

Changes in Personality and Emotion following Bilateral Infarction of the Posterior Cerebral Arteries

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Abstract: Remarkable changes in personality, emotion and behavior were observed in a 66-year-old female with bilateral infarction of the medial inferior portion at the temporo-occipital region. Aggressiveness, emotional lability and indifference were noted in the patient as psychiatric manifestation. No definite delirium, however, was observed. A neuroradiological examination revealed the lesions located at the territory of the posterior cerebral artery, which involved the hippocampus, the parahippocampal gyri, the fusiform gyri and the lingual gyri. Therefore, the psychiatric disturbances and the neuropsychological symptoms presented here are attributed to these lesions with the multiple infarctions in the brain. The present case is noteworthy for its unique changes in personality and emotion which in the literature have not reported to be caused following the vascular accident of the bilateral posterior cerebral artery.

Key Words: *personality change, emotional disturbance, bilateral occlusion of posterior cerebral arteries*

Jpn J Psychiatr Neurol 46: 897-903, 1992

INTRODUCTION

Many neuropathological and neuropsychological findings have been reported in association with the disturbances of the emotional functions.^{4,17} These disorders were attributed to the lesions of medial temporal lobe, prefrontal area, cingulate gyrus, hypothalamus, amygdala and hippocampal complex. These lesions were frequently found to be bilateral. The lesions were commonly caused by tumors, epileptic seizure foci, cerebral birth

trauma and localized removal of cerebral tissue in surgical treatment.¹⁷ The emotional disturbances varied by many factors, such as the size of the lesions, the area of the lesions and underlying cerebral diseases.^{6,17} Only a few reports discussed that the vascular accidents were the causes for emotional and behavioral disturbances such as Klüver-Bucy syndrome. Lesions due to vascular accidents are unlikely to be bilateral and also they are not frequently localized in the limbic system or the medial temporal lobe. Probably these factors are some of the reasons for the rare appearance of such cases.¹⁷

We present here a case with bilateral infarction of the posterior cerebral arteries showing unique changes in emotion and per-

Received for publication on June 3, 1992.

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sonality, and various types of neuropsychological disturbances. It is of interest to discuss that the emotional disturbances were associated with the bilateral temporo-occipital infarction.

CASE REPORT

The patient was a 66-year-old right-handed female. She was born after a normal pregnancy and delivery. She had always been in good health and graduated from a nursing school and had worked as a nurse for a while. She started working at a municipal office at the age of 30. Later she became a chief of the welfare section and a master of a home for children. At the age of 63, she became to be given to weeping and showed a gait disturbance. Three months later, changes in her personality, such as emotional lability, belligerence and indifference, were found. She often grumbled about the associates at her office. She had suffered from a chest pain and cardiac hypertrophy and was recognized as arrhythmia at a local medical hospital on January 24, 1990. Two months later, her recent memory disturbance was noticed by her family. She had delusions of persecution and poverty and became indifferent and disobedient. She sometimes shouted at passengers without any reason and stroke at her family or bit at her close friends. She showed dysarthria and verbigeration. She could walk alone and eat food with help in her daily life.

She was referred to the Tsukuba University Hospital for treatment of the neuropsychiatric manifestations on November 8, 1990. The changes in personality, memory disturbances and disorientation were observed. Brain CT revealed a symmetrical low density area in the bilateral temporo-occipital region. At the age of 65, she showed unconsciousness with eye deviation to the right on January 17, 1991. About a day later, she responded to simple commands and complained to her family that she could not see at all. She became more irritable, disobedient and lazy. She always rejected any offer by her family to

help her. When her family tried to humor her, she only answered bluntly to them. She was agitated impulsively and kicked and struggled meaninglessly. When lying in bed, she cried to a pot near her bed, "Why are you standing here?" When her family asked names of some objects to her, she looked at them quickly, but answered constantly, "I cannot see anything," without giving a thought. In addition, she showed bizarre behaviors, such as calling one of her family suddenly by an unfamiliar name and singing a few measures of songs. She was admitted to the psychiatric ward, Tsukuba University Hospital, for detailed psychiatric, neurological and ophthalmological examinations on April 16, 1991.

