Clinical Case Report

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Intermittent alien hand syndrome caused by Marchiafava–Bignami disease

A case report

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Abstract

Rationale: Alien Hand syndrome (AHS) is characterized in most patients by seemingly purposeful, involuntary movements of the extremities. It is not well known among physicians on account of its diverse clinical manifestations.

Patient concerns: We present a 57-year-old Chinese man who could not stop or turn himself around as he involuntarily and uncontrollably walked forward, which had happened frequently in the month prior to treatment. He had been a heavy drinker for thirty years before the onset of the disease, with an alcohol intake of 600 to 800 ml/day.

Diagnoses: History of alcohol intake and the brain magnetic resonance imaging findings indicated a diagnosis of Marchiafava–Bignami disease. The patient was additionally diagnosed with Alien Hand Syndrome according to his clinical symptoms.

Interventions: The patient was treated with high doses of vitamin B for 1 month.

Outcomes: The patient's abnormal behaviors never appeared during the treatment, and no instance of recurrence was observed during the 6 months of follow-up.

Lessons: The clinical manifestation of AHS is non-specific. Only by considering its diverse manifestation can doctors better understand the disease and achieve early intervention.

Abbreviations: ADC = Apparent Diffusion Coefficient, AHS = Alien Hand Syndrome, CDR = Clinical Dementia Rating, DWI = Diffusion-Weighted Images, FLAIR = Fluid Attenuated Inversion recovery, HAMA = Hamilton Anxiety Scale, HAMD = Hamilton Depression Scale, MBD = Marchiafava–Bignami disease, MES = Memory Executive Screening, MMS = Mini-mental State Examination, MOCA = Montreal Cognitive Assessment, MRI = magnetic resonance imaging, NPI = Neuropsychiatric Inventory, SMA = Supplementary Motor Area.

Keywords: alien-hand syndrome, callosal lesions, Marchiafava–Bignami disease

1. Introduction

Alien Hand Syndrome (AHS) is characterized by involuntary dyskinesia, presented most frequently in the hands, and Occasionally in the legs,[1] AHS also could be accompanied by abnormalities in limb's proprioception. We report a case of AHS caused by Malkia Fava–Bignami disease (MBD). Its unique onset and diverse clinical manifestations not only help to improve the understanding of AHS, but also enrich the clinical symptoms of AHS.

2. Case presentation

A 57-year-old right-handed man had exhibited sluggishness, indifference, clumsiness, and a tendency to not initiate speech or respond to social engagement for 6 months. The Chinese peasant was the patient consumed 600 to 800 ml of alcohol per day for more than 30 years. During the last 2 months of this period, the patient continually experienced the following intermittent episodes without any obvious cause:

- When farming, though the patient had tried to grab the top and bottom of a bag with his right and left hands, respectively, he uncontrollably grabbed the top of the bag with both hands. When the patient tried to release his left hand, both hands relaxed simultaneously. These episodes indicated the patient's lack of control of his left hand.
- When the patient tried to turn left when driving by turning the steering wheel counterclockwise with his left hand, his right hand would repeatedly turn the steering wheel in the clockwise direction. Such occurrences indicated the patient's lack of control of his right hand.

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- When the patient tried to place a battery in a device, he removed without intending to. He repeated the attempt several times before relenting to complete the task.
- After the patient had repaired of a farming truck, it should had been started and left running for a time. However, the patient repeatedly started the vehicle. Even though he realized his was making a mistake, he could not prevent himself from restarting the engine.
- The patient frequently felt that his right leg was extremely heavy and stuck in place, to the extent that he could only lift it and walk with difficultly. The sensation attenuated after a few minutes.
- When the patient was walking, he would realize that he was headed in the wrong direction. Despite this awareness, he moved forward uncontrollably until he reached an unintended destination or was able to get help from other to stop or turn.
- While he fed chickens, he often forgot to feed the chicken when he was inside the enclosure but remembered when he left it. This would happen repeatedly on any given episode.

In the course of the disease, there was no onset of disorders of the consciousness, convulsions, hallucinations, limb weakness, or abnormal paresthesia. Since the onset of the disease, the patient's diet, sleep, and weight remained normal.

The patient presented at our hospital 6 and 2 months following the onset of the aforementioned symptoms and episodes, respectively. On physical examination, his pulse was 83 bpm, and his blood pressure was 160/100 mm Hg. He was conscious, oriented with fluent speech, and exhibited no dysarthria. Both pupils were elliptical, reactive to light, and accommodated sensitively without any visual field defects; however, they were unequally sized: the diameter of the right and left pupils were 2.5 mm and 2.0 mm, respectively. Except for exhibiting left-sided central facial palsy, the other cranial nerves were found to be normal, and no significant abnormalities were found.

