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# Magnetic Resonance Imaging of the Brain: A Case of Central Nervous System Sarcoidosis

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***Summary.*** **This is a case report of central nervous system sarcoidosis for which magnetic resonance imaging of the brain proved useful for diagnosis. A 39-year-old male was diagnosed as hydrocephalus by computed tomography of the brain in May, 1988. Amnesia occurred in October, 1988, followed by slow speech and gait disturbance in January, 1989. Neurological examination showed disturbed consciousness, nystagmus and truncal ataxia. On magnetic resonance imaging (MRI) of the brain, many nodular lesions around the ventricular system became evident in addition to hydrocephalus. Histological examination of pulmonary tissue indicated noncaseating epithelioid cell granuloma. A diagnosis of central nervous system sarcoidosis was confirmed and treatment started with 60 mg/day of prednisolone. Two months later, neurological signs and findings of MRI of the brain showed marked improvement.**

## INTRODUCTION

The central nervous system (CNS) is rarely involved in sarcoidosis, and diagnosis of CNS sarcoidosis is sometimes difficult. This paper presents a case of CNS sarcoidosis of the meningitis type that caused hydrocephalus. For diagnosis and following up of CNS sarcoidosis, magnetic resonance imaging (MRI) of the brain was shown to be quite useful.

## CASE REPORT

A 39-year-old male was diagnosed as having hydrocephalus by computed tomography (CT) of the brain in May, 1988; amnesia followed in October, 1988. Slow speech and gait disturbance were noted in January, 1989, at which time a chest roentgenogram showed bilateral hilar lymphadenopathy (BHL) and patchy infiltration in the left middle lung field. Sarcoidosis appeared quite likely and the patient was referred to Niigata University Hospital for confirmation of diagnosis and treatment in July, 1989. A physical examination showed a temperature of 36.6°C, pulse rate, 60 beats per minute and blood pressure, 102/64 mmHg. The chest and the abdominal findings were normal, with no superficial lymphadenopathy or eruption were noted. Neurological examination showed disturbed consciousness, nystagmus and truncal ataxia. There was no nodular lesion. By hematologic evaluation, the red blood cell count was $340 \times 10^4/mm^3$. The serum LDH level was 450 (normal range, 225 to 434 IU/l). Other routine laboratory findings were normal. The

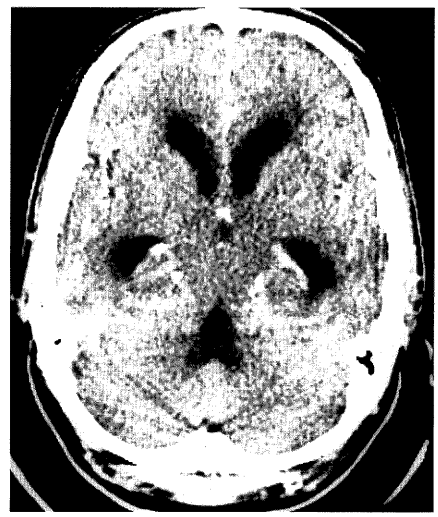

**Fig. 1.** X ray CT of the brain with intravenous contrast material (June 29, 1989) showing hydrocephalus, but no other lesions.

angiotensin converting enzyme was 21.4 U/l, this being within the normal range.

A chest roentgenogram showed BHL and patchy infiltration in the left middle lung field. Lung function tests gave the following values: VC, 4.75 L (110.0% of the predicted value); $FEV_{1.0}$, 4.25 L; $FEV_{1.0}/FVC$, 85.9% $D_{lco}$, 20.91 ml/min/mmHg (60.5%). Bronchoalveolar lavage fluid was obtained from the middle lobe segment. The recovery rate was 72.5% and cell count, $2.63\times10^5$/ml. The proportion of lymphocytes

