Cerebral Tumor in a Dog Resembling Human Medulloblastoma

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INTRODUCTION

It is impossible at this time to attempt any satisfactory classification of spontaneous brain tumors in animals, particularly in dogs, because of the lack of sufficient pathological material for careful histological investigation. The authors, in a previous communication (3), have emphasized that the paucity of cases reported in the literature does not necessarily mean that such tumors are extremely rare. Greater frequency of postmortem examinations might reveal a much higher incidence of brain tumors in animals than is believed to exist. Such a probability is borne out by the experience of Milks and Olafson (7), who encountered brain tumors in as many as 4 per cent of their autopsies on dogs. This is a surprisingly high figure, since in man brain tumors are found in but about 1 per cent of all postmortem examinations, according to Ewing (4). It is desirable, therefore, that all brain tumors observed in animals be reported with complete gross and microscopic findings. A comparative pathological study of intracranial neoplasms should be an invaluable aid toward a better understanding of such tumors in human beings and progress in classification.

CLINICAL OBSERVATIONS

The subject, a pedigreed 3 year old male English bulldog, showed for a period of 3 months symptoms suggestive of a brain disturbance, possibly a tumor. The initial symptoms were profuse sweating, nervousness, panting, and heavy breathing during rest. Beginning with the 2nd month, there were periodic attacks of tetanic muscular spasms, during which the dog assumed a rigid standing position and refused to lie down. Any attempt to move the animal during the attacks caused him to howl as if in pain. Each of these seizures lasted for about 20 minutes. On several occasions the animal was hospitalized; the attacks were controlled by the use of sedatives. Throughout the illness the dog ate and drank well and at no time manifested any elevation of temperature. However, the animal gradually became weaker, vomited occasionally, and, during the last week or so of life, had several convulsions. Howling spells became frequent and uncontrollable. The dog was sacrificed and submitted to postmortem examination.

GROSS AUTOPSY FINDINGS

Postmortem investigation revealed no pathological alterations in the viscera. The brain was dissected after fixation in 10 per cent formalin solution. No lesions were found on superficial examination. A frontal section, made at the level of the anterior commissure, revealed a large, funnel-shaped tumor, 3 x 2.5 x 2 cm. in dimensions, which filled most of the lateral ventricles, particularly the left (Fig. 1). The tumor appeared to arise from the wall of the left lateral ventricle in the region of the collateral trigone; from this site it extended by a broad, poorly demarcated pedicle into the ventricular cavity. Its posterior surface was corrugated, somewhat resembling cerebral convolutions. On section, the bulk of the growth was found to be grayish white, with scattered reddish or brownish areas toward the periphery. The consistency was rather firm. Anteriorly there was no line of demarcation between the tumor and the adjacent white matter of the left frontal lobe. The anterior half of the basal ganglia was replaced by neoplastic tissue. The lateral ventricles, especially posterior to the tumor, were extremely dilated. The septum pellucidum and the fornix had disappeared; the ventricles were in open communication. The corpus callosum was very atrophic.

MICROSCOPIC FINDINGS

In addition to the routine hematoxylin-eosin and the Nissl technics, methods for myelin (Spielmeyer), neurofibrils (Bielschowsky), astrocytes (Cajal), oligodendroglia (Penfield), microglia (Hortega), glia fibers (Holzer), and mesenchymal fibers (Perdrau) were employed.

The bulk of the tumor was composed of large compact masses of cells (Fig. 2). Cell boundaries were...
indiscernible. The cytoplasmic ground substance was amorphous or slightly fibrillary and faintly acidophilic. The nuclei were round or occasionally oval, vesicular, sharply outlined, and rather dark. They contained a delicate network of chromatin, with numerous granules and sometimes prominent nucleoli. Mitotic figures were frequent (Fig. 3). The arrangement of cells in rows, rosettes, or other configurations commonly observed in various forms of gliomas was absent. The tissue of the compact areas contained few blood vessels. In other regions the neoplastic cells large numbers of tumor cells infiltrated the adjacent white matter (Fig. 5). No additional characteristics, such as fibrils or other specific structures present in various forms of tumors of the nervous system, were demonstrable by any of the special staining methods.