On cognitive examination, his Memory Executive Screening (MES), Montreal Cognitive Assessment (MOCA), Clinical Dementia Rating (CDR), Mini-mental State Examination (MMSE), Hamilton Depression Scale (HAMD), Hamilton Anxiety Scale (HAMA), and Neuropsychiatric Inventory (NPI) scores were 67 (>80, normal), 17 (>26, normal), 0.5 (=0, normal), score 29 (>2, normal), 1 (<7, normal), 1 (<7, normal), and 0 (= 0, normal), respectively.

Magnetic resonance imaging (MRI) of the head showed abnormal signals in the mouth, knee, body and gland of the corpus callosum on the sagittal view (margin signal is normal but the center signal is interrupted, (Fig. 1). The focus of T1-weighted and ADC both showed hypointensity (Figs. 2, 6). Hyperintensity was observed in T2-weighted, FLAIR, and DWI (Figs. 3–5). Enhanced MRI revealed that the body of the corpus calcium exhibited hyperextension (Fig. 7). The findings informed a diagnosis of Marchiafava–Bignami disease.

On laboratory examination, the patient's levels of serum uric acid, triglyceride, low-density lipoprotein cholesterol, and red blood cell were found to be 510 μmol/L (208–428, normal), 1.86 mmol/L (0.28–1.80, normal), 2.00 mmol/L (very high risk target < 2.07, normal), and 4.14×10^{12}/L (4.30–5.80, normal). No clinical or EEG seizures were observed. Cervical ultrasound revealed right carotid multiple plaque formation. Cerebral color ultrasound, electrocardiogram, and assessments of formic acid, vitamin B12, and blood sodium concentrations demonstrated no obvious abnormalities.

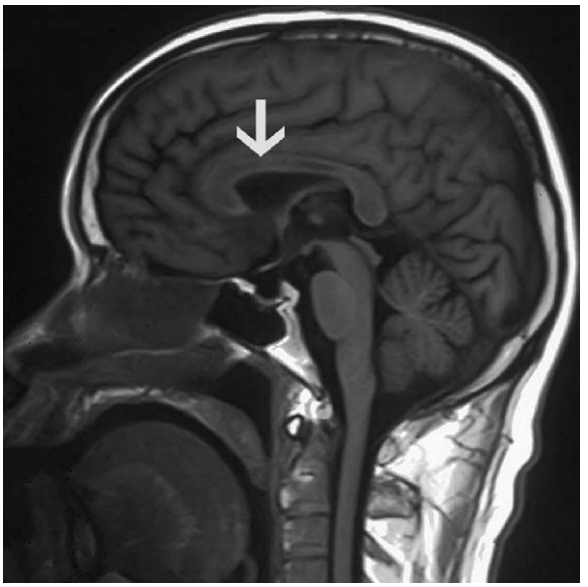

Figure 1. MRI T1-weighted on sagittal view showing intermittent hypointensity in the central part of the corpus callosum, but normal signal around the corpus callosum, which called "sandwich" sign.

The patient was treated with a high dose of Vitamin B for 1 month, and his abnormal behaviors did not recur during treatment or at any point during the 6-month follow-up. Unfortunately, as the patient declined to receive an additional head MRI examination, we could not evaluate the patient's degree of recovery from the lesion.

3. Discussion

MBD is a demyelination disease that mainly affects the central part of the corpus callosum. The lesions are symmetrical, involving the anterior and posterior union, subcortical white matter, and semicircular center.[2] Long-term chronic alcoholism

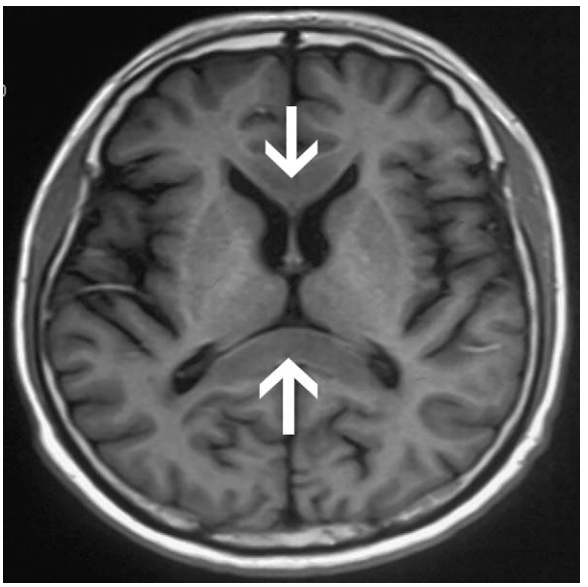

Figure 2. MRI TI-weighted on coronal view.

