PEER REVIEWED LETTER

Acute Chorea with Bilateral Basal Ganglia Lesions in Diabetic Uremia

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Uremia is a syndrome of clinical and metabolic abnormalities, which develops in parallel with the deterioration of renal function. Uremic encephalopathy is one of many manifestations of acute or chronic renal failure. It is usually applied to patients with cortical involvement,[1,2] such as confusion, seizure, tremor, myoclonus, or asterixis.[1-3] Some cases of acute extrapyramidal movement disorders associated with bilateral basal ganglia lesions, especially parkinsonism have been reported in uremic patients.[4-9] Here, we report a diabetic uremic patient who developed acute chorea associated with bilateral basal ganglia lesions.

A 68-year-old woman had suffered from non-insulin dependent diabetes mellitus for 20 years. She had been diagnosed with hypertension six years earlier and chronic renal failure four years earlier. She started to receive regular hemodialysis (three times a week) for the diagnosis of uremia [urea nitrogen 32.5 mmol/L (normal, 2.1~7.1), creatinine 816.4 μmol/L (normal, 27~71) at that time] for one year.

One week prior to her admission, sudden abnormal involuntary movement developed. Her vital signs included a blood pressure of 190/80 mmHg, a pulse rate of 76 /min, a respiration rate of 18 /min, and a body temperature of 36.5°C. During her neurological examination, generalized irregular, arrhythmic, continuous, and rapid involuntary movements were noted, especially in the distal limb and perioral area characteristic of chorea. These movements were not suppressible and sometimes interfered with voluntary movements such as standing and walking. Her consciousness was normal without cortical dysfunction. Motor and sensory systems were symmetrically normal.

Serum laboratory findings showed elevated urea nitrogen (18.9 mmol/L), creatinine (526.5 μmol/L), glucose [9.4 mmol/L (normal, 4.1~5.9)], and homocysteine [15.75 μmol/L (normal, 5.0~13.9)] levels. The results of the blood gas analysis were pH 7.32, PCO_2 38 mmHg, PO_2 74 mmHg, HCO_3- 19.5 mmol/L, and O_2 saturation 93%. All other laboratory findings including electrolyte, hepatic enzyme, thyroid hormone (T3, T4, thyroid stimulating hormone), calcium, thiamine and magnesium levels were within normal limits. An initial brain CT, performed at other hospital eight hours after symptom onset, showed unremarkable findings.

She was hospitalized and underwent hemodialysis every other day. A brain magnetic resonance (MR) imaging was performed two days after admission. Brain MR imaging (Figure A 1-5) depicted signal changes on bilateral basal ganglia (more in the right than the left) that were hyperintense on T2-, diffusion-weighted (*b*-values = 1000 s/mm^2), and fluid-attenuated inversion recovery (FLAIR) images, while the same lesions show hypointensity on T1-weighted image. On apparent diffusion coefficient (ADC) map, the corresponding areas have slightly increased signal intensities. Her choreic movements began to improve slowly. Four days after admission, serum urea nitrogen and creatinine levels were 11.4 mmol/L and 373.9 μmol/L, respectively. The choreic movements considerably improved four weeks later, at which point serum urea nitrogen and creatinine levels were 6.9 mmol/L and 221.3 μmol/L, respectively. Approximately 12 weeks later, only mild perioral dyskinesia remained. At that time, follow up MR imaging (Figure B 1-5) showed slightly decreased signal change and size of the focal edema on basal ganglia compared with the previous study. The obvious finding was that there were focal discrete symmetrical signal changes over the bilateral globus pallidus (arrows; hyperintense on T-2 weighted image and ADC map, and hypointense on T-1 weighted and FLAIR images) which was more prominent in the right than the left.

Discussion

We present a diabetic female patient with chronic renal failure who developed sudden choreic movements associated with bilateral basal ganglia lesions. The most commonly reported clinical manifestations of bilateral basal ganglia lesions in uremic patients are parkinsonism (bradykinesia, rigidity, postural instability, and gait disturbance with no resting tremor), followed by dysarthria, consciousness disturbance, dyskinesia, or dysphagia.[5,7,9] In our case, the patient showed no parkinsonism. As the final lesions were discretely seen on globus pallidus when she had recovered, external segments of bilateral globus pallidus