DISCUSSION

The tumor is definitely anaplastic, somewhat resembling a round cell sarcoma, and lacks the characteristics of the more mature neoplasms of the central nervous system. It has certain similarities to ret-

![Fig. 1.—Section through cerebrum showing anterior view of tumor growing into lateral ventricle. Mag. × 1 1/2.](image)

were more loosely grouped but had the same individual characteristics. The tissue was richly vascularized and contained several hemorrhages. Many small vessels showed proliferation of the endothelial cells with narrowing of the lumina. At the periphery of the tumor such vessels in cross section, under low magnification, somewhat resembled renal glomeruli (Fig. 4). Thick and irregularly outlined hyaline zones surrounded some of the larger vessels. A few deposits of hemosiderin were scattered in this vicinity. Occasional small foci of necrosis were present in the peripheral zones. Although the neoplasm microscopically was fairly clearly differentiated from the brain tissue, inoblastoma, sympathicoblastoma, and especially to medulloblastoma. The relationships of these groups has been emphasized by Bailey (1). Many features of the tumor in question, especially those relative to the nuclear structure, are mentioned in the recent histologic description of the medulloblastoma by Zülch (12). The rhythmic arrangements occasionally seen in this type are absent. In differential diagnosis the oligodendroglioma and ependymoma are to be considered.

Although on superficial examination the growth may slightly resemble an oligodendroglioma, it lacks the higher degree of differentiation manifested by the presence of short argentophil processes, demonstrable
Fig. 2.—Section from solid portion of neoplasm showing compact masses of cells with roundish nuclei. Mag. $\times 240$.

Fig. 3.—Same as Fig. 2, higher magnification, showing mitosis. Mag. $\times 750$. 
Fig. 4.—Periphery of tumor with loosely grouped cells and vascular proliferation. Mag. × 240.

Fig. 5.—Border of neoplasm showing infiltration of subcortical white matter by tumor cells. Mag. × 175.
by the Penfield method and observed by us in another tumor in the brain of a dog (3). In certain cellular ependymomas in man, to which this neoplasm in the dog may at first glance bear some similarity, the nuclei are more homogeneous, mitotic figures are scarce, and the cells do not infiltrate the adjacent brain tissue. However, "transitional" forms may possibly occur, according to Zülch (12). The medulloblastoma in man may, in exceptional cases, be found in the cerebrum (Honeyman, 5). This possibility, however, is rejected by some authors (Kershman, 6). The cerebellum is the center of predilection. In dogs, a questionable medulloblastoma, described by Batten (2), and a relatively typical medulloblastoma, reported by Milks and Olafson (7), originated in the cerebellum. However, Peers (9) found nine cerebral medulloblastomas among fifteen gliomas which he had succeeded in producing experimentally in mice by means of methylcholanthrene. In similar experiments in mice, Zimmerman and Arnold (11) reported one cerebral and three cerebellar medulloblastomas.

The point of origin of the neoplasm under discussion was probably in the periventricular layers of immature cells. Large groups of such cells, considered to be precursors of nervous and glial elements, are a normal finding in the tissue around the lateral ventricles in late fetal and early postnatal life. The development, morphology, classification, and significance of these cells have been discussed by many authors, among them Kershman (6) and Tuthill (10). That they may become the site of origin of brain tumors in man was considered a possibility by Ostertag (8). The elements of the tumor we have just described have a close resemblance to those cell accumulations.

**SUMMARY**

A large spontaneous cerebral tumor in a dog has been described. It obliterated most of the lateral ventricles. Histologically, the neoplasm resembled human medulloblastoma. Its probable origin was in the periventricular layers of immature cells.

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