She was 141 cm in height and 42 kg in body weight. A general physical examination revealed no remarkable abnormality. Routine hematologic studies, urinalysis and serum enzymes presented normal results except for slight hypoalbuminemia. Left ventricular hypertrophy was found by ECG, a chest X-ray and ultrasonic cardiography (UCG). Neurological examinations showed bilateral hyperactive biceps reflexes, positive pathologic reflexes; Chaddock's reflex, palmomental reflex, snout reflex, tonic reflex, orbicularis oculi reflex and orbicularis oris reflex. Intentional tremor and Horner's sign (narrowing of the palpebral fissure, enophthalmos, ptosis) were observed in the left side. Neither superficial nor deep tendon sensation was examined because of her uncooperative attitude.

She was alert but not cooperative in examinations. Her attention was often disturbed. She could not tell us her history sufficiently because she did not speak spontaneously and her speech was not meaningful. With a monotonous voice and immobile face lacking affective expression she only gave us short answers to our questions. She was indifferent and apathetic. She was not concerned about her environments and her own condition with severe illness. She was never willing to do anything by herself and only lay in bed all day. Any attempt to examine her neurological functions provoked her into spitting, biting,

striking and kicking her doctors or nurses. She sometimes grasped the examiner's clothes with a burst of rage caused by any tactile stimulation or repetition of questions. When some objects were shown to her at 30 cm distance in an examination of visual functions, she reacted by grabbing these objects and throwing them away. She beckoned a male doctor into her bed when he came into her room. Oral tendency, hypermorphosis, altered dietary habits commonly seen in Klüver-Bucy syndrome were not observed in the present patient. While visual hallucinations appeared, any other psychiatric symptoms, such as delusions and depressed mood, were not observed.

She could tell her name, age, date of birth and her husband's name correctly. She could, however, remember neither the address nor names of her children. Disorientation to person, time and place and both short- and long-term memory disturbances were revealed. She could recall without mistake seven digits in the forward order and three digits in the backward order and repeat sentences containing 5 phrases when she could maintain her attention throughout these tasks. Immediate memory disturbances and confabulation were not observed. She could do sums and subtractions with numbers of two figures and subtract serial 7s from 100 down to 72 when she was in a good mood. Her general logical function was, on the whole, intact and she could talk to us without hesitation. Proverb interpretation was generally meaningful. She could not finish the WAIS-R test and reading test because of her regressive behavior, negativism and petulance. The Similarities Test of the WAIS revealed her disability to abstract. The Information and Comprehension Tests suggested a slight impairment of the social judgment and thought.

She was unable to identify primary colors, particularly blue, green and orange. She was 25% correct in telling a name of a color shown to her and in selecting a card of a color in question. She was 60% correct in a task to

select a card of the same color shown in front of her from a variety of colored cards. It took her over 30 seconds to give a right answer in each test. Her answer was quick and correct in a test with black and white colors. She was able to distinguish dark from light. She was 80% correct in providing color names from memory in response to questions.

She failed to recognize her doctors and nurses in spite of the fact that she had seen them several times before. She could not identify even her family by sight. She, however, could recognize them immediately by expressing surprise once they spoke to her. She was also unable to identify simple objects by sight, but could name them immediately by touching them.

She had no difficulty in writing her name and drawing or copying common two-dimensional geometric forms such as a circle, a triangle and a square. An assessment of her spontaneous speech revealed no evidence of aphasia or other language disability. She could describe features of common objects when those names were given. Reversely, she could tell the names of objects when those objects were described to her. She could name her body parts and common objects correctly. Apraxia, right-left agnosia and finger agnosia were not observed by several neuropsychological tests.

Brain CT demonstrated bilateral symmetrical low density areas in the temporo-occipital region, involving the parahippocampal gyrus, fusiform gyrus, lingual gyrus and cuneus (Fig. 1). The region corresponded to the territory of the cortical branch of the posterior cerebral artery. Diffuse cortical atrophy and dilatation of the 3rd, the 4th and the lateral ventricles were found. Lacunar infarctions were found in the right putamen and the surroundings of the lateral ventricles. T2-weighted axial and coronal section by MR (TR=2,500 msec/ TE=90 msec) showed high intensity areas at the same parts where the low density area was revealed by brain CT and also in the left cerebellar hemisphere. The lesions in the parahippocampal, lingual and



Fig. 1: Symmetrical low density area with diffuse cortical atrophy was demonstrated in the bilateral temporo-occipital regions. It was involved in parahippocampal gyrus, fusiform gyrus, lingual gyrus and cuneus. There were also multiple small infarctions in right putamen, the surroundings of the lateral ventricles and left cerebellar hemisphere.

fusiform gyri and the hippocampus were located predominantly in the left hemisphere (Fig. 2a, b). Low intensity areas were also found in the temporo-occipital region, suggesting deposit of hemosiderin. On the other hand, there was no definite abnormal lesion in the frontal lobe on the axial and the coronal slices. A low perfusion in the bilateral occipital area was found in ^{123}I -IMP (N-isopropyl-p-iodoamphetamine) SPECT images. EEG showed irregular unsteady alpha waves of 8-10 Hz with a moderate voltage of theta waves of 5-7 Hz in the central, parietal and occipital areas.

