

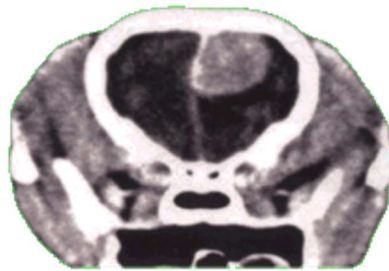
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By Wendy C. Brooks, DVM, DipABVP
Educational Director, VeterinaryPartner.com

Meningioma

The Most Common Brain Tumor of Dogs and Cats

The idea that someone we care about has a brain tumor is virtually unthinkable; yet, sometimes it must be considered. The meningioma is probably the most common cause of seizures in dogs over age 6 years of age. It behooves us to know our enemy and it turns out there is a fair amount to know about this tumor.



The meninges are the membranes that line the skull and vertebral column, effectively surrounding the central nervous system, which consists of the brain and spinal cord. Often the words "brain tumor" lead us to conjure an image of a growth deep and inaccessible inside the brain, but this is not what a meningioma is. Because the meningioma is a tumor of the meninges (the outer membranes) these tumors grow from the skull inward. This makes them much more accessible surgically, depending on their size, than you might have at first thought.

Meningiomas are generally benign, meaning that they do not create cancer. They do not spread to other areas of the body or invade and destroy tissue local to them. The reason they are a problem is that there is a limited amount of space within the skull. The brain and its bath of cerebrospinal fluid take up almost all the room and when a tumor begins to grow, the brain tissue is compressed. Inflammation can result leading to more swelling and soon nerves of the brain are damaged.

Signs of Meningioma

In dogs, seizures are the most common sign. In cats, signs are more vague and consist of listlessness and behavior changes. The following signs have been reported with meningiomas, largely depending on the brain area involved:

- Walking in circles
- Blindness
- Dragging toes

- Drunken gait
- Getting "stuck" in corners, and pressing the head against a wall or upright object

Some things we know:

- While there are meninges surrounding both the brain and spinal cord, meningeal tumors almost always arise in the meninges around the brain. (About 14% of canine meningiomas and 4% of feline meningiomas involve the spinal cord.)
- Meningiomas are classified based on the different cell types they involve. Different types have different growth rates.
- Meningiomas are usually benign in that they do not spread to other body areas.
- Oddly, meningiomas contain high numbers of progesterone receptors. In dogs, the number of progesterone receptors a meningioma contains correlates to more aggressive progression. This means that anti-progesterone medications may be helpful. In cats, there is no such correlation. Anti-progesterone therapy is still under investigation at this time.
- 95% of canine meningiomas occur in dogs over age 7 years. Most affected cats are over age 10 years.
- Dogs with long noses (particularly collies) seem to be predisposed.
- In cats, meningiomas tend to have a more rubbery texture than in their canine counterparts. This makes the feline tumor a bit easier to remove.
- In dogs, most meningiomas occur in the front of the skull. This is the area where the olfactory lobes (which control the sense of smell) are located. Altered sense of smell may easily lead to a behavior change or appetite change.

What Kind of Testing is Done for a Possible Brain Tumor?

A basic blood panel, and urinalysis if possible, is the foundation for virtually every medical work up as this will help assess the patient's general health. Obviously, it is important to identify if there are any other problems to contend with but it is worth pointing out that routine blood work cannot confirm a brain tumor.

Chest radiographs are important to screen for cancer spread. Often times, brain tumors are the result of spread from a malignancy that developed somewhere else. In one study, 55% of brain tumors had not actually started in the brain but had spread there from some other location.

The central test for a brain tumor is imaging of the brain: either CT (sometimes called CAT scan) or MRI (magnetic resonance imaging). These techniques allow imaging of the brain so that the tumor can be located specifically and distinguished from areas of blood clot or inflammation. Radiographs simply cannot penetrate the skull bone and it is only since these more advanced technologies have become available that imaging the brain is possible. The MRI is preferred over CT as it is better able to identify fluid build up, swelling, cysts, bleeding and other subtle soft tissue changes inside the brain.

Treatment

Medication. If the goal is palliation, in other words just keeping the pet comfortable and minimizing seizures, prednisone can be used to relieve swelling in the brain tissue and anti-seizure medication such as phenobarbital or potassium bromide can be used to control seizures. Prednisone is surprisingly effective in shrinking a meningioma simply by

decreasing tumor blood flow. In one study the tumor's blood volume was 21% reduced within 24 hours of beginning prednisone. Eventually, the tumor will grow too big to respond to these tactics but for a time they are usually effective (3-6 months survival in one study).

A more definitive therapy involves surgical removal of the tumor and/or radiation therapy, both very expensive treatments.

Surgery. As noted earlier, in cats the meningioma is an easier tumor to remove than it is in dogs. Most cats do well with surgery and mortality is low. As the tumor has benign behavior in cats, generally speaking survival rates are good. In one study, 71% were alive 6 months after surgery, 66% were alive one year after surgery and 50% were alive two years after surgery. Approximately one cat in five will have a tumor recurrence within 27 months.

The story is a bit different in dogs where the tumor is less well defined. Canine tumors tend to be more invasive into the surrounding brain and it is hard for the surgeon to tell where to cut (approximately 1/3 of canine meningiomas infiltrate normal brain tissue). Median survival times are approximately 7 months though this can be extended by following surgery with radiotherapy.

A new piece of equipment called an ultrasonic aspirator seems to be improving the situation. This piece of equipment has a vibrating tip that breaks up tissue and then suctions it away, making for less bleeding and less swelling. In one study, meningiomas removed with this piece of equipment showed a 42-month median survival time.



Ultrasonic Aspirator

There are different types of meningiomas that biopsy can distinguish. Different types of meningiomas are associated with different post-operative survival times, some short and some long. Surgery enables the tumor tissue to be not only removed, thereby treating the disease, but enables tissue sampling which can be used to get a better sense of prognosis in a given dog.

Radiation. There are many different schedules used for radiation treatments: some weekly, some daily, some on alternate days. Radiation can be done instead of surgery or in combination with surgery. Which protocols yield the longest survival times is not clear. Currently, the philosophy on treatment is that a combination of surgery plus radiation yields the best results for dogs. Cats seem to do so well with surgery that recommendations lean away from radiation.

Radiosurgery. Radiosurgery involves using a focused dose of radiation to a well-defined target in the brain, effectively cutting a deep lesion away. Instead of using one radiation beam, several beams are focused on the target such that the path of each beam through the beam is not damaged but the target where all the beams come together is destroyed. This technique is called stereotactic radiosurgery and uses either an adapted linear accelerator (a LINAC) or a Gamma Knife, as is done in human brain tumor surgery. This procedure is particularly attractive as it is a one-time treatment rather than a series of radiation treatments. The tumor must be small (less than one inch in diameter) for this type of treatment to work and currently only a few facilities offer it.

Chemotherapy. For chemotherapy to be effective against brain tumors, the drugs used must be able to cross the blood-brain barrier, the biological shield that protects the brain from metabolic changes in the body reflected in the bloodstream. Only a few medications are available and results have been unexciting in cats and possibly promising in dogs. Further studies are needed before recommendations can be made.

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