

# Canine Multicentric Lymphoma

## WHAT IS LYMPHOMA?

Lymphoma is a cancer of the cells of the immune system called lymphocytes. Lymphocytes are present throughout the body, so dogs can develop lymphoma in multiple organs. Lymphoma most often affects lymph nodes, but can also affect the liver, spleen, bone marrow, and other sites.

Lymphoma is typically diagnosed using aspirates collected from enlarged lymph nodes. In some cases, diagnosis may require sampling of bone marrow or other organs, tissue biopsy, or molecular testing (flow cytometry, PARR). Once a diagnosis is made, staging tests are recommended to assess the extent of disease. Complete staging includes blood and urine testing, non-invasive imaging (chest X-rays, abdominal ultrasound), and additional aspirates. This evaluation provides prognostic information, a baseline for monitoring, and information regarding organ function and involvement. Results may influence treatment recommendations or help anticipate potential complications.

Lymphoma is categorized into five stages, depending on the extent of the disease in the body: single lymph node enlargement (stage I), regional lymph node enlargement (stage II), generalized lymph node enlargement (stage III), liver and/or spleen involvement (stage IV), and bone marrow and blood involvement (stage V). Patients are further categorized into a substage, with substage "a" being patients who show no clinical signs of illness and "b" being patients who show signs of illness (such as vomiting, weight loss, lethargy, fever, decreased appetite, etc.).

## WHAT IS THE DIFFERENCE BETWEEN B CELL AND T CELL LYMPHOMA?

In addition to staging and substaging, lymphoma can be further characterized based on the type of lymphocyte (T cell or B cell) that becomes cancerous. B cell lymphoma is more common, and dogs with this variant often achieve and maintain remission more readily than patients with T cell lymphoma. Because of this favorable response to treatment, survival times are longer for dogs with B cell lymphoma. Individual survival and treatment response are patient dependent, however. Some dogs with T cell disease achieve durable remissions, and some patients with B cell disease do not.

## WHAT ARE THE TREATMENT OPTIONS?

Options for treating lymphoma include chemotherapy (+/- bone marrow transplant) or palliative therapy with steroids alone. Treatment selection depends on your goals, your pet's tolerance of visits, cost, and most importantly, quality of life. Our goal in veterinary medicine is to provide treatments and promote an ongoing relationship between yourself and your pet. This means ensuring activities that make your pet happy such as walks, swimming, and interacting with you, continue to happen during and after treatment.

## **WHAT IS THE PROGNOSIS?**

Prognosis is determined by the susceptibility of the cancer to the treatment elected. It is patient dependent with many dogs having a good initial response to treatment. The most effective treatment for canine lymphoma is chemotherapy combined with bone marrow transplant (see below). Chemotherapy alone is also effective, but not curative. With multi-drug therapy, dogs with B cell lymphoma have an average survival time of 12 months and those with T cell lymphoma have an average survival of 6-9 months.

Without chemotherapy, the prognosis is poor (< 3 months).

## **WHAT ARE THE SIDE EFFECTS?**

Side effects are treatment associated but most commonly include mild gastrointestinal upset (vomiting and/or diarrhea.) Decreased appetite and mild lethargy may also occur. You will be prescribed medications to use as needed. It is best to be proactive with these medications and start them as soon as signs are noted. Should you have any questions, your oncology team is available to assist.

## **CONCERNS OF CHEMOTHERAPY FOR MY PET:**

Chemotherapy carries a negative impression especially with our understanding of its use in human medicine. Our approach to chemotherapy in veterinary medicine is different. As quality of life is imperative for our pets, doses are adjusted, and your pet is monitored to limit severe side effects. Though there is a risk of hospitalization, the majority of pets tolerate therapy well. Hair loss is rare except in certain breeds. Should you have concerns during therapy, speak with your oncologist.