The pupils were anisocoric in size (lt; 3 mm, rt; 5 mm). The pupil reaction to light was bilaterally quite normal. The appearances of the cornea, media and optic funds of the right eye were normal but old obstruction of the central retinal vein and synechia iridis posterior was evident in the left eye. The blinking reaction to light or threatening movement was present. There was no nystagmus. She could gaze at all directions with a full range of the eye movement. She was not cooperative in an examination of visual acuity

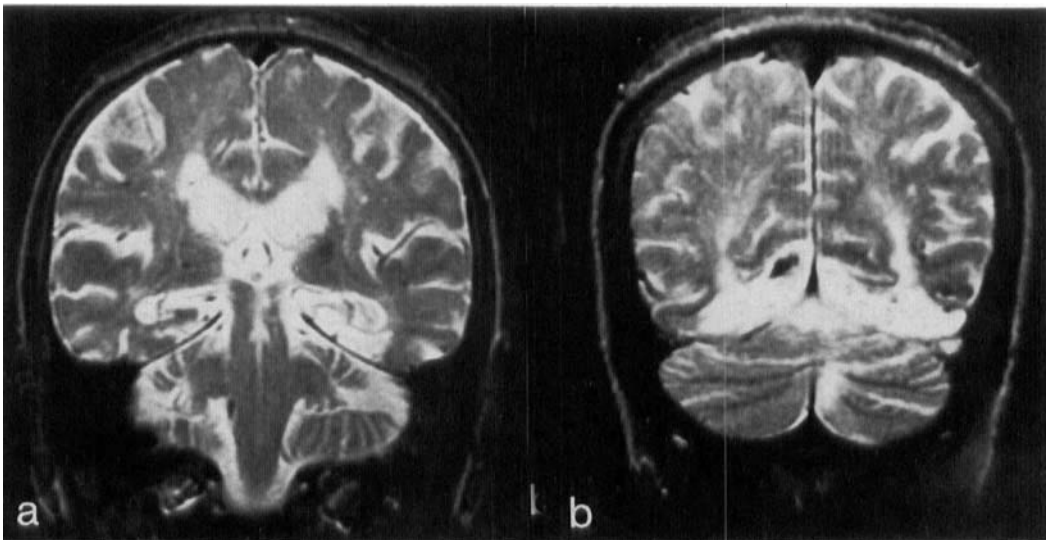


Fig. 2a, b: T2-weighted coronal section by MR revealed high intensity area in the lesion correspondent to the low density area on brain CT. The lesion in temporo-occipital regions involving the hippocampus was predominantly noted in the left hemisphere.

and field. When an object was shown in front of her eyes, she always told us that she could not see anything although she could fix her eyes on the object. She displayed a marked bilateral limitation of the visual field, i.e., tunnel vision, by the confrontation test at her bedside. She appeared to be aware of her visual disturbances. Electroretinogram (ERG) and flash visually evoked responses (VER) were normal. With her ophthalmologic data we obtained we could estimate that her visual acuity was at least 0.1 according to Ishihara's criteria of visual acuity. Her audiogram was normal.

Her neuropsychiatric and visual disturbances have continued for the following several months of our observation. She was discharged from our hospital on July 17, 1991.

