Case Report

Dramatic Recovery from Neurological Deficits in a Patient with Central Pontine Myelinolysis Following Severe Hyponatremia

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A 28-year-old woman developed central pontine myelinolysis (CPM) following severe hyponatremia. Radiological examinations demonstrated a characteristic pontine lesion of CPM. Her neurological symptoms (drowsiness, emotional lability, dysarthria, dysphagia, and quadriparesis) were improved dramatically by treatment with thyrotropin-releasing hormone (TRH) and rehabilitation. However, results of repeat computed tomographic (CT) scans of the brain remained unchanged. This case therefore suggests that TRH may be beneficial for the treatment of CPM, and that CT findings appear to be a limited prognostic indicator for CPM.

Key words: Computed tomographic (CT) scan, Thyrotropin-releasing hormone (TRH)

Central pontine myelinolysis (CPM), a demyelinating disorder of the pons, is often associated with severe hyponatremia, and is frequently fatal. The majority of cases of CPM reported in the literature were diagnosed by postmortem examination (1). Recently, however, antemortem diagnosis of this disorder has been made possible by computed tomographic (CT) scanning or magnetic resonance imaging (MRI) of the brain (2–9). According to these diagnostic advances, it has been demonstrated that patients with CPM in whom the pontine lesion is diagnosed can recover.

Herein we report a patient with CPM, confirmed by both CT scanning and MRI, who recovered dramatically following thyrotropin-releasing hormone (TRH) administration. However, the characteristic CT findings of the pons revealed no alteration despite the clinical improvement.

CASE REPORT

A 28-year-old woman was admitted to Department of Obstetrics, Yuri-Kumiai General Hospital, because of an acute confusional state on August 10, 1989. She had received intravenous fluids for treatment of hyperemesis due to toxemia of pregnancy (12 weeks' gestation), for 20 days prior to the admission at another clinic. On admission, confusion, disorientation, and urinary incontinence were noted. Laboratory findings revealed severe electrolyte imbalance: serum sodium was 96 mEq/l; potassium was 1.4 mEq/l; and chloride was 47 mEq/l. The urinary sodium was 2.3 mEq/l, the potassium 2.0 mEq/l, and the chloride 18.8 mEq/l. The serum osmolality was 216 mOsm/kgH₂O and the urinary osmolality was 184 mOsm/kgH₂O. These abnormalities were considered due to water intoxication. The patient was treated with intravenous physio-

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logical saline and potassium supplements. Her serum electrolytes returned to normal levels over the next 6 days (Table 1). Despite the correction of electrolyte imbalance, further neurological deterioration occurred, i.e., drowsiness, emotional lability, dysarthria, dysphagia, and quadriparesis. Thereafter, her neurological condition remained unchanged.

She was referred to the Department of Internal Medicine on September 12, after artificial abortion had been performed. On physical examination, the pupils were equal and reactive to light. Eye movements seemed to be normal in all directions. Muscle strength was graded as 3/5 and 2/5 in the upper and lower extremities, respectively. Deep tendon reflexes were symmetrically hyperactive in the upper extremities, but were hypoactive in the lower extremities. Mild joint contractions were noted in the ankles. CT scan of the brain (Fig. 1) revealed a well-circumscribed area of low density affecting the central pons. MRI of the brain (Fig. 2) also demonstrated the characteristic pontine lesion. From these radiological findings, and the patient's clinical course, a diagnosis of CPM following severe hyponatremia was made. Treatment with TRH (2 mg/day, for 4 wk) and rehabilitation were started. Several days after the TRH administration, she became alert and able to respond to questions by shaking her head. At that time, no sensory deficit was detected. Thereafter, her dysarthria, dysphagia, and quadriparesis improved dramatically. About 10 days later she could write for communication with us. One month later she could speak and swallow well, and 2 months later she could walk independently. Although the patient recovered com-

Fig. 1. Computed tomographic scan demonstrating a circumferential low density area within the central pons.

Fig. 2. T₁-weighed magnetic resonance imaging demonstrating a large, low signal focus within the central pons.

Table 1. Serum electrolyte levels during the first 6 days of treatment

	Serum electrolyte level (mEq/l)		
	Sodium	Potassium	Chloride
Day 0	96	1.4	47
Day 1	110	1.5	67
Day 2	120	1.6	80
Day 3	130	1.8	89
Day 4	133	2.3	93
Day 5	135	2.8	97
Day 6	137	3.5	101

pletely from the neurological deficits of CPM, the results of repeat follow-up CT scans remained unchanged. She was discharged from the hospital on December 26, and now lives a normal life without any difficulty.

DISCUSSION

We reported a patient with CPM who recovered dramatically after the treatment with TRH. The diagnosis of CPM was made according to the following findings: 1) Neurological symptoms and

signs found in this patient were characteristic of a pontine disorder. 2) These neurological abnormalities had developed following severe hyponatremia. 3) Radiological examinations demonstrated a characteristic lesion within the central pons.

The exact etiology of CPM remains unknown, but the greatest attention has been paid to changes in serum sodium concentration as the possible etiology. Some authors have emphasized the importance of rapid correction of hyponatremia as it is a cause of CPM (10, 11). Sterns et al (10) have suggested that CPM is most likely to occur when the serum sodium concentration increases at a rate greater than 12 mEq/l/day. According to their guideline, the rate of correction of hyponatremia in our patient (14 mEq/l in the first 24 h) may have been too fast. On the other hand, other reports have stated that the development of CPM does not depend on the rate of correction of hyponatremia (12, 13). In any event, a major pathophysiological factor in CPM is likely to be the anatomic grid structure of the basal pons, which is vulnerable to edema and osmotic shifts (1). Since this disease primarily affects the myelin sheaths, the nerve cells and axons within the pons can be spared. Thus, patients with CPM have the potential for neurological recovery, if they survive from complications of the underlying disease. Marra (5) reported a case of CT-confirmed CPM with an early clinical improvement, and observed that the electrical continuity of some important pathways across the pons was maintained. It is considered that a relatively mild form of structural disruption may have occurred in such a case.

The present patient showed no tendency toward natural improvement of neurological deficits for 4 wk after the onset of CPM. Because animal experiments and clinical observations have demonstrated that TRH enhances the neurological recovery in some types of neurological diseases such as spinal injury, amyotrophic lateral sclerosis, and spinocerebellar degeneration (14–16), this patient was treated with TRH. Several days after the start of treatment, recovery of consciousness was observed, and all of the other symptoms related to CPM improved almost completely within 2 months. In consideration of the time course of clinical recovery in the present case, the treatment with TRH

can be considered quite effective. Although the exact mechanism of TRH action on the central nervous system has not been established, there are several interesting experiments supporting a theory that TRH may act as a brain-stimulating substance (17). First, the TRH administration improves neurological disturbances, particularly disturbance in consciousness, induced by brainstem compression in cats (18). Second, TRH significantly increases local cerebral blood flow in some brain regions, including the brainstem regions, in conscious rats (19). Finally, TRH enhances muscle contractions through an action on motor neurons in a tissue culture system (20). These brain-stimulating effects of TRH may have been contributory in the neurological recovery of our patient.

Currently, cases of CPM with clinical recovery can be assessed by sophisticated diagnostic techniques (2, 4–7, 9). Those reported cases and the present case demonstrate that there is little or no change on the CT findings early in the clinical recovery. The patient described by Gerber et al (4) recovered completely, but serial CT scans did not return to normal until 12 to 18 months after the clinical recovery. Thus, despite apparent diagnostic specificity for CPM, CT findings appear to be of limited prognostic value.

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