## **HOW DO I PREPARE?**

We understand this is a difficult time and we are here to support you and your pet. Selecting a therapy is not binding and can be adjusted to you and your pet's needs. During treatment sessions, you will be provided with updates and any recommendations depending on your pet's response. Should any concerns arise, your oncology team will provide answers and help to guide you.

## NAVIGATING THROUGH MY OPTIONS:

Treatment	Prognosis- (median)	Treatment schedule	Approximate cost*
Steroid (prednisone) alone +/- L-asparaginase	1 - 2 months	Oral medication provided daily at home	\$20 - \$30 per month \$200 per injection
CHOP protocol (vincristine, cyclophosphamide, doxorubicin, and tapered course of prednisone/ prednisolone) +/- L-asparaginase	B cell: 12 months T cell: 6 - 9 months	Alternating three chemotherapy drugs on a weekly basis with bloodwork performed on the fourth week. This is repeated four times. Oral chemotherapy can be administered at home after the first month	\$300 - \$350 per treatment \$3,600 - \$4,600 over the course of the protocol
Single-agent doxorubicin	6 - 8 months	Intravenous chemotherapy every 2 - 3 weeks, for 6 treatments	\$350 - \$400 per treatment
Rabacfosadine (Tanovea ®) alternating with doxorubicin	4 - 5 months	Alternating intravenous chemotherapy every 3 weeks for 6 treatments	\$700 per treatment
Rabacfosadine (Tanovea ®)	6 months (progression free interval)	Intravenous chemotherapy every 3 weeks for 5 treatments	\$300 - \$700 per treatment
Single-agent CCNU or CCNU and L-asparaginase	2 - 4 months	Oral chemotherapy every 3 weeks, for 5 treatments	\$300 - \$400 per treatment, L-asparaginase adds ~ \$200 to the expected visit cost
Bone marrow transplant	Cure rate of: 33% B cell 19% T cell	Transplant provided after chemotherapy-induced clinical remission. Total body irradiation and hospitalization with supportive care	\$19,000 - \$25,000 one-time treatment

\*Cost estimates are based on individual appointments and overall cost is dependent on patient response, which does not include additional supportive care or hospitalization.

## WHAT IS A BONE MARROW TRANSPLANT?

Bone marrow is found within your bones and bone marrow stem cells are the source of all the blood cells needed for life. We can cause these stem cells to leave the bone marrow (with a medication called Neupogen ®) and travel out into the peripheral blood, where we collect them using an apheresis machine. During apheresis, dogs are anesthetized for ~4-5 hours. The apheresis machine painlessly takes blood out of the patient, separates and collects stem cells, and returns the other blood cells back into the dog.

Once cells are collected, the dogs undergo total body irradiation in an attempt to kill all the remaining lymphoma cells in their body. This treatment also kills all their own bone marrow cells, which is why we need to replace it with the previously harvested stem cells. Once these cells are replaced, the transplant is complete.

After the transplant, dogs are hospitalized for ~2 weeks until their bone marrow recovers, and their blood cell counts return to normal. During this time, dogs are carefully monitored and supported through any side effects. A portion of their time is spent in an isolation ward to protect them from acquiring an infection.

Overall, patients tolerate bone marrow transplant well. Risks include those related to anesthesia, radiation side effects, and infection. Cure has been obtained in 33% of dogs with B cell lymphoma and 19% of dogs with T cell lymphomas. Dogs should be in a clinical remission from chemotherapy before the transplant is performed. Further information is available from our Bone Marrow Transplant Unit under the direction of Dr. Steven Suter.

## GETTING STARTED

Once you have determined the best therapeutic option for your pet, you may work with our oncology team to develop an appointment plan.

**Scheduling:** Appointments for patients undergoing treatments and rechecks should be scheduled in advanced. You are responsible for making this appointment with the front desk:

- > Schedule your appointments at reception upon check out.
- > Drop offs are requested between 7:30-8:30 am.
- > Pick ups are requested by 4:30 pm.
- > No discharges are done from 3:30-4:30 pm as our oncology team is in rounds.