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Cystic Pituitary Mass in Neurosarcoidosis

Noriko Sato, Gordon Sze, and Jung H. Kim

Summary: An MR examination in a patient with neurosarcoidosis showed an intrasellar cystic mass extending into the suprasellar space. The wall of the mass was thick, it enhanced after administration of contrast material, and it extended into the infundibulum and hypothalamus. Pathologic findings showed noncaseating granulomatous inflammation; the cystic component was considered to be ischemic necrosis of the intracranial sarcoid mass.

Index terms: Sarcoidosis; Sella turcica, cysts

Sarcoidosis is a multisystem granulomatous disorder of unknown origin. Central nervous system (CNS) involvement is rare. We report the magnetic resonance (MR) imaging findings in a patient with a cystic pituitary mass, which proved to be consistent with neurosarcoidosis.

Case Report

A 24-year-old woman presented in October 1993 with amenorrhea and weight loss. Subsequently, she reported progressive weakness, fatigue, nausea, vomiting, and further weight loss. She was admitted to the hospital in February 1994. Computed tomography (CT), sonography, and chest radiography showed diffuse retroperitoneal, mediastinal, and bilateral pulmonary hilar lymphadenopathy. Results of a biopsy of the left cervical lymph node revealed noncaseating granuloma, consistent with sarcoidosis. Clinical investigation of the amenorrhea showed low plasma luteinizing hormone, follicle-stimulating hormone, cortisol, and free thyroxin levels; and was highly suggestive of panhypopituitarism. The patient was started on high doses of prednisone in February 1994. After beginning prednisone, she noted profound polyuria and polydipsia, consistent with diabetes insipidus that had previously been masked by the low plasma cortisol level.

An MR examination of the pituitary was performed in March 1994. A cystic mass, which was slightly hyperintense relative to cerebrospinal fluid on T1-weighted sequences and isointense with cerebrospinal fluid on T2-weighted sequences, was identified in the sellar and suprasellar regions (Fig 1A). The mass compressed the optic chiasm (Fig 1B and C), its walls were thick and enhanced after contrast administration, and it extended into the infundibulum and the hypothalamus (Fig 1C). There was no other abnormality within the brain or along the meninges. Radiologically, several differential diagnoses were considered, including cystic macroadenoma, Rathke's cleft cyst, or less likely, a craniopharyngioma.

A transsphenoidal biopsy was performed in April 1994. Two milliliters of straw-colored fluid were aspirated, and multiple biopsies of the wall were performed. Pathologic examination confirmed noncaseating granulomatous inflammation that showed multinucleated giant cells with negative special stains for periodic acid–Schiff, Giemsa, acid-fast bacillus, and fungus (Fig 1D). The final diagnosis was systemic sarcoidosis involving the CNS.

The patient was treated with high doses of prednisone, desmopressin, and levothyroxine sodium. Estrogen and progesterone were also recommended but were refused. The systemic sarcoidosis responded well to prednisone; however, over the subsequent several months, the patient continued to have headaches and amenorrhea and intermittent polyuria and polydipsia. She also had a tremendous weight gain to 104 kg from 49 kg before treatment. A follow-up MR study in August 1994 showed progressive disease. Although no cyst was seen, a densely enhancing sellar mass that extended into the infundibulum, tuber cinerum, and right cavernous sinus was identified (Fig 1E and F). These MR findings were typical of neurosarcoidosis. Because the CNS disease had not responded to prednisone and because the patient had adverse side effects to the steroids, radiation therapy (27 Gy) was initiated. A repeat MR study in March 1995 showed a decrease in tumor size (Fig 1G and H). Clinically, the patient has been in good condition, although she still requires replacement therapy with prednisone, desmopressin, and levothyroxine sodium.

Discussion

Involvement of the CNS is unusual in systemic sarcoidosis. Estimates of the proportion of patients with neurologic involvement in series with large numbers of patients have ranged

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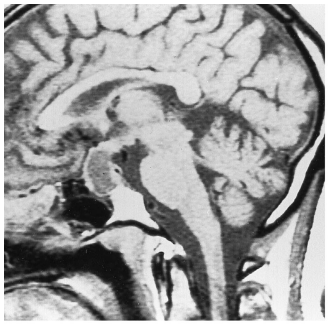
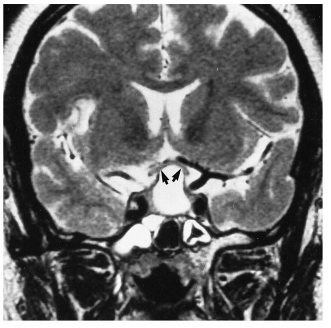
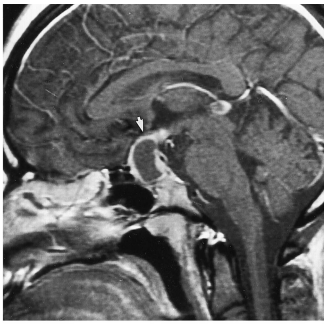