DISCUSSION

Various types of disturbances in the visual and nonvisual systems are known to appear in patients with lesions located within the territory of the posterior cerebral arteries. Anomic aphasia, alexia without agraphia, amnesic syndrome and visual agnosia appear predominantly in cases with the left occipital infarction. Charcot-Willbrand syndrome and a loss of visual dreaming occur in patients with the right occipital infarction. Visual defects, such as cortical blindness and Balint syndrome, are known to be caused in patients with bilateral infarctions in the territory of the posterior cerebral arteries.^{4,8} Dide-Botcazo syndrome, including severe and permanent disturbances of both memory and vision, also often occurs in bilateral cases.^{2,7,16,18,25}

Depression and obsessive thinking also frequently appear, but not specifically, in patients with lesions in the left hemisphere. The psychiatric symptoms are generally known to occur due to the infarction of the bilateral occipital lobe and the limbic system caused by the occlusion of the posterior cerebral arteries.^{2,3,5,7,9,10,13-15,22,24} These include agitation, restlessness, excitement, confusion and in-

difference as well as memory disturbance and hallucination. Horenstein *et al.*¹⁰ discussed that agitated delirium was also attributable to the bilateral infarction of the undersurface of the temporal and occipital lobe, in particular, calcarine, fusiform and lingual gyri and the region extending to the medial hippocampal complex. The behavioral abnormalities include restlessness, agitation, forced crying and hyperreaction to the sensory stimuli. The patients with these symptoms were reported to usually recover within several days to 2 months.^{4,6,10,13,14} There were, however, some reports describing cases which showed no psychiatric manifestation following the bilateral or unilateral infarction of the temporo-occipital region.^{1,12,18,21,25}

The present patient showed marked changes in personality, emotion and behavior with other disturbances, such as severely limited bilateral visual field, various types of visual agnosia (object agnosia, prosopagnosia, inability to identify colors), amnesic syndrome, dysarthria and neurological abnormalities. The changes in personality and emotion included emotional lability, burst of rage, indifferent and disobedient attitude. Many past reports described a delirious state in patients with bilateral infarctions of the territory of the posterior cerebral arteries. Neither hallucinatory delusional state nor incoherent speech, however, was clinically observed in the present patient. Repeated EEG examinations also revealed no evidence of the delirium. It is noteworthy that the bilateral occlusion of the posterior cerebral artery caused the marked personality changes rather than disturbances of consciousness such as agitated delirium.

She showed hypersexuality, burst of rage and aggressiveness. Hypersexuality is known as one of the characteristic symptoms in Klüver-Bucy syndrome. Aggressive behavior is also recognized in the syndrome, though not so frequently as hypersexuality is.^{19,20} Other classical behavioral abnormalities of Klüver-Bucy syndrome, however, did not occur in the present case. There were a few

reports showing etiologically that vascular factors, such as occlusion or narrowing of the middle cerebral arteries with multiple small infarctions scattered over the whole brain^{11 23} and embolism due to postpartum coagulopathy¹⁹, caused Klüver-Bucy syndrome. In spite of the high morbidity of cerebral vascular accidents, the past reports did not recognize the vascular accidents as a cause for emotional and behavioral disturbances such as Klüver-Bucy syndrome.¹⁷ Lesions due to the vascular accidents are unlikely to be bilateral and also they are not frequently localized in the limbic system or the medial temporal lobe.

There was only one case described by DeJong *et al.*⁵ which showed changes in personality and emotion similar to those in the present case. They reported that in their case neuropathologically bilateral lesions were localized within the medial inferior portions of the temporo-occipital lobe in the territory of the posterior cerebral arteries. Particularly, the hippocampal formation, the parahippocampal gyri, the fusiform gyri, the lingual cortex and the calcarine cortex were bilaterally involved while the thalamus, the uncus and the amygdala were not impaired.

In most of the reported cases with bilateral occlusion of the posterior cerebral arteries, the lesions predominantly affected the left hemisphere.^{5 13 14 24} There were a few cases with unilateral lesions.^{10 12-14 21} Occasionally, multiple small infarctions were disclosed in other brain regions.^{3 10 13 22 24} The unique psychiatric disturbances in the present case occurred possibly because the lesions in the territory of bilateral posterior cerebral arteries were predominantly affected in the left hemisphere accompanying with small infarctions in other regions.

In conclusion, the unique psychiatric disturbances, such as marked changes in personality, emotion and behavior, found in the present case occurred possibly because of the bilateral lesions in the hippocampus and the medio-inferior portion of the temporo-occipital region. Many more lesions were

found in the left hemisphere. Varied neuropsychiatric disturbances were reported to be caused due to many different factors such as the size and distribution of the lesion involved in the specific brain regions for emotion, the pathological process and premorbid psychological or organic conditions and the number of small infarctions in the brain.⁶ Cases with the bilateral occlusion of the posterior cerebral arteries should be further studied symptomatologically.

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