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Case report

Hypersomnia due to acute disseminated encephalomyelitis in a 5-year-old girl

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Abstract

A 5-year-old girl suffering from hypersomnia due to acute disseminated encephalomyelitis (ADEM) is reported. Brain CT revealed a large low-density lesion involving the lentiform nucleus, posterior limb of the internal capsule, thalamus, posterior hypothalamus and midbrain in the left side. She was treated with intravenous dexamethazone. After the initial dose of dexamethazone, hypersomnia was dramatically and rapidly improved. A later brain CT study disclosed that the lesion in the brain disappeared. The brain lesion in this case involved the waking center in the brain, which was described by Von Economo. We concluded that hypersomnia in this case was due to ADEM involving the neural mechanism for maintaing wakefulness, probably in the thalamus and posterior hypothalamus. Repeat all night polysomnograpy in this case disclosed prolonged total sleep time and increased amount of stage 3–4 sleep in the hypersomniac state. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

Brain tumor, encephalitis and stroke involving the diencephalon not infrequently cause hypersomnia [1]. Acute disseminated encephalomyelitis (ADEM) is an acute inflammatory demyelinating disease of CNS characterized by the onset of neurologic deficits occurring days to weeks after viral infection or vaccination [2]. The disease is thought to be mediated by some immunological mechanism. ACTH and dexamethazone are widely used for treatment of ADEM but its therapeutic outcome is variable [2,3]. We report a 5-year-old girl with hypersomnia due to ADEM, from which she recovered immediately after beginning treatment with dexamethazone. Although a decreased level of consciousness due to ADEM has been shown frequently [2,4], repeated polysomnographic data of a patient showing hypersomnia due to ADEM has not yet been described.

2. Case report

A 5-year-old girl, with no preceding infectious illness, began to suffer from hypersomnia accompa-

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nied by frequent yawning in the beginning of October 1986. Previously, she slept about 9 h per night and usually did not take daytime naps. After the onset of hypersomnia she took a long nap every afternoon. In the hypersomniac state, she slept over 10 h per night and did not get up by herself in the morning. However, after getting up, she played a lot in kindergarten as usual and her appetite did not change. A few weeks after the beginning of hypersomnia she began to show an abnormal posture, leaning slightly to the right side. On November 11th, her facial appearance became very dull and she was not able to keep her eyes open. Upon admission to our hospital she appeared very sleepy, leaned her head to the right side, and could not walk smoothly. Her body temperature was 37.9°C, body weight was 16 kg and height was 106 cm. Her grip strength was apparently weak, 5 kg in either side. Her muscle tone, muscle stretch reflexes, cerebellar findings and plantar responses were normal on admission day, however right extensor plantar response appeared 2 days later.

The results of other physical and neurological examinations were normal. Erythrocyte sedimentation rate was moderately increased (33 mm/h). However, C reactive protein was not increased. Blood chemistry, electrocardiogram (ECG) and chest radiograph were normal. The lumbar puncture showed 20 white blood cells/mm [3] (75% lymphocyte) with normal glucose and protein amount. EEG in the waking state showed slight slowing of the basic rhythm (7–8 Hz) without any pseudoperiodic or spike activity. During the EEG recording, she could not keep awake without being stimulated verbally. Nocturnal polysomnography revealed that her total sleep time (TST) was 570 min, sleep latency was 1 min, and sleep efficiency was 95%. Significantly high amount of SWS was observed (Table 1). The percentages of sleep stages were 0.2 wake, 9.3 stage 1, 24.2 stage 2, 45.2 stage 3–4 and 21.2 REM sleep. Neither periodic limb movements nor sleep apnea were observed. Brainstem auditory evoked potential (BAEP), visual evoked potential (VEP), and somatosensory evoked potential (SEP) were normal. A brain CT (Shimadzu, SCT 200N) with contrast enhancement showed a large, diffuse and enhanced low-density lesion in the left brain including the lentiform nucleus, posterior limb of internal capsule, thalamus, posterior hypothalamus and midbrain (Fig. 1 upper).

