CASE REPORT

Secondary Mania after Cerebral Infarction in the Recovery Phase: Case Report

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Introduction: Although patients commonly experience psychological disorders such as depression following cerebrovascular events, mania is extremely rare. Here we present a patient who experienced secondary mania while being hospitalized in a convalescent rehabilitation ward following cerebral infarction. Case: The patient was a 70-year-old man who was hospitalized at our hospital for convalescent rehabilitation after suffering mild right hemiplegia and higher brain dysfunction following cerebral infarction. During hospitalization, the patient experienced a progression-free course. Upon awakening on day 26 after hospitalization, the patient suddenly showed signs of mania. The symptoms included elevated mood, pressured speech, hyperactivity, insomnia, and agitation; these symptoms caused problems in his daily life at the hospital. On day 29 after hospitalization, the patient was referred to a psychiatric hospital as an outpatient. He was diagnosed with organic manic disorder and was hospitalized. The patient was administered lithium carbonate (Limas®; 400 mg daily) and risperidone (Risperdal®; 2 mg daily). Because the mania persisted for more than 1 week, he was diagnosed with secondary mania. His manic state gradually improved, and he was transferred to our hospital. He was able to undergo rehabilitation without any problem and with no exacerbation of mania. The patient was discharged on day 139 after readmission. Discussion: In cases where patients with cerebrovascular disorders display abnormal behavior, it becomes necessary to differentiate between secondary mania and social behavior disorder. Because mania has a negative impact on the patient’s hospitalization and convalescence, if secondary mania is suspected, early consideration of psychiatric treatment is required.

Key Words: cerebral infarction; convalescent rehabilitation; late-onset mania; secondary mania; social behavior disorder

INTRODUCTION

Patients often experience psychological disorders such as depression following cerebrovascular events.1–4) The frequency of such disorders following stroke is 29%.1) Depression can affect the patient’s course of therapy, including rehabilitation, and this can become problematic.2) However, cases of post-stroke mania are extremely rare, occurring in less than 1% of patients.5–7) To the best of our knowledge, there are no reports of its occurrence during convalescence. Here, we report our experience with a patient who suffered secondary mania during hospitalization in a convalescent rehabilitation ward following cerebral infarction.

CASE

The patient was a 70-year-old, right-handed man. After graduating from college, he worked in a manufacturing company until he was 60 years old. He lived with his wife and daughter (three people in the household). His son lived in the neighboring prefecture. The patient’s hobby was music, and he had a sociable, cheerful personality. No difficulty with his family or others was reported. His medical history included appendicitis, varicose veins, and type 2 diabetes. He had no family history of mental illness.

Symptoms such as difficulty in speaking and the inability to operate the email function on his mobile device appeared...
suddenly. Because the symptoms showed no improvement after 20 days, he was examined at a neurosurgical hospital. Brain magnetic resonance imaging revealed, in the left temporal and parietal lobes, a low signal on T1-weighted imaging and a high signal on T2-weighted imaging. Consequently, the diagnosis of cerebral infarction was made. Because the patient had type 2 diabetes, he was diagnosed with atherothrombotic embolization and was administered clopidogrel sulfate (Plavix®), edaravone (Radicut®), and ozagrel sodium (Cataclot®). Although no atrial fibrillation was indicated, cardiogenic embolism could not be ruled out because of the extensive infarct area, and apixaban (Eliquis®) was administered. Because the patient had decreased motivation, he was also administered nicergoline (Sermion®). He received physical therapy (PT), occupational therapy (OT), and speech–language–hearing therapy (ST) for right hemiplegia, aphasia, attention disorder, ideomotor apraxia, and ideational apraxia. On day 50 of hospitalization, the patient was transferred to our hospital for convalescent rehabilitation.