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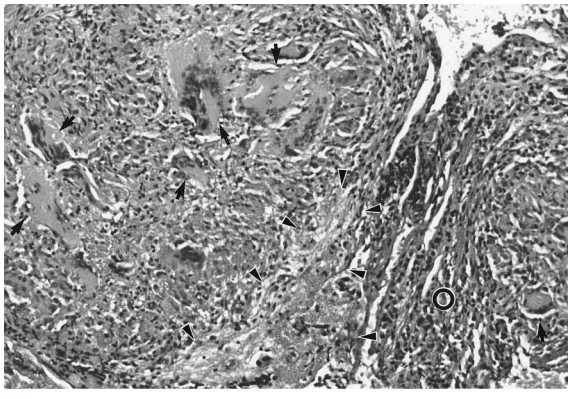

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Fig 1. MR findings in a 24-year-old woman with neurosarcoidosis.

A, Sagittal T1-weighted image (600/11/2 [repetition time/echo time/excitations]) of the pituitary shows a large low-intensity mass in the sellar and suprasellar area with irregular thickening of the wall and extension into the infundibulum. The high intensity of the posterior pituitary is absent.

B, Coronal T2-weighted image (2000/112/4) shows that the mass is of high intensity, equal to cerebrospinal fluid. The optic chiasm is compressed superiorly (*arrows*).

C, Sagittal contrast-enhanced T1-weighted image (633/22/2) shows enhancement of the wall and compressed infundibulum, continuing to the hypothalamus. *Arrow* indicates the compressed optic chiasm.

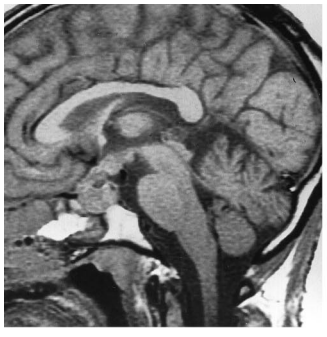
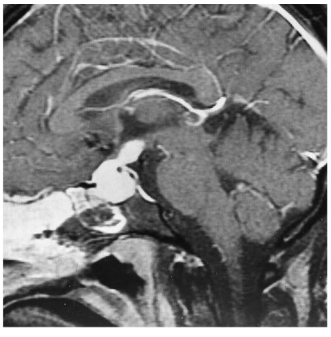
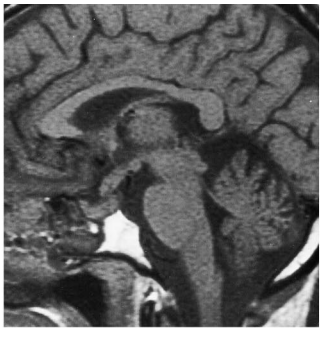
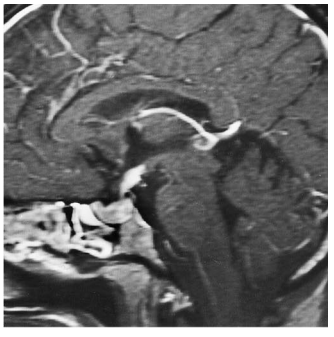
D, Photomicrograph shows two noncaseating granulomatous lesions that are composed of epithelioid cells, lymphocytes, and multiple multinucleated giant cells (*arrows*), which are of the Langerhan type with ringlike, peripherally located nuclei. Focal necrosis (outlined by *arrowheads*) is seen between the two granulomatous lesions and there is compressed adenohypophyseal tissue (*circle*). No caseous necrosis or columnar epithelium was seen (hematoxylin-eosin, original magnification ×180).

E, Sagittal T1-weighted image (600/11/2) 5 months later shows large mass of heterogeneously low intensity or isointensity in the pituitary without high intensity in the posterior pituitary. Diffuse thickening of the infundibulum is also noted.

F, Sagittal contrast-enhanced T1-weighted image (433/29/2) at same time shows well-enhanced pituitary mass. The enhanced mass continues superiorly to involve the infundibulum and the hypothalamus. Despite treatment with high-dose prednisone for 6 months, the pituitary mass has progressed.

G, Sagittal T1-weighted image (600/11/2) 7 months later, after radiation therapy, shows the mass has decreased in size.