Table 1
Polysomnographic findings

Sleep parameters	Nov/16	Dec/4
Time in bed (min)	600	540
Total sleep time (min)	570	424
Sleep onset (min)	1	14
WAKE (min)	1	79.5
Stage 1 (min)	53.5	18
Stage 2 (min)	138	193.5
SWS (= stage 3 + 4) (min)	258	114
REM sleep (min)	120.5	98
Sleep efficiency index (%)	95	78.43
Wake (%)	0.18	18.75
Stage 1 (%)	9.39	4.25
Stage 2 (%)	24.21	45.64
SWS (= stage 3 + 4) (%)	45.26	26.89
REM sleep (%)	21.14	23.11

Based on this CT finding, her pathological brain condition was considered to be glioma with secondary brain edema.

Intravenous dexamethazone (2 mg/day) was administrated on November 17th for the purpose of reducing her brain edema. Several hours after the intravenous administration of the initial dose of dexamethazone, her hypoactivity and hypersomnia gradually faded away. On the following day she walked smoothly. The dosage of dexamethazone was tapered and was discontinued on November 28th. Her symptoms did not reappear. Brain CT (General Electric, CT/T 8800) examined on December 2nd disclosed complete resolution of the cerebral lesion (Fig. 1 Lower). Nocturnal polysomnography performed after her recovery from the hypersomniac state revealed that her TST decreased to 424 min. Sleep latency was 14 min and the percentages of sleep stages were 18.7 wake, 4.2 stage 1, 45.6 stage 2, 26.9 stage 3–4 and 23.1 REM sleep, indicating that the percentage of stage 3–4 sleep decreased markedly (Table 1). Sleep latency and the percentage of stage 2 were increased as compared to the previous recording. BAEP, VEP and SEP were within normal range.

A second lumbar puncture performed on December 5th showed normal cell count, normal fluid chemistry, and normal amount of gamma-globulin. There was an excessive amount of total globulin and three oligoclonal bands were found in her cerebrospinal fluid (CSF). Serological and CSF viral titers (influenza A, influenza B, mumps, adenovirus, herpes simplex, varicella