At the time of hospitalization at our hospital, the following parameters were measured: height, 176.0 cm; weight, 67.0 kg; blood pressure, 107/69 mmHg; pulse, 65 bpm, regular; percutaneous arterial oxygen saturation, 98%; body temperature, 36.6°C; and Glasgow Coma Scale, 15 (eye opening: 4, best verbal response: 5, best motor response: 6). An electrocardiogram (ECG) indicated sinus rhythm. A head computed tomography (CT) examination revealed a region of low absorption in the left temporal and parietal lobes but did not indicate atrophy of the cortex (Fig. 1). The Brunnstrom stages were as follows: right upper extremity, V; left fingers, V; and right lower extremity, VI. The right grip strength was 10 kg, and the left grip strength was 20 kg. The Simple Test for Evaluating Hand Function (STEF) score was 70 for the right hand and 91 for the left hand, indicating mild right hemiplegia; however, the patient was able to walk without assistance. Examination of speech and language functions used the Standard Language Test of Aphasia (SLTA). This test revealed that listening and reading abilities had declined, and speaking and writing abilities had declined even further (Fig. 2). In terms of common daily language ability, the patient was able to vocalize as well as understand the spoken word at the word level; however, he had difficulty with short sentences. He communicated using words such as “OK” and “alright”; his vocalizations mainly comprised simple greetings, and he communicated using gestures and by making inferences about the person with whom he was speaking. The Revised Hasegawa Dementia Scale (HDS-R) score was 0, and the Raven’s Colored Progressive Matrices result was 30. In addition to aphasia, higher brain dysfunction included attention disorder, ideomotor apraxia, and ideational apraxia. He was unable to simultaneously concentrate on two things. He had much difficulty in imitating gestures. He was unable to shave with a razor, cut his nails, or use a mobile phone. The Functional Independence Measure (FIM) score was 101 (motor: 85, cognitive: 16), indicating that the patient was generally capable of performing the activities of daily living. The rehabilitation objectives were improvement of right upper and lower extremity hemiplegia, improvement of higher brain function, and discharge to home. One unit comprised 20 min of PT, OT, and ST, and he was placed on a schedule of 9 units per day. Administration of linagliptin (Tradjenta®; 5 mg daily) and clopidogrel sulfate (75 mg daily), which were prescribed by his previous physician, were continued. Because no atrial fibrillation was indicated by multiple ECG examinations provided by his previous physician or on the ECG examination performed on admission to our hospital, apixaban was discontinued. He no longer showed signs of decreased motivation; therefore, nicergoline was also discontinued.

After admission to the rehabilitation unit, PT consisted of walking training and right upper extremity functional training. OT consisted of right upper extremity functional training and rehabilitation for higher brain dysfunction. Cancellation and dual task training were conducted for attention disorder. Imitation training of gestures for communication was performed for ideomotor apraxia. Grooming activities training, such as shaving and cutting nails, and training to use a mobile device were carried out for ideational apraxia. Training to write his name and address was conducted for aphasia. ST consisted of aphasia rehabilitation, such as

![Fig. 1. Head computed tomography on admission.](image)
repeating sentences, reading aloud short sentences, and writing words. There was no abnormality in the patient’s vital signs or physical and psychological state. He could go outdoors and was allowed trips home several times a week.

On day 26 after hospitalization in the rehabilitation unit, the patient suddenly displayed signs of mania upon awakening at 6 a.m. His mood was elevated, he became talkative and used multiple nonsensical words at the word level; he rarely made eye contact, and he was easily distracted by people walking nearby. The patient suddenly began calling out to staff members and other patients and at times struck people on the shoulder. He would suddenly raise both hands and bend backward. He would also place his wallet and mobile device on the floor, and at times, he would suddenly push other patients’ wheelchairs at high speed. He interfered with nurses attempting to respond to other patients’ nurse calls and struck them on the chest. He attempted to hug a female therapist during rehabilitation and would stroke her arms as if trying to cling to her. He exposed his underwear and attempted to enter female-only rooms. He experienced insomnia at night and would wander the ward while calling out in a loud voice. In addition, the patient refused our recommendation of sleep medication. When he did fall asleep at night, he would get up again after only a few hours and continue wandering the ward. He entered the nurses’ station without permission and refused to leave when told to do so. He opened the curtains closing off other patients’ bed areas, called out in a loud voice, and sometimes caused trouble.
with other patients. Multiple patients in other rooms were frightened of him, and his behavior had an effect on the environment of the entire ward. A head CT showed no change since his initial head CT performed on admission to our hospital. On day 29 after hospitalization, it was explained to his main caregiver (his wife) that organic manic disorder was suspected, and it was becoming difficult to handle him in the unit; he was therefore referred to a psychiatric hospital as an outpatient. The patient was diagnosed with organic manic disorder; his rehabilitation was discontinued, and he was admitted to a psychiatric hospital. The patient was administered lithium carbonate (Limas®; 400 mg daily) and risperidone (Risperdal®; 2 mg daily). Although the patient showed an improving trend, his manic state continued for more than a week after the initial onset, and he was diagnosed with secondary mania. The patient’s manic state gradually improved at the psychiatric hospital after 9 days, and he was transferred back to our hospital.

