

# Canine Brain Tumors

## Client Informational Handout



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### Overview

There are several different types of primary brain tumors, including meningioma (the most common tumor), glioma (astrocytomas, oligodendroglioma, glioblastoma multiforme), choroid plexus tumor, histiocytic sarcoma, and a variety of other less common tumors. Some tumors are slow growing and may insidiously develop over months while others grow rapidly and cause acute symptoms. Tumors that arise in other locations in the body can metastasize (spread) to the brain as well, most often causing multiple lesions in the brain. Brain tumors vary in the response to treatments but many advances have been made towards improving outcome for dogs that are treated.

### Clinical Signs

Neurologic signs that occur in dogs with brain tumors often include pacing or lethargy, getting "lost" in corners of a room, seizures (the most common sign), altered mentation and gait, altered appetite, blindness, and nonspecific signs like weight loss, vomiting, and weakness.

### Diagnosis

While the gold standard of diagnosis for brain tumors is a surgical biopsy and/or removal, it may be difficult to safely obtain a piece of tumor to confirm the underlying type. A diagnosis is always helpful as it helps us learn more about tumor behavior in dogs; however, we sometimes make a presumptive diagnosis on the basis of the appearance and location of a mass on imaging (usually MRI, less commonly based on CT scan) when it is risky to sample the tumor.

### Treatment Options & Prognosis

#### Definitive Intent Treatment For Long-Term Control

1. Surgery: In people, surgery is often the mainstay of treatment for brain tumors. We do not have the same wealth of information in dogs as we do in people, but it stands to reason that surgery would be helpful in pets for tumor control. Brain surgery can be performed for many tumors, particularly those located on the surface of the brain; for some dogs with deeper tumors (gliomas), surgery may also be beneficial if combined with adjuvant therapy. We offer surgery for many brain tumors and our surgeons have experience determining which cases are more likely to do well after treatment. The benefits of surgery include that we are able to immediately reduce the size of the tumor (which likely leads to decreased discomfort and improvement in clinical signs) and obtain a definitive diagnosis with histopathology.

Risks of surgery include: bleeding, brain swelling, incomplete removal of tumor (meaning that tumor cells are left behind that can cause tumor regrowth), postoperative infection, and discomfort. Risks are rare with the exception of tumor recurrence. Postoperative treatment with immunotherapy or radiation therapy (RT) is often recommended to delay tumor recurrence. In humans, meningiomas are often treated surgically with good outcomes. For gliomas and recurrent or aggressive meningiomas, postoperative radiation has been useful for improved control. Prognosis is dependent on the underlying tumor type and how effective surgery is at removing the tumor. While it is difficult to predict outcome, we are generally aiming for at least

1-2 years of tumor control following surgery for meningioma and 4-9 months following surgery for dogs with gliomas. At this institution, following surgery and vaccine-mediated immunotherapy, we expect a minimum of 2 years of tumor control for meningioma, regardless of grade. For high-grade gliomas, we have found that our surgical approach with a checkpoint inhibitor has increased our expectation to approximately 12-13 months. Dogs with the rare diagnosis of low-grade glioma survive an average of 2 years after surgery and immunotherapy. With improved surgical techniques and combined approaches with other therapies, we hope we can improve outcomes in the future.

2. Definitive-Intent Radiation Therapy (RT): Conventional RT can be prescribed before surgery, after surgery or instead of surgery. We know that RT will slow the rate of growth of most types of brain tumors and can shrink some tumors. The intent of definitive-intent RT is to achieve control for as long as possible while maintaining an excellent quality-of-life. Radiation is typically prescribed such that 20 fractions (administrations) of radiation are administered daily (Monday through Friday) for 4 weeks. Radiation is administered with pets under rapidly-acting general anesthesia and most animals are up and looking for food within 30 minutes of treatment. Dogs with brain tumors may be slightly slower to recover from anesthesia; we work with you and our anesthesia department to ensure that repeated anesthesia is safe and tolerable. A CT scan for RT planning is necessary prior to treatment so that a patient-specific plan is created to best target tumor tissue and avoid normal structures like the eyes and ears. Most pets do very well with RT and acute side effects (reversible effects like radiation burn to the skin and mouth) are rare with this type of treatment. Any time that brain undergoes radiation, acute swelling (edema) is possible so we encourage you to keep an open dialogue with us and let us know if you have concerns about worsening neurologic symptoms. Late radiation toxicities refer to permanent side effects that develop months to years after RT are uncommon; the most common changes include hair coat color change or skin pigmentation changes in the hair/skin over the brain. Every dog is different and risks of toxicity vary depending on the location, size and type of treatment. With prolonged survival after RT (>1-3 years), late radiation effects could include fibrosis or necrosis of the brain, which can mimic clinical signs caused by tumor (seizures, behavior changes). The daily dose of radiation is the most important factor in predicting the likelihood of late toxicity; the low dose every day to normal brain tissue helps minimize the likelihood of significant fibrosis or necrosis.

