Cerebellar Myxoid Type Meningioma in a Shih Tzu Dog

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ABSTRACT. A 6-year and 9 month-old, male, Shih Tzu dog showed ataxia and trembling. By MRI examination, a mass (1 cm) was found in the right cerebellum. As the dog did not respond to radiation therapy, and showed a rise of intracranial pressure, he was euthanized. The cerebellar mass was soft and hemorrhagic. Histologically, the mass contained vimentin-positive spindle- or polyhedral-shaped cells arranged in a cord-like pattern. Mucinous materials were observed in the intercellular spaces. Ultrastructural examination revealed cell processes, microtubule-like structures and desmosomes. The case was diagnosed as myxoid type meningioma.

KEY WORDS: canine, meningioma, myxoid type.

Meningioma is the very popular intracranial tumor in dogs and cats [2, 7, 8]. The tumor includes several histological types such as meningothelial, fibrous, transitional, psammomatous, angiomatous, papillary, granular cell, myxoid, and anaplastic [7]. Among them, myxoid meningioma, which might be equivalent to chordoid meningioma in humans [5], is very rare and only four cases [9] have ever been reported in the dog. We describe a case of cerebellar myxoid meningioma in a male Shih Tzu in this report.

A 6-year and 9 month-old male Shih Tzu dog was presented to the Veterinary Medical Center, the University of Tokyo with a complaint of ataxia and trembling. The magnetic resonance image (MRI) examination revealed a tumor-like mass about 1 cm in diameter at the cranial part of cerebellum beneath the cerebellar tent (Fig. 1). The size of the mass had not changed in spite of repeated irradiation treatment. The mass was operated one month later and histologically diagnosed as chordoma-like tumor. The condition of the dog had been good after the operation, but he showed a rise of intracranial pressure one month later and euthanized.

At autopsy, a gray- to black-colored mass 1 cm in diameter was observed at the right cranial surface to parenchyma of the cerebellum (Fig. 2). The mass was attached to the caudal surface of the cerebellar tent. The center of the mass was hemorrhagic. Other gross findings included pulmonary edema, umbilical hernia and enteritis.

The tumor mass was fixed in 10% neutral buffered formalin, and embedded in paraffin. Four-micron sections were made and stained with hematoxylin and eosin (HE) and periodic acid-Schiff and alcian blue (PAS-ALB). Immunohistochemistry was performed using primary polyclonal antibodies against keratin (wide-range, Dako, Carpinteria, CA, U.S.A.), vimentin (V9, Dako), glial fibrillary acidic protein (GFAP) (Dako), S-100 (Dako), type I collagen (LSL, Tokyo, Japan), type IV collagen (LSL), laminin (LSL) and fibronectin (LSL). Small pieces of the tumor tissue were subjected to electron microscopic examination.

Fig. 1. MRI of the canine cerebellar tumor. A T-2 enhanced mass (arrow) is indicated. Sagittal (a) and transverse (b) images.
Briefly, the tissue was refixed in glutaldehyde and osmium tetroxide, and embedded in Epon 812 using a routine procedure. Ultrathin sections were double-stained with uranyl acetate and lead nitrate, and observed using a JEM 1200 electron microscope.

Histopathological examination revealed that the cerebellar tumor consisted of short spindle- or polyhedral-shaped cells arranged in a cord-like pattern (Fig. 3) with extensive necrotic and hemorrhagic regions. Tumor cells invaded cerebellar parenchyma in a part. The nuclei of the cells were pale-stained and had prominent nucleoli, showing moderate anaplastic appearance. Few mitotic figures were observed. Some cells possessed cytoplasmic vacuoles. The cytoplasm of the tumor cells was positive only for vimentin. There were either PAS- or ALB-positive materials in the intercellular spaces (Fig. 4), which were abundant in some areas. The materials were negative for type I and IV collagen, laminin and fibronectin.

Ultrastructurally, the tumor cells had a moderate number of cytoplasmic processes, and connected with adjacent cells by desmosomal junction (Fig. 5, inset). Some cells possessed intracytoplasmic microtubule-like structure 20 to 30 nm in diameter, with or without surrounding membrane (Fig. 5).

The present canine case was diagnosed as chordoma-like tumor at biopsy. Chordoma is a rare tumor not only in dogs and cats but also in humans, and is derived from the remnant tissue of embryonal notochord [5, 7, 8]. The tumor usually occurs at the center portion of the skull or vertebral bones. Histologically, chordoma contains abundant intercellular mucinous matrix often similar to cartilage. In the present case, however, the tumor was found at the right cerebellar lobe without bone involvement and the mucinous intercellular materials were less abundant. The case, therefore, was not identical to canine chordoma.

Meningioma is the most popular brain tumor in aged dogs and cats [2, 7, 8] as well as in humans [5]. Among subtypes of canine meningioma, meningothelial, fibrous and transitional types are frequently encountered, but several other types are rare. Together with the clinical and pathological findings, the present canine cerebellar tumor belonged to chordoid type meningioma according to human meningioma classification [3, 5] or myxoid type meningioma to domestic animal classification [7]. Myxoid and chordoid types are not included in human and canine classifications, respectively. However, there are a few reports [1, 4] of human myxoid type meningioma, in which abundant intercellular mucinous materials are characteristic. These reports stated that the essential difference between myxoid and chordoid types was the amount of the intercellular mucous matrix. In fact, the ultrastructural structures of human chordoid [3, 6, 10] and myxoid [1, 4] meningiomas seem to be almost same. Canine myxoid type meningioma is histologically characterized by vacuolated meningial neoplastic cells with moderate to abundant PAS-ALB-positive intercellular mucinous matrix [9]. The present case was histologically very similar to the cases previously reported, and the ultrastructure of tumor cells was similar to that of human chordoid or myxoid meningioma cells [1, 3, 4, 6, 10]. The present canine case would, therefore, belong to the category of myxoid type.

Microcystic meningioma is another rare type and characterized by larger but less mucious intercellular spaces called "microcysts" in the tumor tissue. The type is considered to be a variant of myxoid or chordoid type [1], and is included in the meningioma classifications of both humans [5] and dogs [7]. No microcyst formation was observed in the present case and this diagnosis was excluded.

Canine meningiomas are usually benign tumors except for anaplastic type [7]. The present tumor was, however, considered to be malignant because of invasion of tumor cells into the cerebellar parenchyma and a large area of necrosis and hemorrhage.

REFERENCES

Fig. 3. Tumor tissue in the cerebellum. Cord-like proliferation pattern of tumor cells is observed. The tumor border is not distinct (left). HE stain. Bar = 300 µm.

Fig. 4. Polyhedral tumor cells are arranged in a cord pattern. PAS-positive materials are observed in the intercellular spaces. PAS stain. Bar = 40 µm.

Fig. 5. Ultrastructural appearance of a tumor cell. Abundant microtubule-like structures filling the cytoplasm. The cell has many cytoplasmic processes which connect those of adjacent cells by desmosome junction (inset). Bar = 660 nm.