

Rescue Protocols for Canine Lymphoma

Most dogs treated with CHOP chemotherapy achieve remission. The duration of remission varies from a few months to a year or more after completion of treatment. Remission does not equal cure, and 95% of dogs **relapse** following treatment. We detect relapse by noting increased lymph node size. Needle aspirates are usually done to confirm relapse.

Some dogs do not respond to CHOP. Or they may relapse during treatment. The cancer cells of these dogs have developed **resistance** to the drugs in the CHOP protocol.

Relapse and resistance are devastating, but expected, consequences of having lymphoma. When they occur, we recommend treatment with **rescue** protocols. There are many options for rescue protocols. We discuss the pros and cons of each as they relate to your dog and your goals and assist you in choosing the best plan of action.

The goal of rescue protocols is response. This can be either a complete or partial remission.

Should you decide to pursue rescue treatment, we recheck lab work (complete blood count, serum chemistry panel, and urinalysis) to ensure your dog is good candidate. Other diagnostics are recommended on a case-by-case basis.

TREATMENT OPTIONS

- 1. Restarting CHOP chemotherapy:** If more than two months has passed between when your dog finished CHOP and relapse, we can restart CHOP treatment. This option has an 80% chance of inducing another complete remission. The duration of remission depends on the length of the first remission. Side effects are the same as during the first CHOP protocol.

Note: Due to concerns for toxicity to the heart muscle, we may recommend substituting doxorubicin with mitoxantrone.

Estimated cost: \$400-\$500 per treatment. \$4,500-\$5,500 over the course of 15 weeks

- 2. L-asparaginase (L-spar)/CCNU (Lomustine)**

L-asparaginase is injected under the skin and CCNU is an oral drug. Treatments are repeated every 3 weeks. There is an 80-90% chance of remission. Responses typically last about 3 treatments but could be longer. Should your dog achieve a complete remission, we recommend a total of 6 treatments.

Side effects include temporary low white blood cell counts. Upset stomach signs (vomiting/diarrhea/poor appetite) are rare. CCNU can cause liver damage and affect platelet counts. We monitor bloodwork during treatment. Note: L-asparaginase is usually given with the first 1-2 treatments only.

Estimated cost: \$1,500 total for first 2 treatments, \$500 per treatment thereafter

3. MOPP (Mustargen/Vincristine/Prednisone/Procarbazine)

This protocol involves administering 2 injectable chemotherapy drugs (mustargen and vincristine) at the same time. Two oral medications (prednisone and procarbazine) are given at home. Dogs receive both injectable drugs on day 1 and this is repeated one week later. The oral drugs are given at home starting on day 1 and continued for 14 days. This 14-day period is a cycle of MOPP. This cycle is followed by a one week “rest” and then repeated. There is a 65% chance of remission. Responses typically last about 2-3 cycles but could be longer. Should your dog achieve a complete remission, we recommend a total of 6-8 cycles.

Side effects are rare, but include temporary upset stomach signs and temporary low white blood cell counts.

Estimated cost per cycle: \$1,800 - \$2,000

4. Tanovea (rabacfosadine)

This is an injectable chemotherapy drug given once every 3 weeks. There is 50-75% chance of remission which usually lasts between 1-4 treatments but can be longer. Should your dog achieve a complete remission, we recommend a total of 5 treatments.

Side effects include temporary upset stomach signs. Rare side effects include liver value elevation, skin changes, and scarring of the lungs.

Estimated cost per treatment: \$500-\$800

5. Mitoxantrone

This is an injectable form of chemotherapy given once every 3 weeks. The chance of remission is about 50%. Typical responses last for about 4 treatments. Should your dog achieve a complete remission, we recommend a total of 6 treatments.

Side effects include temporary upset stomach signs and/or low white blood cell counts. Estimated cost per treatment: \$350-\$450

6. LOPP

This protocol involves administering vincristine and CCNU. Two oral medications (prednisone and procarbazine) are given at home.

EXAMPLE OF THE LOPP PROTOCOL SCHEDULE

Week 1: CCNU and Vincristine given in hospital. Procarbazine and prednisone are given at home for 14 days

Week 2: Continue procarbazine and prednisone at home

Week 3: Vincristine given in hospital. Stop procarbazine and prednisone

Week 4: Off week

There is an ~60% chance of remission. Responses typically last about 3 cycles but could be longer. Should your dog achieve a complete remission, we recommend a total of 6-8 cycles.

Side effects are rare, but include temporary upset stomach signs and temporary low white blood cell counts.

Estimated cost per cycle: \$1,000 - \$1,200

7. Dacarbazine (DTIC)

This is an intravenous chemotherapy treatment given as a long infusion (5-6 hours) every 2-3 weeks. The chance of remission is 35%. Typical responses last for 2-3 treatments. Should your dog achieve a complete remission, we recommend a total of 6 treatments.

Side effects include temporary upset stomach signs and/or low white blood cell counts and decreased platelet counts. In some cases, we recommend combining dacarbazine with other drugs (e.g., CCNU, doxorubicin, or mitoxantrone) to potentially increase efficacy.

Estimated cost per treatment: \$500 (combination treatment will increase cost)

8. Doxorubicin/Temozolomide

Temozolomide is an oral version of dacarbazine (DTIC). Treatment is given for 5 consecutive days. The chance of remission is about 30%, but the duration is usually short lived with the average patient only responding to one treatment. Therefore, when appropriate, we recommend combining this drug with another chemotherapy drug (typically doxorubicin). This can increase the both the chance of response to about 60-70% and the duration of response to about 3-6 weeks.

Estimated cost per treatment: varies significantly with patient size and source of drug

9. L-asparaginase (L-spar)/prednisone

L-asparaginase is injected under the skin and prednisone is given orally at home. This is a highly effective treatment. Response durations are short (weeks). This option is the LEAST likely to cause any side effects (beyond using prednisone alone). Treatments can be repeated every few weeks or as needed but are less effective over time. Repeat use can lead to allergic reactions.

Estimated cost per treatment: \$300 - \$400

10. Prednisone (+/- Laverdia/verdinexor)

Prednisone can be an anti-cancer treatment for some dogs with lymphoma, and also can be a drug that helps them feel better and maintain their appetite and energy. The benefit doesn't typically last more than a few weeks to months once a dog is out of remission. No specific monitoring is required for dogs on prednisone alone. We can combine prednisone with Laverdia. Laverdia is an oral chemotherapy drug given twice weekly. Rechecks are required every 2-4 weeks.

Estimated cost per month: Prednisone alone: \$20-\$30. Combined with Laverdia: \$250-\$450.

Note: Prednisone is frequently prescribed in conjunction with the protocols listed above.

These options are not mutually exclusive and many patients receive multiple protocols as long as they continue to feel well.