OLIGODENDROGLIOMAS IN THE YOUNG-AGE GROUP
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OLIGODENDROGLIOMAS are comparatively rare brain tumors in the first and second decades of life. Most often they are slow-growing tumors involving the cerebral hemispheres of adults.1

During a recent survey of brain tumors two unusual varieties of this neoplasm were encountered. One arose near the third ventricle of a 5-year-old boy; the other involved the left frontal lobe of a 14-year-old girl. In both instances there was an initial history of trauma which obscured the correct diagnosis. The clinical and pathologic aspects of the following cases present several interesting features.

REPORT OF CASES

Case 1. B.W., a 5-year-old boy, was admitted to the hospital because of vomiting and headache. One month prior to admission he had fallen from a height of about 12 feet. He did not lose consciousness, and the only apparent residual effect was a slight limp of the left leg.

On the morning of admission he had an episode of non-projectile vomiting, which was followed by severe frontal headache. Within a few minutes he complained of abdominal pain and became drowsy. On the way to the hospital he had generalized convulsions, which lasted 5 minutes. He then became comatose.

Past history disclosed normal growth and development up to the onset of the present illness.

Examination. Temperature was 98.3°F., pulse rate 76, respiratory rate 24, and blood pressure 116/68. The patient was a well developed and nourished boy, who was unconscious. There were slight generalized twitchings of all extremities. The pupils were fixed, widely dilated, and did not react to light or in accommodation. Occasional strabismus of the left eye was noted. Funduscopic examination disclosed bilateral papilledema. Respirations were irregular, but there were no heart murmurs. There was almost constant spasm of the extremities. The slightest stimulus caused marked extensor spasm. Deep tendon reflexes were exaggerated. Bilateral positive Babinski, Gordon, Oppenheim, Chaddock, and Hoffmann signs were noted. The superficial abdominal and the cremasteric reflexes were absent.

Laboratory Data. Routine urinalysis and blood counts were within normal limits. Roentgenograms of the heart and lungs were unrevealing. Roentgenograms of the skull disclosed no intracranial calcification, and the sella turcica was not enlarged.

Hospital Course. The day after admission there developed respiratory distress
with cyanosis, and repeated episodes of vomiting. In spite of oxygen therapy and repeated aspiration the patient expired on the 2nd hospital day.

*Autopsy.* There was diffuse atelectasis of the right lung, and focal atelectasis of the left lung. The significant findings were confined to the central nervous system. The weight of the brain was 1350 gm. There was moderate cerebral edema, with a pressure cone over the brain stem, and herniation of the cerebellar tonsils. A yellow gelatinous mass, 2.5 cm. in diameter, was observed just anterior to the optic chiasm, and arising from the floor of the 3rd ventricle. On coronal section, this mass appeared to originate from the posterior portion of the 3rd ventricle, and also involved the lateral portions of the basal ganglia near the globus pallidus. Foci of hemorrhage and necrosis were noted throughout the cut surface of the tumor. The 3rd and 4th ventricles were markedly dilated and filled with recent hemorrhage.

*Microscopic Examination.* The tumor was composed of a uniform cell type. The individual cells had round central nuclei, and a clear cytoplasm (Fig. 1). Mitotic figures were rare. Slight focal calcification was present about the periphery of the tumor, and thick-walled blood vessels were prominent in some regions. The initial impression was that this represented an oligodendroglioma arising from the 3rd ventricle. Since this appeared to be an unusual neoplasm in a child of this age, representative sections of the tumor were submitted to the Armed Forces Institute of Pathology. The members of this institution confirmed the original impression of oligodendroglioma.

Case 2. P.S., a 14-year-old white girl, was admitted to the hospital because of convulsions. Two and one-half months previously she had fallen at a roller skating rink. She was unconscious for a few minutes, but did not feel ill. Upon returning
home she had a convulsion, and was then promptly admitted to another hospital. The convulsions were temporarily controlled with Dilantin, and she was discharged. Upon her return home, she complained of headache, and had repeated episodes of vomiting and convulsions. She was readmitted to the same hospital the next day, at which time complete blindness and ptosis of the left eye were noted. Examination disclosed no movement of the left eye, and a complete 2nd and 3rd nerve palsy on the left. Lumbar puncture revealed normal pressures. Chemistry studies and the cell count of the spinal fluid were within normal limits. She continued to complain of headache, and at times was stuporous. She was then transferred to the Robert Packer Hospital.

Examination. Temperature was 98.6°F, pulse rate 85, respiratory rate 24, and blood pressure 110/70. The patient was a well developed and nourished young girl, who appeared acutely ill. She complained of severe generalized headache. The head was tender to percussion, the neck was stiff, and a positive Kernig's sign was present. She had a complete left 3rd nerve palsy, right facial weakness, and definite weakness of the right arm and leg. Deep tendon reflexes on the right were hyperactive.

Laboratory Data. The rbc. count was 4,200,000, with 12.0 gm. of hemoglobin per 100 cc. The wbc. count was 28,000, with a differential of: polymorphonuclear leukocytes 93, and lymphocytes 7. Urinanalysis was negative.