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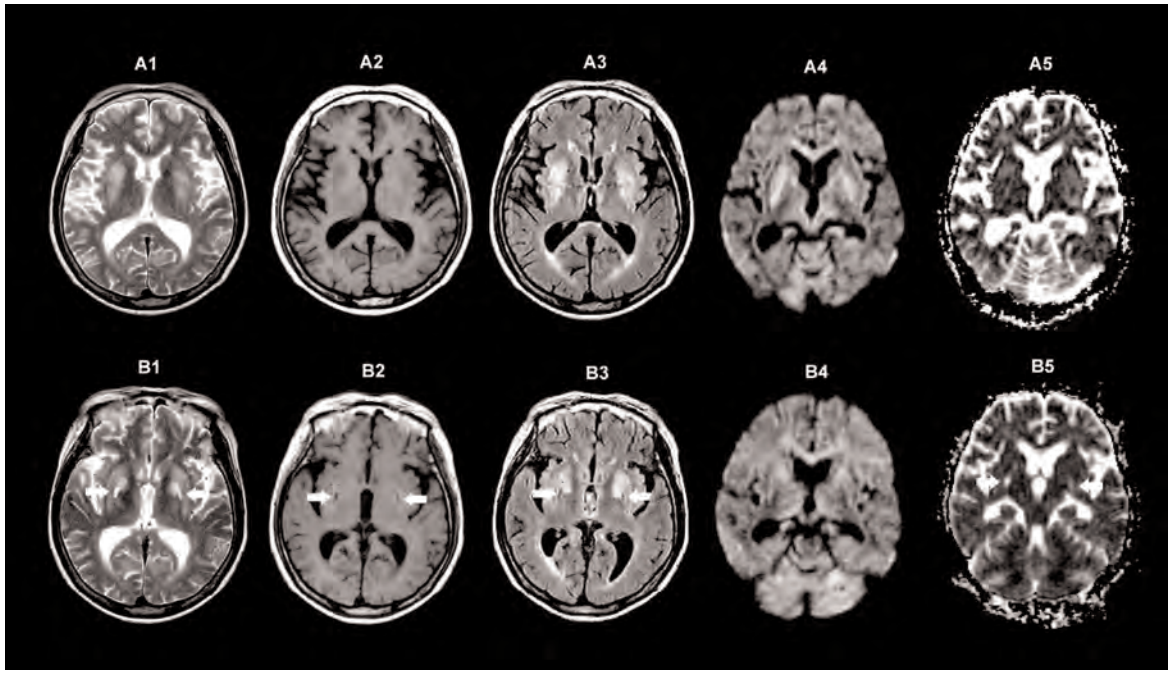

Figure: *1. T2-weighted image, 2. T1-weighted image, 3. fluid-attenuated inversion recovery (FLAIR) image, 4. diffusion-weighted image, 5. apparent diffusion coefficient (ADC) map. Initial brain MR imaging demonstrating bilateral basal ganglia lesions (A1-5). These areas show hyperintensities on T2-, diffusion-weighted, and FLAIR images, while the same lesions show hypointensity on T1-weighted image. On ADC map, the corresponding areas have slightly increased signal intensities. Follow up MR imaging (B 1-5) performed 3 months after onset shows decreased signal change and size of the focal edema in basal ganglia compared with the previous study. Discrete symmetrical signal changes over the bilateral globus pallidus are noted (arrows; hyperintensities on T2- weighted image and ADC map, and hypointensities on T1-weighted, and FLAIR images).*

might be predominantly responsible for chorea. In uremia, brain imaging shows hypodense areas on brain computed tomography, hypointensity and hyperintensity on T1-weighted, and T2-weighted MR images, respectively on basal ganglia.[4-7,9] The cardinal abnormal laboratory findings in this patient were the elevation of the urea and creatinine levels. It seems that there is no clear threshold to cause abnormal movements, as reported in laboratory findings[5,7,9] of other reports.

Although the exact pathogenesis of uremic encephalopathy is unknown, multiple chemicals including methylguanidine,[10] parathyroid hormone,[11-13] aluminum,[7] and metabolic acidosis[1] have been implicated as toxins in cases of uremia. The serum parathyroid hormone or aluminum levels are not always elevated in uremic patients with an acute movement disorder.[5]

Another possible etiology for extrapyramidal symptoms is thiamine deficiency.[14] It is possible for thiamine deficiency to develop as a result of dialysis,[14] and can lead to cellular hypoxia of the basal ganglia and extrapyramidal motor dysfunction due to the blocking of the citric acid cycle.[15] However, the serum thiamine level was within normal limits in this case.

