



## **CANINE BRAIN TUMORS**

### **What are brain tumors?**

Primary brain tumors are relatively uncommon in dogs. Brain tumors include a broad spectrum of tumor types. Gliomas and meningiomas are the most common type in dogs. Brain tumors occur most frequently in older dogs (over 5 years) no sex predilection. Boxers have an increased incidence of meningiomas. The most common secondary tumors in dogs include local extension of nasal tumors, metastases from mammary, prostatic, or lung carcinoma and metastases from hemangiosarcoma. Skull tumors that may affect the brain by local extension include osteosarcoma, chondrosarcoma, and multilobular osteochondroma (MLO).

### **How are brain tumors diagnosed?**

The signs of brain tumors will depend on the location, extent, and rate of growth of the tumor. Many dogs with brain tumors will have a long history of vague symptoms such as behavior alterations that are often overlooked by owners until significant brain dysfunction develops. The most frequently recognized clinical sign is seizures, particularly in dogs over the age of 4 years. Other signs may include weakness, head tilt, circling, and ataxia. A complete blood cell count, chemistry panel and urinalysis are necessary to rule out metabolic causes of seizures. It is also important to rule out infectious causes of seizures such as Valley fever and toxoplasmosis. Advanced imaging such as CT scan or MRI is necessary to identify a brain tumor. Ultimately, a biopsy is needed to definitively diagnosis the type of brain tumor. This is not usually performed due to the risk to the patient. MRI and CT imaging characteristics for certain tumors have been described which may help differentiate tumor types. Chest X-rays are useful to evaluate for metastases or secondary tumors prior to consideration of treatment.

### **What are the treatment options?**

#### Surgery

The precise location, size, and extent of the tumor determine the possibility of surgical removal. The possibility of complete surgical removal is also affected by tumor type. Surgical removal of brain tumors is being practiced more frequently, but requires a neurosurgical specialist. Meningiomas, particularly those located in the frontal lobes may be excised. Tumors of the caudal fossa and brain stem have significant morbidity and mortality associated with surgery. If the tumor is not able to be completely removed with surgery, additional therapy such as radiation or chemotherapy may be warranted.



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### Radiation therapy

The use of radiation therapy for dogs with brain tumors has been well established. Radiation therapy may be used as a sole treatment for nonresectable brain tumors or as an adjuvant to surgery. The CT or MRI image is used to plan the radiation therapy in order to minimize radiation effects on surrounding normal brain tissue. Radiation therapy is performed Monday through Friday daily for 16-18 treatments. General anesthesia is required for treatment.

Stereotactic radiation therapy (cyberknife, gammaknife, SRT) is a new and innovative radiation technique which uses special equipment to position the patient and precisely deliver radiation to the tumor. The advantages are shorter treatment time (3 doses vs. 16-18 doses), improved tumor control and decreased side effects. SRT is available at Colorado State University as well as several other academic and private practices. Preliminary data indicate a control rate of 1-2 years for meningiomas and 6-9 months with glial tumors with SRT.

### Chemotherapy

Little information is available regarding the efficacy of chemotherapy for brain tumors in dogs. Few chemotherapy drugs are capable of penetrating the blood-brain barrier. CCNU is one drug with limited use in canine brain tumors. This is an oral chemotherapy agent that is administered on an every 3 week schedule. Recent attention has been given to hydroxyurea in the treatment of meningiomas in humans. Hydroxyurea is an oral chemotherapy that is administered daily. In humans, administration of hydroxyurea appears to slow or arrest the progression of the tumor based on serial MRI imaging. Because of the financial investment, it is often not feasible to perform serial imaging examinations (MRI or CT) in dogs, making it difficult to evaluate the efficacy of these therapies.

### Palliative therapy

Palliative therapy involves the use of Phenobarbital or other anticonvulsants to control seizure activity and prednisone to reduce tumor associated swelling or edema.

### Chinese herbal medicine

Chinese herbs may be used in combination with traditional western therapies or as a primary therapy. The goal is to boost immune system function, slow progression of the tumor and reduce symptoms. The responses to Chinese herbal medicine have been variable. Patients with smaller tumors with minimal symptoms have responded better with survival times greater than 1 year. Other patients with more severe symptoms, including seizures have not shown a great response with progression of symptoms within 1-3 months.



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### **What is the prognosis?**

The prognosis of brain tumors depends on several factors including the tumor type and method of treatment. With palliative therapy only, the prognosis is poor, with an average survival time of between 2-4 months. The prognosis for dogs with primary brain tumors is significantly improved by surgical removal, irradiation, and chemotherapy either alone or in combination.

Surgical removal of brain tumors yields an average survival of 6-10 months. Many brain tumors are not able to be completely excised and postoperative radiation therapy is warranted. If radiation therapy is performed following surgery, the average survival time is improved to 14-18 months. For nonresectable brain tumors treated with radiation therapy, the average survival is 12 months. Little data exists on survival times for dogs with brain tumors receiving chemotherapy as the sole treatment or chemotherapy as an adjuvant to surgery.