Hospital Course. Shortly after admission a carotid arteriogram was done. Di-drast was injected into the left internal carotid artery, and there was good visualiza-
tion of the major branches. Slight medial displacement of the ascending branches in the mid-line was noted.

1st Operation. Multiple trephines of both frontal and temporal regions, and of the left parietal region were performed. The brain was tense, but no mass was detected. However, a catheter was placed in the right lateral ventricle. During the procedure the patient's condition was critical, and her respirations were extremely labored.

Course. Within 12 hours after operation her respirations ceased. Artificial respiration was started, and after intubation, spontaneous but irregular respirations were observed.

Fig. 3. Case 2. Broad sheets of tumor cells are present within the subarachnoid and perivascular spaces. Hematoxylin and eosin, X160.

2nd Operation. A large frontal flap was turned down. The brain was tense and herniated through the operative defect, requiring removal of almost the entire left frontal lobe. At the base of the frontal lobe was a large firm mass, which also involved the adjacent temporal and parietal lobes. Along the sphenoid wing there appeared to be local infiltration of the dura mater. Although the tumor was considered hopelessly inoperable, as much as possible was removed in an attempt to provide decompression.

Course. Following surgery the patient was unresponsive, and she died within 6 hours.

Pathological Report. The operative specimen consisted of three portions of frontal lobe, the largest measuring 8.0 cm. in greatest diameter. The inferior surface of each portion was infiltrated by a hemorrhagic, friable, gray-white neoplasm. Histologically this tumor (Fig. 2) and that observed in Case 1 had almost identical features.
Autopsy. The pertinent findings were confined to the brain, the weight of which was 1350 gm. The gyri were flattened and the sulci were narrowed. Marked dilatation of the superficial blood vessels was noted. Virtually the entire left frontal lobe had been resected. The right lateral ventricle was collapsed. Residual tumor was evident along the line of surgical excision, with extension into the temporal lobe and the basal ganglia.

Microscopic Examination. There were broad sheets of tumor cells within the subarachnoid space (Fig. 3), and invasion of the adjacent dura mater. The cerebral cortex of the remaining left frontal lobe also showed tumor cells within the perivascular spaces. Focal hemorrhage and necrosis were present, but there was no calcification.

DISCUSSION

Most of the current textbooks of pathology and pediatrics fail to mention the oligodendroglioma as a tumor to be considered in the young-age group. Nelson\(^4\) stated that the cerebral hemispheres of children are rarely invaded by tumor, but if they are, one of the most common types is the malignant sarcoma of the meninges.

Earnest and his co-workers,\(^4\) in a comprehensive survey of 200 cases of oligodendrogioma, found the highest incidence in the fourth and fifth decades of life. No age group, however, was spared, and this particular neoplasm was surprisingly frequent at both extremes of life. The same study included 7 cases in the first decade, and 19 cases in the second decade of life. No appreciable sex difference was found, but the cerebral hemisphere was the primary site affected. In 10 instances other sites, such as the thalamus, lateral ventricle, or region of the optic chiasm were involved.

Shenkin et al.\(^7\) found that tumors of the ventricles occurred at a significantly earlier age than those in the cerebral hemispheres. The third ventricle was the site of origin in 4 cases, but no patient in this group was younger than 19 years of age.

Most studies have stressed calcification as one of the important criteria in the histological diagnosis of oligodendrogioma. Martin and Lemmen\(^5\) reviewed a series of 1577 varied intracranial lesions, correlating the incidence of calcification with histological type. They found calcification in every major type of cranial neoplasm except the schwannomas and hemangioblastomas. A total of 34 oligodendrogiomas were included in the study, and slightly over half (18) showed calcification. It is interesting to note that in the latter study 3 oligodendrogiomas were found in the age group 0–15 years. Although no details are recorded, 2 in this group demonstrated calcification.

The immediate cause of death in Case 1 was probably intraventricular hemorrhage, which occurred secondary to necrosis and hemorrhage of the tumor in the third ventricle. The death in Case 2 was related to the massive infiltration of the neoplasm throughout the left frontal lobe.

In the latter case there was evidence of seeding within the subarachnoid and perivascular spaces. There is considerable evidence to support the view that such dissemination is more frequent than generally thought.
Blumenfeld and Gardner found oligodendrogliomas second only to medulloblastomas in tendency to disseminate through the subarachnoid space and ventricles. Earnest et al. found evidence of seeding in 14 of 165 cases. Trowbridge and French reported an interesting case with dissemination throughout the fourth ventricle and leptomeninges. The above evidence indicates that subarachnoid seeding and dissemination are not unusual features of these tumors in adults or children.

SUMMARY

Two cases of oligodendroglioma occurring in the young-age group are presented. Some of the current features with respect to subarachnoid seeding and dissemination are discussed briefly.

REFERENCES

2. Armed Forces Institute of Pathology. Personal communication.