In consideration of the clinicoradiologic aspects of the case, the acute onset and signal changes on the MR images (hyperintense on T2-, diffusion weighted, and FLAIR images, hypointense on T1-weighted image) suggested an ischemic insult, however, it is unusual for thromboembolic disease.[5] There are two reasons. First, bilateral basal ganglia lesions in this case showed hyperintensities on diffusion-weighted image and ADC map. These findings suggest that pathomechanism of perifocal edema might be vasogenic. A recent report[9] demonstrated that vasogenic edema on basal ganglia resulted from focal hyperemia secondary to abnormal vasodilatation, using MR angiography and SPECT. Second, the basal ganglia lesions described here were symmetrical. Symmetrical signal changes on brain MR imaging can be seen in patients with hypoxia or metabolic disorders such as hyperglycemia, liver cirrhosis and Wilson's disease. However, there was no history of hypoxic brain damage, hyperglycemia or hepatic disease in the present case.

On follow-up MR imaging, although signal change and size of the focal edema in basal ganglia were decreased compared with the previous study, the most characteristic findings are focal hyperintensities of the globus pallidus on T2-weighted image and ADC map with hypointensities of the corresponding area on T1-weighted, and FLAIR images. These findings are iso-signal with cerebrospinal fluid and suggest that cystic degeneration developed in the globus pallidus, as shown in a separate report.[8] Initial vasogenic edema was shown to regress in accordance with the normalized ADC map, but irreversible change occurred in the globus pallidus. Further large series need to be elucidated to confirm what cystic degeneration means.

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Usually, basal ganglia lesions in uremia develop in patients on inadequate hemodialysis[4-6] or not on hemodialysis.[7] Our patient developed chorea despite regular hemodialysis, but the chorea gradually improved after the frequency of hemodialysis increased.

In conclusion, bilateral basal ganglia lesions in diabetic uremia may have been damage from the combined input of microvascular dysfunction and uremic toxin accumulations. It is also noticeable that all the reported patients,[4-9] including this patient, are Asian. It remains to be elucidated whether there are some ethnic factors affecting the basal ganglia metabolism.

References

1. Raskin NH, Fishman RA. Neurologic disorders in renal failure. N Eng J Med. 1976;294:143–8.
2. Hughes JR. Correlation between EEG and chemical changes in uremia. Electroencephalogr Clin Neurophysiol. 1980;48: 583–94.
3. Raskin NH. Neurological complications of renal failure. In: Aminoff MJ, editor. Neurology and general medicine. New York, NY: Churchill Livingstone; 1995. p. 303–19.
4. Wang HC, Brown P, Lees AJ. Acute movement disorders with bilateral basal ganglia lesions in uremia. Mov Disord. 1998;13(6):952–7.
5. Wang HC, Cheng SJ. The syndrome of acute bilateral basal ganglia lesions in diabetic uremic patients. J Neurol. 2003;250:948–55.
6. Wang HC, Hsu JL, Shen YY. Acute bilateral Basal Ganglia lesions in patients with diabetic uremia: An FDG-PET Study. Clin Nucl Med. 2004;29:475–8.
7. Okada J, Yoshikawa K, Matsuo H, Kanno K, Oouchi M. Reversible MRI and CT findings in uremic encephalopathy. Neuroradiology. 1991;33:524–6.
8. Kim TK, Seo SI, Kim JH, Lee NJ, Seol HY. Diffusion-weighted magnetic resonance imaging in the syndrome of acute Bilateral Basal Ganglia lesions in diabetic uremia. Mov Disord. 2006;21(8):1267–70.
9. Lee PH, Shin DH, Kim JW, Song YS, Kim HS. Parkinsonism with basal ganglia lesions in a patient with uremia: Evidence of vasogenic edema. Parkinsonism Relat Disord. 2006;12:93–6.
10. Nakamura K, Ienaga K, Nakano K, Nakai M, Nakamura Y, Hasegawa G, et al. Diabetic renal failure and serum accumulation of the creatinine oxidative metabolites creatol and methylguanidine. Nephron. 1996;73:520–5.
11. Ritz E, Stefanski A, Rambausek M. The role of the parathyroid glands in the uremic syndrome. Am J Kidney Dis. 1995; 26:808–13.
12. Slatopolsky E, Martin K, Hruska K. Parathyroid hormone metabolism and its potential as a uremic toxin. Am J Physiol. 1980;239:1–12.
13. Smogorzewski M, Ni Z, Massry SG. Function and metabolism of brain synaptosomes in chronic renal failure. Artif Organs. 1995;19:795–800.
14. Hung SC, Hung SH, Tarng DC, Yang WC, Huang TP. Chorea induced by thiamine deficiency in hemodialysis patients. Am J Kidney Dis. 2001;37(2):427–30.
15. Janavs JL, Aminoff MJ. Dystonia and chorea in acquired systemic disorders. J Neurol Neurosurg Psychiatry. 1988;65:436–45.

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