Suprasellar germinomas: diagnostic confusion with optic gliomas

Case report

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The authors report a case in which a suprasellar germinoma (ectopic pinealoma) was mistakenly interpreted as an optic glioma. The proper diagnostic and therapeutic procedures for the management of this lesion are discussed, emphasizing recognition of the characteristic triad of visual loss, hypopituitarism, and diabetes insipidus, as well as verification by biopsy and adequate radiation therapy.

KEY WORDS • suprasellar germinoma • optic glioma • ectopic pinealoma

Suprasellar germinomas may occasionally confuse the physician by symptoms and signs that simulate other disease entities. It is extremely important to include this entity in the differential diagnosis of lesions in the region of the optic chiasm since proper treatment might prolong life, while inadequate or improper therapy may be life threatening. We are reporting and discussing such a case.

Case Report

A 14-year-old girl was first seen at the Cleveland Clinic in September, 1970, because of diurnal bifrontal headaches and failing vision. The patient was the product of a normal pregnancy, and had developed normally until the age of 8 years when growth stopped. She had not experienced menarche.

Examination. The patient was a small girl with no development of secondary sexual characteristics. The skin was dry and pale. Visual acuity was limited to light perception with the right eye and 20/300 with the left. There was a bitemporal hemianopia and bilateral optic atrophy. The remainder of the physical examination and the neurological examination were unremarkable. Results of endocrine studies showed deficiencies of adrenocortical, thyroid, and growth hormone, as well as diabetes insipidus and hyperlipemia. A cerebrospinal fluid (CSF) examination including cytology was normal. Skull x-ray films including the optic foramina and brain scan were normal. Bone age determined by x-ray studies of the hand was 9 to 10 years. A pneumoencephalogram showed marked thickening of the floor of the third ventricle, which on a lateral tomogram
measured 14 mm (1.5 times normal); the thickening extended slightly into the infundibulum and toward the dorsum sellae while the posterior end of the mass obliterated the upper half of the interpeduncular cistern. Anteroposterior tomograms showed the mass to be in the midline. The quadrigeminal cistern was normal. The lateral ventricles were slightly dilated, and the remainder of the ventricular system including the fourth ventricle was normal. The sella turcica was normal, and no calcification was noted in the suprasellar area.

**Operation.** On September 22, 1970, a frontal craniotomy was performed. The operative note read as follows: “The suprasellar region was exposed and at once it was noted that the chiasm was markedly swollen and it appeared as if a neoplastic process involved the whole chiasm. The chiasm was discolored (yellow-gray) and appeared to be translucent. The process extended forward only slightly into the optic nerves but did extend well back into the optic tracts. The right carotid artery was displaced laterally by the swollen chiasm.” Because of the fear of further visual loss, a biopsy specimen was not taken. The diagnosis of optic glioma was made, and the patient received 5000 rads of cobalt therapy to the hypothalamic area. Her condition improved, and she was discharged on hormonal replacement therapy. During the following 18 months the patient grew 2 inches. She returned to school, and her vision remained stable enough to permit her to attend regular classes, where she performed well.

**Second Examination.** The patient was readmitted in May, 1972, because of progressive fatigue, repeated vomiting, neck pain, and irritability for 1 month. Admission was precipitated by the onset of weakness, incoordination, disorientation, and hallucinations. With the exception of the above findings and horizontal nystagmus on lateral gaze bilaterally, the physical examination was unchanged from previous admission. A repeat examination of CSF cytology was normal. Skull x-ray films and bilateral carotid arteriograms were normal, except for a suggestion of dilated ventricles. A pneumoencephalogram failed to fill the ventricles.

A ventriculoperitoneal shunt was performed, and the patient improved slightly. A new course of radiation to the hypothalamic region was begun, but 2 days later she became apneic and died. The clinical diagnoses at the time of death were: optic glioma, panhypopituitarism, and pulmonary embolus.

**Postmortem Examination.** Significant autopsy findings included severe atrophy of the adrenal glands. Gross examination of the brain showed markedly thickened leptomeninges in the chiasmatic region. A mid-sagittal section through the cerebral hemispheres, brain stem, and cerebellum was made (Fig. 1). The chiasm and optic tract appeared to be normal in size and were firm, yellow and granular. The ependymal surface of the frontal horn of the right lateral ventricle contained several small, yellow, granular nodules. The genu of the corpus callosum appeared necrotic, and more yellow, granular tissue appeared to infiltrate the necrotic area. The entire fourth ventricle was filled with a yellow-white, friable mass which was compressing the cerebellum, pons, and medulla. The aqueduct of Sylvius and the lateral and third ventricles were dilated.