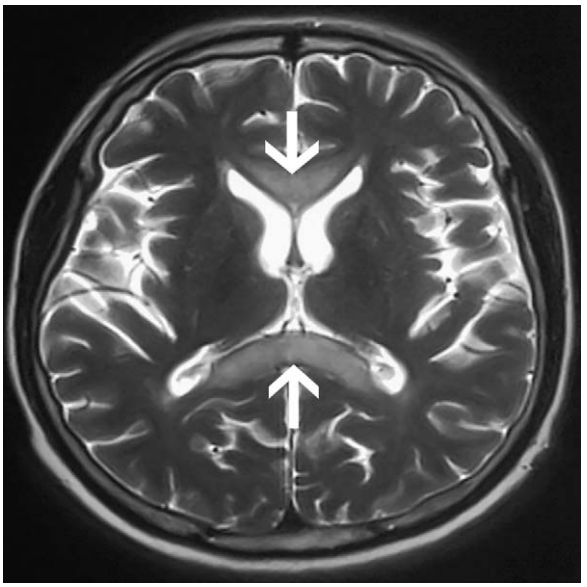

Figure 3. MRI T2-weighted.

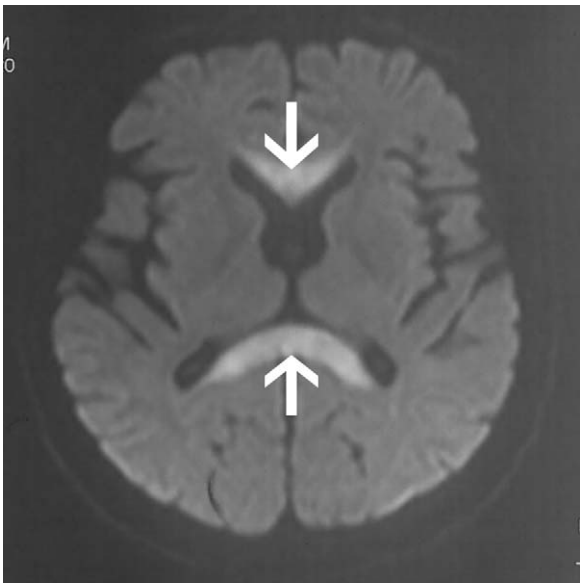

Figure 5. DWI showing abnormal hyperintensity in corpus callosum.

is a common feature of most patients with MBD. Clinical manifestations can be divided into 3 types[3]:

1. Acute, which is mainly characterized by the disturbance of consciousness;
2. Subacute, characterized by rapid progression dementia;
3. Chronic, mainly characterized by progressive dementia and AHS.[4]

Because the clinical manifestations of MBD are complex, its diagnosis is mainly based on history of long-term alcoholism and characteristic imaging manifestations. The acute phase is marked by swelling of the corpus callosum, is low T1 and T2 signals, high signal intensity on FLAIR and DWI, and low signal on ADC. The subacute and chronic phases are characterized by abnormal signals in the center of the corpus calcium while its ventral and dorsal sides remain relatively intact in a typical sandwich-like manifestation. MRI can therefore be a first-choice method used for diagnosis and follow-up of the disease. The prognosis is relatively favorable with alcohol withdrawal and treatment with high doses of vitamin B.

In the present case, the patient had a long history of alcoholism, and his main clinical manifestation was "slow response." His MOCA, CDR, and MES scores were lower than normal, these indicated cognitive dysfunction. His imaging finding showed a typical sandwich-like manifestation. In addition, after treatment with vitamin B, he recovered obviously and the abnormalities and disharmony of limb movement disappeared. In summary, the diagnosis of MBD was clear.

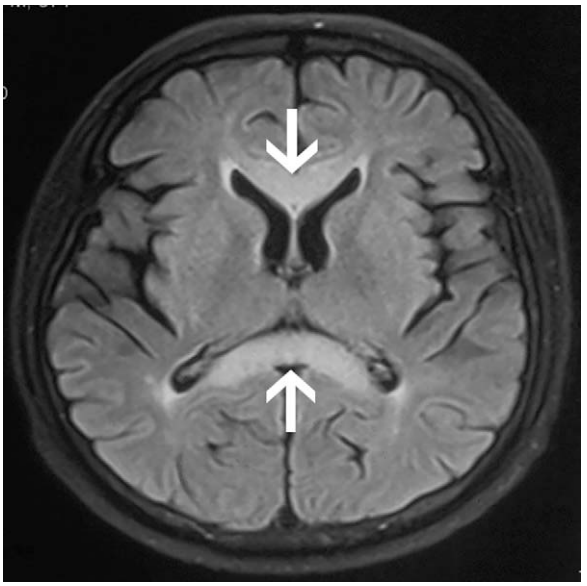

Figure 4. Flair showing abnormal hyperintensity in corpus callosum.