The patient was treated with lithium carbonate (400 mg daily) and risperidone (2 mg daily) on readmission to our hospital. Because his mental state was stable, risperidone was reduced to 1 mg daily on day 9 and was withdrawn on day 16 after readmission. We checked serum concentration of lithium carbonate every month; it was 0.35–0.51 mEq/L (target serum concentration: 0.6–1.2 mEq/L). Because the patient’s mental state did not worsen, the lithium carbonate dose was not increased. He was once again able to perform rehabilitation without any problem and with no exacerbation of mania during hospitalization. In addition to the same rehabilitation as conducted during his previous admission, he also performed outdoor walking and climbing up and down a staircase as PT, performed constraint-induced movement therapy of the right upper limb as OT, and singing as ST. Subsequently, the patient’s FIM score improved to 106 (91 for motor items and 15 for cognitive items). The right grip strength and the STEF score for the right hand improved for motor items and 15 for cognitive items). The right grip strength and the STEF score for the right hand improved for motor items and 15 for cognitive items). The right grip strength and the STEF score for the right hand improved for motor items and 15 for cognitive items). The right grip strength and the STEF score for the right hand improved for motor items and 15 for cognitive items). The right grip strength and the STEF score for the right hand improved for motor items and 15 for cognitive items).

The patient exhibited a manic state 75 days after the diagnosis of cerebral infarction, and organic manic disorder was suspected at our hospital; subsequently, he was diagnosed with secondary mania at a psychiatric hospital. Secondary mania was first identified in 1978 by Krauthammer and Klerman; they identified its causes as neurological disorders, metabolic disorders, and addictive disorders. The diagnostic criteria for secondary mania are the following: (1) symptoms have persisted for at least 1 week, (2) the presence of elevated or irritable mood, (3) the presence of at least two of the following symptoms: hyperactivity, pressured speech, flight of ideas, grandiosity, decreased sleep, distractibility, and lack of judgment, (4) there was no previous history of manic depression or other affective illness and no symptoms of a confusional state (such as delirium) co-occurring with the mania. Furthermore, the validity of a diagnosis of secondary mania is supported when there is no family history of emotional disorder, there is a temporal association between stroke and the manic state, and onset takes place in an elderly individual. The temporal association is specifically defined as secondary mania that occurs within 2 years following the onset of stroke. In their study of 49 cases of secondary mania, Catarina et al. reported that 53% experienced onset of secondary mania on the day of stroke, 23% within 1 month after stroke, and 23% more than 1 month after stroke. Other characteristics of secondary mania in-

DISCUSSION

This patient suffered the sudden onset of a disturbed psychological state and exhibited abnormal behavior during hospitalization for convalescent rehabilitation. One type of higher brain dysfunction that appears as a sequela in patients with cerebrovascular disorders is social behavior disorder. Japan’s Ministry of Health, Labour and Welfare indicates that social behavior disorder is characterized by (1) a decline in motivation and drive, (2) the inability to control emotions, (3) dysfunctional interpersonal relations, (4) dependent behaviors, and (5) persistence. Social behavior disorder is common in cases of frontal lobe dysfunction and trauma-related diffuse axonal injury. The current patient displayed an inability to control emotions and dysfunctional interpersonal relations but did not display any other related disorders; moreover, the lesion site was in the left temporal and parietal lobes. The clinical presentation of this patient was not, therefore, a typical presentation of social behavior disorder. Instead, because the patient satisfied the diagnostic criteria for secondary mania, it is unlikely that his abnormal behaviors were evidence of social behavior disorder.
cluded a higher prevalence among males, no medical history or family history of mental illness, at least one vascular risk factor, no atrophy of the cortex, and right-side brain infarction. Common symptoms of secondary mania are elevated mood (92%), pressured speech (71%), insomnia (69%), and agitation (63%). The prevalence of a single manic symptom such as euphoria or elated mood has been reported. The current patient satisfied all the diagnostic criteria and supplementary items for secondary mania and displayed many of the characteristics indicated by Catarina et al. It was extremely unlikely that the worsening of psychological symptoms occurred as a result of the administration or cessation of medication; therefore, a diagnosis of secondary mania was valid.