Microscopic examination showed a normal pituitary gland. The chiasm and hypothalamus showed marked astrogliosis, diffuse loss of hypothalamic neurons, thickening and hyalinization of the small blood vessels, and only a few scattered nests of tumor cells and lymphocytes. The ependymal nodules and the abnormal region in the genu of the corpus callosum consisted of tumor infiltrating the substance of the brain. The lateral geniculate bodies showed disorganization of cell layers, neuronal loss, and mild astrogliosis. The pineal gland was entirely normal except for a few superficial malignant cells. The mass filling the fourth ventricle was entirely composed of tumor with widespread infiltration of the cerebellum, and superficial invasion of the pons and medulla in the periventricular, subependymal region.

The tumor was composed of sheets of large cells with a fine fibrous stroma (Fig. 2 left). Lymphocytes were present, especially in the stroma, but were also sprinkled among the large neoplastic cells. Microscopic examination under high power (Fig. 2 right) showed the large cells to be characterized by large, rounded nuclei with prominent nucleoli, and abundant clear cytoplasm.

**Discussion**

The so-called “ectopic pinealomas” or, more correctly, suprasellar germinomas were
Fig. 1. Midsagittal section through the gross brain. Note the relatively normal appearance of the chiasm and third ventricle and pineal region. Tumor tissue fills the fourth ventricle, compressing the brain stem downward and pushing the cerebellum upward.

First separated from pineal germinomas as a distinct clinical entity by Kageyama and Belsky in 1961. Other clinical and pathological studies by Simson, et al., have confirmed their findings and established the "syndrome" of this tumor. In any young patient with the triad of hypopituitarism, diabetes insipidus, and visual problems, the consideration of germinoma should be high on the list of differential diagnoses.

The etiology of this tumor is controversial, but the most popular theory proposed an origin from germ cells in the yolk sac endoderm. Mintz in 1960 showed that these germ cells migrate widely before localizing in the gonadal ridge, and some of the cells may find their way into the head of the embryo. Normally, all the germ cells atrophy and disappear except for those in the gonadal ridges. It is felt that the cerebral germinomas arise from migratory germ cells that fail to undergo physiological dissolution. The cell rests may later proliferate in midline areas; in the suprasellar area they may cause the syndrome of diabetes insipidus, visual changes, and hypopituitarism.

The importance of making the correct diagnosis is reinforced by the excellent results of radiation therapy. It is interesting that in all of the series there were cases in which the gross appearance of the chiasm at surgery could easily have been confused with an optic glioma or even granulomatous inflammation. This unusual appearance is due to the fact that in many cases the tumor tends to infiltrate the chiasm without necessarily presenting as a separate mass.

Our patient had a dense bitemporal hemianopia and probably could have had a biopsy from the center of the chiasm or from the nasal aspect of the junction of the right optic nerve and chiasm without seriously increasing the risk of further visual loss. Despite the error in diagnosis the patient received "adequate" doses of radiation to the hypothalamic tumor with subsequent evidence of striking regression of the tumor and residual gliosis in the chiasm and...
Suprasellar germinomas versus optic gliomas

Fig. 2. Left: Photomicrograph of the tumor from the fourth ventricle. Note the pleomorphism and two distinct cell types; neoplastic cells contrast sharply with the small round lymphocytes. H & E, × 200. Right: Higher power view of the same tumor demonstrating the "two-cell" characteristic of germinomas. The neoplastic cells are very large. There is abundant light staining cytoplasm and round nuclei with dense prominent nucleoli. H & E, × 512.

hypothalamus. However, Simson, et al., and Kageyama point out the potential for brain stem metastases and recommend irradiation of the posterior fossa. In addition, some investigators have noted the potential for spread down the spinal axis and recommend early irradiation to this area if the tumor is believed to be large or if the cell type is undifferentiated. Death in our case was secondary to the large tumor mass in the fourth ventricle probably seeded from the original tumor. Death might have been prevented had the correct histologic diagnosis been made by biopsy and the entire ventricular system irradiated.

References


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