H, Sagittal contrast-enhanced T1-weighted image (600/29/2) at same time shows a heterogeneously enhancing pituitary. The marked enhancement of the thickened infundibulum and hypothalamus is still apparent.

E F G H

from 4% to 9% (1–4). Silverstein et al (1) reported that 18 (4%) of 450 patients had neurologic findings; James et al (2) found 148 (4%) such cases in a total of 3676 patients; James and Williams (3) identified 74 (9%) cases in 818 patients; and Stern et al (4) noted 33 (5%) cases in 649 patients. Most patients with neurosarcoidosis are those with previously diagnosed systemic sarcoidosis in whom signs of neurologic involvement develop during the course of their illness. A small number of patients present with neurologic signs and later display systemic involvement, while an even smaller number show only neurologic disease and no signs of other organ system involvement (1, 5).

The most common intracranial manifestations of sarcoidosis are meningeal sarcoidosis and parenchymal sarcoidosis (6, 7). Meningeal sarcoidosis often occurs at the skull base and involves the optic chiasm, the pituitary gland,

the floor of the third ventricle, and the hypothalamus. It also affects other extraaxial areas, such as the interhemispheric fissure and cerebral cortex. Cranial neuropathy is the most common neurologic sign. The facial nerve, optic nerve, and eighth nerve are frequently involved (1, 8). Hydrocephalus can be caused by periventricular inflammation around the aqueduct, fourth ventricle, foramina of Luschka and Magendie, or inflammation and/or fibrosis of the subarachnoid space (6). Secondary extension through Virchow-Robin spaces has been reported with nodular and linear enhancement extending from the cortex to the deep white matter (9). Parenchymal sarcoidosis is less common than meningeal sarcoidosis. Most often, it appears as homogeneously enhancing isolated or multiple nodules, or as ringlike enhancement. It can occur in any part of the brain (6, 7, 10).

Recently, periventricular and subcortical white matter abnormalities have been reported in sarcoidosis. They appear as areas of low density on CT scans, as areas of low intensity on T1-weighted MR images, and as areas of high intensity on T2-weighted MR images. No enhancement is seen. These changes may represent ischemia associated with vasculitis or infiltration of subependymal sarcoid granulation tissue (11, 12).

Our patient had a large cystic mass in the pituitary with thick and enhanced walls involving the infundibulum and the hypothalamus. The differential diagnosis of a cystic pituitary mass such as this includes a cystic adenoma, a Rathke's cleft cyst, and a craniopharyngioma. Involvement of the infundibulum and hypothalamus is important in establishing a diagnosis, since this is not usually seen in these conditions. In addition, the wall of a Rathke's cleft cyst is usually thin, smooth, and does not enhance, which are findings different from those in our patient.

This patient had both anterior and posterior pituitary insufficiency, which is rare, as benign neoplasms, such as adenoma, craniopharyngioma, or Rathke's cleft cyst, do not usually cause panhypopituitarism and diabetes insipidus. On the other hand, pituitary insufficiency is frequently noted in inflammatory diseases, such as sarcoidosis, tuberculosis, lymphocytic hypophysitis, malignant neoplasms, and metastasis (13). In our patient, who had abnormalities of the pituitary, infundibulum, and hypothalamus, cystic neurosarcoidosis was proved pathologically.

In pulmonary sarcoidosis, cavitation is generally due to a secondary complicating infectious process. Rarely, a primary granulomatous process can cavitate (14–17). The pathogenesis of excavation in primary pulmonary cavitary sarcoidosis is not clear. However, small areas of necrosis are frequently seen in sarcoid granulomata, and it is believed that ischemic necrosis of large conglomerate granulomata can cause cavitation (15–17).

In neurosarcoidosis, small arteries and the walls of blood vessels are frequently involved in the granulomatous process (18–20). The lesions consist of invasion of the arterial wall by epithelioid cell granuloma with disruption of the media and the internal elastica. The granulomatous tissue may then grow into the lumen, causing stenosis or even complete obliteration and resulting in small infarcts. Most likely, the cystic neurosarcoid region in our patient formed by the same mechanism as seen in cavitary pulmonary sarcoid nodules; namely, ischemic necrosis. Pathologically, some necrotic areas were observed between the granulomas. The necrosis was different from caseation necrosis observed in tuberculosis, which is typically seen at the center of a granulation and also shows finely granular necrotic debris with ghostlike cell images. Rathke's cleft cyst was also ruled out, because no columnar epithelium was found, even in the deep sections.

In patients with cystic pituitary masses, especially involving the infundibulum and hypothalamus, neurosarcoidosis should be considered with cyst formation resulting from ischemic necrosis.

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