There is no consensus regarding the relationship between the location of a brain lesion and psychological disorders. Although many studies have reported that there is a relationship between right cerebral hemisphere lesions and manic phase, there are also reports of mania in patients with left cerebral hemisphere lesions. Cases of manic phase only (unipolar group) and mania accompanied by depressive phase (bipolar group) both show a tendency toward a higher incidence of right cerebral hemisphere lesions. There is a high frequency of cortical lesions (temporal lobe and frontal lobe) among patients in the unipolar group and a high frequency of subcortical lesions (head of caudate nucleus and thalamus) among patients in the bipolar group. The manic phase reportedly occurs when the basal ganglia and the frontal and temporal lobes are simultaneously and multiply impaired (mixed infarction). Although the current patient had a brain lesion in the left cerebral hemisphere, it was a mixed-type cortical lesion in the temporal and parietal lobes.

The age of the current patient at the time of mania onset was 70 years, indicating an older individual. Late-onset mania that occurs in the involutional period and senescent period is rarer than late-onset depression. Reportedly, 17%–43% of patients with late-onset mania have indications suggesting organic brain abnormalities, a finding that suggests the presence of secondary mania. The characteristics of late-onset mania include minimal medical history or family history of mental illness. There are only a few genetic factors for mania accompanying organic cerebrovascular disorders. In addition, in many cases, the personality of the patient prior to the occurrence of late-onset mania is characterized by conscientiousness, seriousness, and nervousness. Within the preceding 4 weeks of the occurrence of late-onset mania, many patients reportedly experienced a death or separation in the family, trouble at work, or other lifestyle-related events or physical conditions, such as a respiratory disease. In the present case, there was no family history of mental illness, and the patient did not display a nervous personality or experience any family difficulties or other physical illness prior to the onset of mania.

The frequency of onset of secondary mania following cerebrovascular disorders is not high, but once it occurs, it is often difficult to handle. There is increased need for psychological therapy in the acute stage of mania; however, because patients are often unable to recognize that they are ill, it can be difficult to inform the patient of the disease and obtain consent for treatment. Therefore, information should first be provided to the family and caregiver to obtain consent. In the present case, because the mania was accompanied by aphasia, the patient was unable to understand why he required a psychological examination. Therefore, his wife, who was his main caregiver, was given explanatory information, and she provided consent for the psychological examination.

Treatment for organic cerebrovascular disorders comprises the administration of lithium carbonate and anti-epileptic agents such as sodium valproate and carbamazepine. The current patient was administered lithium carbonate in the psychiatric hospital. In many cases of mania in elderly patients, lithium carbonate is as effective as when used in younger patients. However, the pharmacokinetics of lithium carbonate changes as a person ages, and elderly patients are more likely to have changes in renal function that can lead to lithium poisoning. Therefore, it is necessary to monitor serum lithium levels during treatment. Lower doses of lithium are more effective in cases of late-onset mania than in cases of early-onset mania, and recurrence is infrequent. Although the patient’s serum concentration of lithium carbonate was low during hospitalization, his mental state did not worsen.

The present study reports our experience of a patient with secondary mania following cerebral infarction. Secondary mania should be kept in mind as a possible complication in patients with cerebrovascular disorders. In a patient with a cerebrovascular disorder exhibiting abnormal behavior, it is necessary to differentiate secondary mania from social behavior disorder. Mania has a negative impact on a patient’s hospitalization and recovery. Therefore, if secondary mania is suspected, it is necessary to consider early psychiatric and psychological interventions.
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CONFLICTS OF INTEREST

This study was approved by the Research Ethics Committee of Toyonaka Heisei Hospital and was carried out in accordance with the principles of the Declaration of Helsinki and CARE guidelines. Informed consent was obtained from the patient and his wife for publication of this case report. The authors report no conflicts of interest.

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