some degree of Wallerian degeneration of the internal white matter of the putamen with gemistocyte accumulation. Protein desiccation occurring in the course of Wallerian degeneration could explain the CT hyperattenuation and the T1-weighted MR imaging pattern [9].

The differential consideration for nonketotic hyperglycemia-induced hemiballism-hemichorea must include conditions related to clinical presentation and CT and MR imaging appearance. In regard to the clinical presentation, many diseases other than nonketotic hyperglycemia can manifest with the acute development of hemiballism-hemichorea [1, 2]. The most frequent condition is represented by ischemic or hemorrhagic stroke followed by complications of human immunodeficiency virus infection [3], vasculitis, central nervous system lupus, mass lesions, multiple sclerosis, thyrotoxicosis, and pharmacologic therapy (ie, anticonvulsants, levodopa, oral contraceptives, and neuroleptics) [3, 4]. However, in this patient, the characteristic CT and MR findings and the medical history, including laboratory values, make all these diagnoses unlikely. In regard to MR features, other causes of T1-weighted hyperintense basal ganglia lesions are to be considered. Indeed, the typical T1-weighted MR imaging characteristic of hyperglycemic hemiballism- hemichorea is not specific to this condition and can be observed in other toxic, metabolic, or degenerative disorders. The most frequent condition is chronic hepatic encephalopathy [5], followed by manganese toxicity during long-term parenteral nutrition [6], post–cardiac arrest encephalopathy, hypoglycemic coma, hypothyroidism, mild focal ischemia or chronic changes due to hypoxia, neurofibromatosis, Fahr disease or abnormal calcium metabolism, Wilson disease, and carbon monoxide poisoning [1, 7, 8]. All these conditions usually involve basal ganglia on both sides of the brain converse to

hyperglycemic hemiballism-hemicorea; however, a few cases of bilateral increased T1 signal intensity within the striatum have been reported in patients with hemiballism-hemichorea associated with hyperglycemia [1, 9]. Moreover, patients with hemiballism-hemichorea not related to hyperglycemia have a different presentation compared with this patient, and these conditions largely can be excluded on the basis of patient history and laboratory findings. Furthermore, in patients with hepatocerebral disease and manganese toxicity, the changes are seen mostly in the globus pallidus in contrast to hyperglycemia-related chorea-ballism where the putamen is the most consistent focus, as in this case [1, 7].

In patients developing hemiballism-hemichorea secondary to nonketotic hyperglycemia, the clinical course is usually favorable, and the symptoms tend to resolve spontaneously with normalization of hyperglycemia within hours, days, or weeks [10, 11]. Thus, normalization of glucose is the primary therapy, along with long-term diabetic control [12]. However, 20% of patients have some persisting hemichorea-hemiballism for more than 3 months, although it is typically much milder than that at presentation. In these cases, pharmacologic therapy has a role in improving symptoms [13]. In addition, striatal hyperintensity of basal ganglia is reversible after cessation of choreic and ballistic movements with complete resolution on CT and MR images within 2–11 months, although imaging resolution is slower than the clinical course [1, 14].

CONCLUSION

In summary, recognition of this unique clinicoradiologic manifestation with its peculiar CT and MR appearance is essential to select the correct therapy and avoid drugs to treat the clinical aspects of this syndrome when it is caused by hyperglycemia. Furthermore, vigilance for this cause of hemichorea-hemiballism is important, since the movement disorder may be the presentation of potentially dangerous underlying hyperglycemia.

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