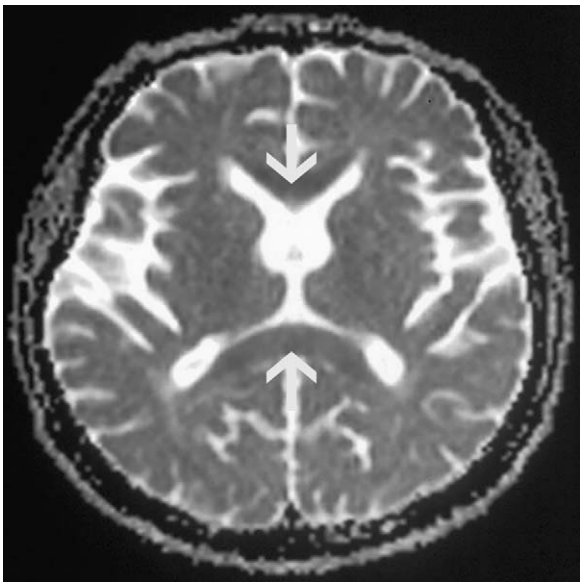

Figure 6. ADC showing abnormal hypointensity in corpus callosum.

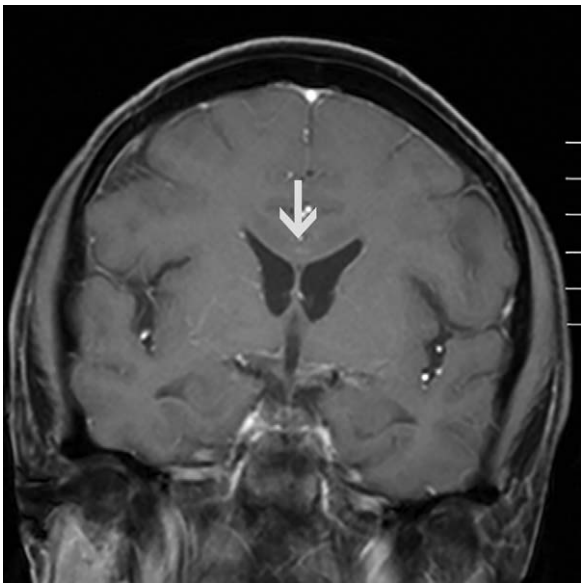

Figure 7. MRI Enhanced MRI (Fig. 7) showsing hyperintensity in the body of corpus callosum.

In the present case, we believe the patient's involuntary limb movements indicated AHS caused by corpus callosum lesions. AHS is a rare neurologic disorder first advanced by Goldstein[5] in 1908 in describing an older woman who had suffocated herself with her left hand. Beginning with the popularization of the condition by Stanley Kubrick's film "Dr Strangelove,"[6] the disease has garnered increasing attention on account of its complexity and mystery; however, the disease remains imprecisely defined.

AHS can be accompanied by a variety of diseases, such as demyelination disease,[7] prion disease,[8] cerebrovascular disease,[9] epilepsy,[10] and neurodegenerative disease.[11] Of these, neurodegenerative disease of the central nervous system is the most common.

In 1990, Goldberg and Bloom[12] suggested that limb movement involves 2 systems: the medial system, including movement planning, recruitment, and suppression of the supplementary motor area (SMA), and callosal convolution associated with expected movement of the contralateral limb; and the lateral system, which us comprised of the distal areas responsible for generating motion. The systems were described to be mutually inhibitory.