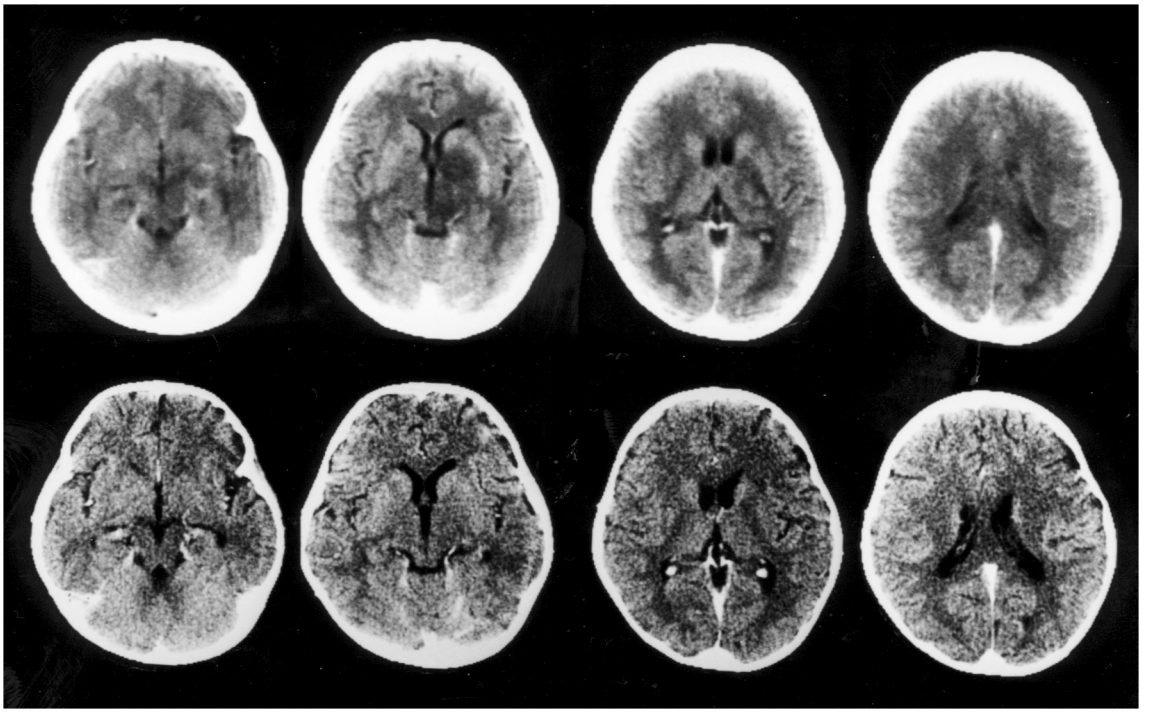

Fig. 1. (Upper) A brain CT (Shimadzu, SCT 200N) examined on the day of her admission with contrast enhancement showed a large, diffuse and enhanced low-density lesion in the left brain including the lentiform nucleus, posterior limb of internal capsule, thalamus, posterior hypothalamus, cerebral peduncle, and superior colliculus. (Lower) Brain CT (General Electric, CT/T 8800) examined 2 weeks after the beginning of dexamethazone administration showed complete resolution of the lesion.

zoster virus, Japanese B encephalitis, measles, cytomegalovirus, rubella, Epstein–Barr virus, mycoplasma) and cultures of bacteria were negative. She was discharged from the hospital without any complication or sequela, and in the past 13 years has had no relapse.

3. Discussion

The pathological condition in this patient was initially considered to be a brain tumor with a diffuse and large lesion in the left brain. Later, based on her clinical course and outcome, the diagnosis was changed to an acute demyelinating disease. On the basis of CSF findings with increased amount of globulin and three oligoclonal IgG bands, good therapeutic response to dexamethazone and the clinical course with no recurrence for over 10 years, the pathological condition of this patient was finally diagnosed to be ADEM.

Von Economo attributed the hypersomnolence in encephalitis lethargica (EL) to lesion involving the posterior hypothalamus and peri-aqueductal region in the midbrain and speculated that these regions constituted a ‘waking center’ [5]. The location of the lesion, judged by the abnormal radiological finding in our patient, closely resembled that of the pathological finding in acute EL. The pathological state in many of Von Economo’s classic examples began with a flu-like condition associated with fever followed by an increasing somnolent state with disturbance of ocular movement, finally passing into the state of stupor and coma [5,6]. Hypersomnia, the initial symptom of our case, was caused by the lesion involving the ‘waking center’. The posterior hypothalamus has recently been recognized as the location of Hypocretin/Orexin neuronal cell body, whose neurotransmitters are considered as arousal neuropeptides [7].

In the hypersomniac state of our patient, TST and stage 3–4 sleep were apparently increased, stage 2

sleep was decreased and stage 1 and REM sleep were within the normal range. Bassetti et al. [8] reported that patients with paramedian thalamic stroke frequently had hypersomnia characterized by increased TST and stage 1 sleep, but decreased stage 2 sleep. In patients with severe hypersomina stage 3–4 sleep was often reduced, but occasionally increased [8]. Santamaria et al. [9] also reported significantly diminished stage 2 sleep and increased stage 3–4 sleep in patients with unilateral thalamic stroke. Although our patient did not have a unilateral thalamic infarction, the lesion involved the left thalamus, so this feature of sleep parameters might be close to those of patients with unilateral thalamic stroke.

Clinical improvement has been reported in up to 64% of patients with ADEM treated with corticosteroids [3]. Fortunately, our patients also responded to intravenous administration of dexamethazone. Plasmapheresis [10] and intravenous administration of immunogloblin [4] were also successfully used for patients with ADEM.

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