Following RT, we strongly recommend routine recheck examinations and imaging (MRI or CT depending on your pet's tumor type) to evaluate how well RT worked and how sustained a response is. This helps us make good decisions with you for your pet and also helps other pets since we learn how well our treatments work over time. As with surgery, prognosis is dependent on the underlying tumor type and its response to therapy. For gliomas treated with RT (when grade is not known), the median survival time is approximately 9 months, meaning that 50% of dogs will do better than this and 50% of dogs will do worse. There are large ranges in reported outcomes, varying from 2 months to > 2 years survival. For meningiomas, the prognosis tends to be favorable with the median survival time after RT approximately 18 months (range 6 months to > 3 years). There is less data to predict outcome with other tumor types but generally, we hope for at least 6-12 months of control with RT. Your oncology team will help discuss the advantages/disadvantages of treatment and expected outcomes with you once your pet has been assessed.

3. Stereotactic Radiation Therapy (SRT): While we know the most about conventional RT, where radiation is given in small doses each day over several weeks, we are interested in investigating the use of higher doses of radiation that are administered less frequently. Stereotactic radiation therapy (SRT) refers to the use of

high doses of radiation given in 3-5 fractions. Currently, we do not know if this provides equal control to conventional RT but it is an alternative option for owners wishing to consider a different approach. Preliminary work in veterinary medicine suggests that some brain tumors will have equal control to conventional radiation protocols but work needs to be done to confirm this. A CT is required for planning so that we can sculpt the radiation beams precisely to the tumor target.

Not all dogs and cats are good candidates for this type of therapy; SRT is likely optimal for small, very well defined targets, thus this is not a standard treatment after surgery or when the tumor is large and difficult to define. Acute toxicity is not expected, but any time the brain is irradiated, there is a risk of acute swelling, thus we encourage you to let us know about any new or worsening neurologic symptoms. There is a risk of late radiation toxicity with prolonged outcome (>9-12 months), as the radiation dose given at each treatment is very high; however, since this technique is generally used for well-defined tumors, the margin of normal brain around the tumor is limited to avoid toxicity. We do not have sufficient information yet to determine what the true rate of late toxicity is for our patients and therefore we recommend routine monitoring after RT.

4. Systemic Therapy: Immunotherapy, targeted drugs (tyrosine kinase inhibitors) or chemotherapy may be options for your pet, although it is not always clear if these improve outcome over surgery with or without RT. Clinical trials may be available for your pet that help us determine if immunotherapy is effective with local treatment.

### **Palliative-Intent Treatment**

1. Palliative-Intent RT: Palliative RT is also an option for brain tumors and would consist of a larger fraction of radiation given less frequently. We typically prescribe palliative RT over the course of 1 week (treatments Monday through Friday for 5 doses total) or once weekly for 4 doses. The overall dose of radiation is lower compared to definitive intent protocols, and the intent is purely to improve quality of life, not to gain as much tumor control as possible; therefore durable responses to palliative RT are uncommon. Because the dose of radiation for each treatment is higher, there is a higher risk for significant late radiation effects.
2. Chemotherapy: Chemotherapy or other medical treatments may be available for your pet and can be palliative in nature. Please discuss alternative options with your oncologist should you choose not to pursue RT.
3. No further therapy is always an option, should you elect not to consider definitive or palliative treatments. Palliative options will almost always remain an option to you should your dog have progressive disease and you wish to pursue treatment. Sometimes the use of anti-pain medications can make a big difference for a short period of time so we will often discuss methods to keep your pet comfortable.

**\*It is important to discuss all options with your oncology team as alternative treatments may be more appropriate for your pet. Please do not hesitate to let us know if you have questions or concerns\*.**