AHS is also known as callosal disconnection syndrome,[13] which is caused by corpus callosum lesions that induce the loss of inhibitory input from the SMA to the bilateral hemispheric motion areas; this accounts for the loss of suppression of the non-dominant hemisphere by the dominant hemisphere. AHS can be divided into 3 types according to the location of the lesion: frontal lobe (or anterior), which is the most common type[14]; corpus callosum; and posterior (or sensory).[17] Of these, the frontal-lobe and corpus-callosum types are considered the motor types. The frontal-lobe type is primarily caused by damage to the anterior part of the corpus callosum, anterior cingulum, medial frontal cortex, or the SMA. It is characterized by a unintentional gripping of objects within the visual field, groping actions, and manipulation of tools. The corpus callosum type,[16] which is characterized by conflicting motor movements between hands is caused by damage to the corpus callosum. The posterior type is mainly caused by damage to the thalamus or the parietal, medial temporal, or occipital lobes that damages fibers projecting from sensory inputs, visual guidance, or sensory integration to the motor planning area. Apart from involuntary movement, posterior AHS is often accompanied by self-agnosia or sensory disorders. It is noteworthy that the abnormal imaging findings of this patient were concentrated in the medial frontal lobe as well as the anterior and central areas of the corpus callosum, suggesting that the patient's main clinical manifestations should be motor AHS, without obvious agnosia or redundant hand sensory disorder. This was confirmed by the patient's inability to complete simple tasks, such as carrying batteries, feeding chickens, repairing farm wagons, or walking, as well as the patient's compulsion to repeat the actions. A recent study by Lhermitte suggests that the aforementioned abnormal manifestations were caused by the loss of inhibitory input from the parietal lobe after the frontal lobe was damaged,[15] and the release of parietal activity driven by external vision and tactile sensation. In addition, the patient's episodes of conflicting hand movements when he tried to turn the steering wheel are consistent with the inter-hand conflict characteristic of corpus-callosum AHS. Thus, the patient's clinical manifestations should be attributed to AHS without excessive hand sensory disturbance or the obvious loss of recognition.

AHS has a variety of clinical manifestations that mostly involve abberant limb movements. In 2003, Aboitiz classified AHS into 5 types according to its clinical symptoms[18]:

1. Hand-to-hand conflict, which usually involves the non-dominant hand, occurs when the patient attempts to complete a certain action, but the affected limb interferes by executing an action that opposes the movement of the unaffected limb. As in this case, the patient's right hand constantly interfered with his left, which made it difficult for the patient to complete tasks with his left hand. Some investigators posit that this abnormal behavior is caused by the loss of the inhibition from the cerebral hemisphere corresponding to the non-affected limb on the opposite hemisphere.[18]
2. Alien hands, which principally involves the non-dominant hand, occurs when the patient performs an action with the affected limb that, without the absence of visual assistance, he or she considered not to have been performed by him or herself.
3. Abnormal hands is characterized by the performance of what seems to be purposeful action, but is actually an involuntary movement; when leg is involved, it is often expressed as forced forward walking that is difficult to stop, the separation of intention and action such that the individual reaches an unexpected destination, and the inability to initiate movement with the lower limbs. As described in the present case, the patient would walk involuntarily forward to an unknown destination and experienced difficulty in stopping the movement, indicating that the action was not controlled by the patient's consciousness; moreover, the patient also felt that his right leg was excessively heavy, which made the initiation of walking excessively difficult.
4. Excess hands occur when patients have the feeling of additional limbs.
5. Competitive disability occurs when the a patient intention of using 1 limb to complete a certain action is compromised by the inability to control the other limb. This was exemplified in

the present case by the patient's inability to handle the bag. This is due to the damage to the corpus callosum that prevents the inhibition of the hemisphere contralateral to the affect limb, resulting in the uncontrolled abnormal activity of the non-dominant hand.

Interestingly, Lunardelli et al[19] found that patients with AHS have multiple intermittent dyskinesia and are environmentally dependent and that separation behavior is more likely to be driven by accidents rather than targets.[20] In addition, fatigue, anxiety, or impaired concentration reportedly exacerbate the frequency or intensity of alien-hand episodes.[21]

There is no effective treatment for AHS other than addressing the etiological factors. In 2010, Haq used clonazepam and botulinum toxin to treat a woman with sensory AHS and thus reduced the frequency of involuntary limb movement significantly.[22] Haq suggested that lorazepam might enhance the thalamic GABAergic pathway and desensitize the affected arm to external stimuli or inhibit the internal stimuli that drives AHS. In addition, Harini[23] found that some physical methods, such as cognitive behavioral therapy, visual space training, and distraction, also helped to attenuate the patient's AHS, but the efficacy of these methods is uncertain.

The etiology and clinical manifestations of AHS varied, often complicated by other diseases and is easily misdiagnosed. Some of the them have a good prognosis if they can be intervened early. Such as the case we reported here had AHS caused by MBD. Therefore, clinical practitioners should have increased awareness of AHS and strive to make an early diagnosis and addressing the underlying, variable etiology.

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