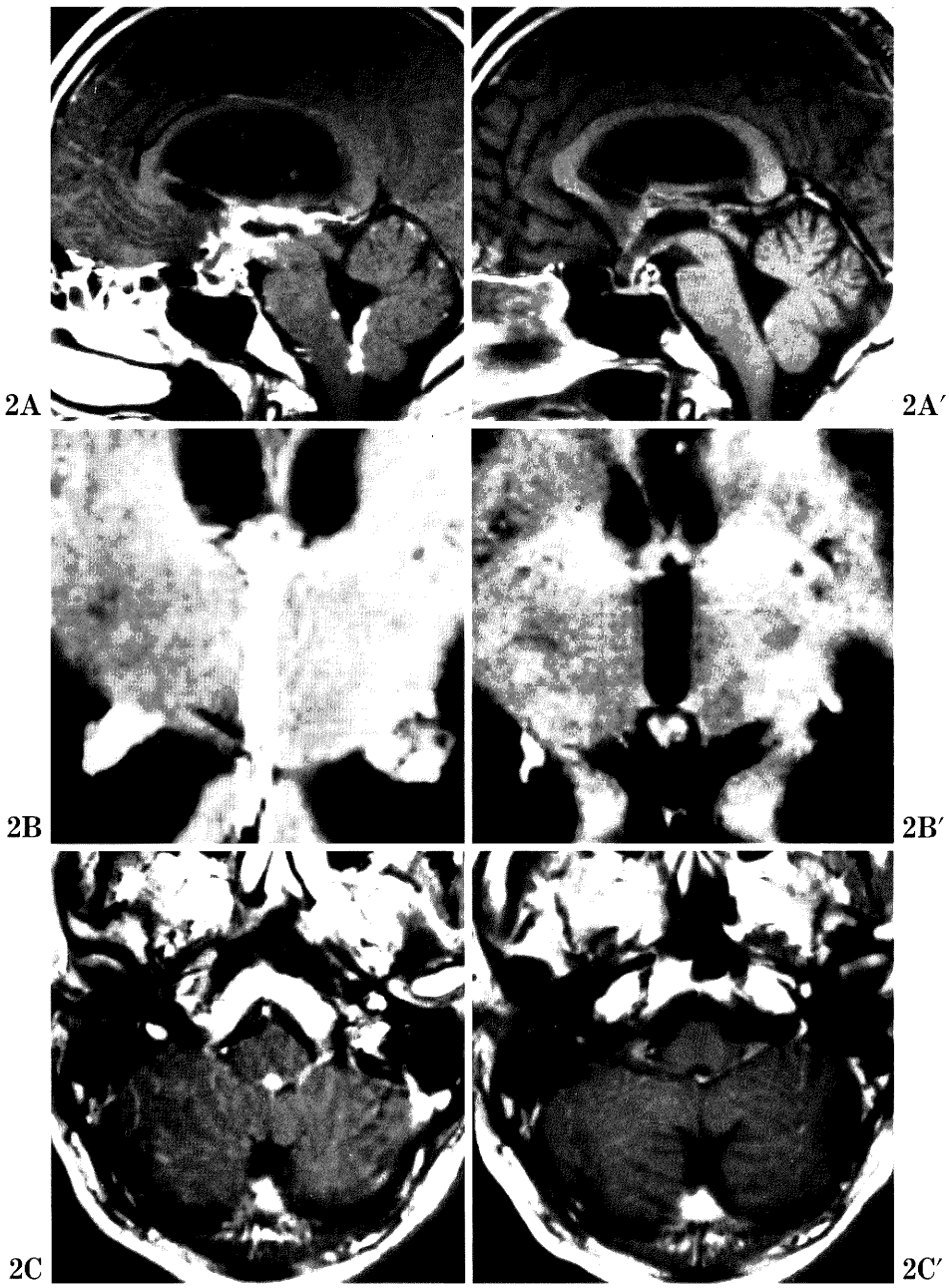


**Fig. 2.** Brain MRI (July 24, 1989)indicating Gd-DTPA enhanced nodular lesions on the third and the fourth ventricle floors, the third ventricle roof, the suprasellar cistern (Fig. 2-A) and the foramen of Monro (Fig. 2-B) and Magendie (Fig. 2-C) on $T_1$WI (SE 500/15). Two months of steroid therapy brought about marked improvement in the findings of MRI of the brain (October 4, 1989) (Fig. 2-A′, B′, C′).

was 25.8% and Leu3a$^+$/2a$^+$ ratio of T cells, 2.21. Cerebrospinal fluid showed 133/3 cells, 201 mg/dl of protein, 30 mg/dl of glucose and an initial pressure of 16 cm$H_2O$. X ray CT of the brain obtained after intravenous administration of contrast material in June, 1989 revealed hydrocephalus, but no other lesions (Fig. 1). A electroencephalogram in July, 1989 showed waves at the leads from the frontal to parietal lobes. On the same day, MRI of the brain was conducted using an imager operated at a magnetic field strength of 1.5 Tesla, applying the spin-echo (SE) technique. Gd-DTPA enhanced nodular lesions were evident on the third and the fourth ventricle floors, the third ventricle roof, the suprasellar cistern (Fig. 2-A) and at the foramen of Monro (Fig. 2-B), Magendie (Fig. 2-C) and Luschka on $T_1$-weighted images ($T_1$WI) which were obtained with a TR (repetition time) of 500 msec, and a TE (echo time) of 15 msec (SE 500/15). High intensity signals could also be detected on $T_2$WI (SE 3000/90) and proton density weighted images (PDWI, SE 3000/15) about the ventricular system. A histological examination of pulmonary tissue from a transbronchial lung biopsy showed noncaseating epithelioid cell granuloma, while there was no indication of vasculitis or alveolitis. These findings confirmed a diagnosis of CNS sarcoidosis and treatment was started with 60 mg/day of prednisolone. Two months of the steroid therapy brought about marked improvement in the neurological signs and findings of MRI (Fig. 2-A′, B′, C′).

## DISCUSSION

In some cases of CNS sarcoidosis, tumor masses of variable densities on X ray CT of the brain[1-4] have been found, and nodular lesions and hydrocephalus have also been reported.[5,6]

Abnormalities on MRI are reported as high signal intensity nodular or mass lesions on $T_2$WI,[1,7-9] and high signal intensity along the ventricular system and in the periventricular white matter on $T_2$WI.[8,10,11] A greater number of lesions have been observed and their extent is more clearly defined with MRI than CT.[8,12]

In the present case, only hydrocephalus could be detected by X ray CT, while MRI of the brain showed (1) Gd-DTPA enhanced nodular lesions along the walls of the ventricular system on $T_1$WI, and (2) high intensity signals on $T_2$WI and PDWI around the ventricular system as well. Thus, MRI of the brain has greater capacity for detection of abnormalities than X ray CT of the brain, and was found quite helpful for the diagnosis and following up of CNS sarcoidosis in this study. In particular, the outlet obstruction of the fourth ventricle, frequently detected in CNS sarcoidosis[13] as in this case, is suggestive of sarcoid meningitis. MRI can also be used to detect white matter and spinal lesions in CNS sarcoidosis. However, multiple sclerosis is still difficult to be ruled out by MRI.[14]

The response of CNS sarcoidosis to steroid therapy varies by case. The marked improvement noted here appears typical of the steroid sensitive subset of this disease. Steroid therapy should be considered when a diagnosis of CNS sarcoidosis has been established.

In summary, MRI of the brain was shown to be very useful for the diagnosis and following up of CNS sarcoidosis.

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