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# Deerhound Anesthesia

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I graduated from the University of Tennessee College of Veterinary Medicine in 1981, and our options for anesthesia were considerably more limited then than they are today. Inhalation anesthetics available were methoxyflurane and halothane with or without nitrous oxide, injectables were ketamine, xylazine, ultrashort barbiturates, and pentobarbital. While we might still use ketamine as part of a mixture for induction, it's about the only one listed that's still in common use in small animal practice. Most practices didn't even *have* inhalants in those days. Now a small animal practice without it is in danger of being sued for malpractice if surgery is done there at all. Methoxyflurane gave way to halothane, and halothane to isoflurane as safer products became affordable for animals. Now many practices use sevoflurane, the next generation inhalant which is more quickly metabolized and excreted than its forebears. Soon newer and better drugs will replace these. And so anesthesia for Deerhounds will change with time, just as it changes for all breeds.

Every anesthetic procedure should be considered a major event in

your dog's life. Please listen to suggestions for reducing risk, especially preanesthetic bloodwork, and if your veterinarian doesn't suggest it, request it.

At the very least, a liver and kidney function test and CBC should be performed, and I prefer a full chemistry profile for my anesthetic patients.

Because Deerhounds can carry one or two copies of a defective gene for a blood clotting factor (Factor VII), they can be at risk for prolonged or excessive bleeding during or after surgery. A blood clotting test called Prothrombin Time (PT) will measure your dog's likelihood to bleed due to FVII deficiency, even if you don't know his/her genetic status. Many practices have this test in house and can run it the day of the procedure.

You should be aware that Deerhounds also sometimes suffer from a congenital disease of the liver which shunts blood around it and reduces its ability to metabolize drugs. This is called Portosystemic Shunt, or Liver Shunt, and you should know if your Deerhound was tested for this as a puppy with a bile acids test. If not, and the anesthesia is for an elective procedure (that is, you have time to run the test and await the results), it would be wise to have at least a resting bile acids test run. If the dog is over six years old and healthy, it's unlikely s/he has liver shunt, but the disorder can be fairly minor or very severe, and some animals are five or six before symptoms are apparent.

There are other disorders of the clotting system that are not fully

understood and only now coming to light in sighthounds. One has been identified in Greyhounds which we believe is also a problem in Deerhounds, having to do with blood clot fragility. Because sighthounds have very concentrated blood (high packed cell volumes) needed for increased oxygen-carrying capacity required for sprinting after game, sludging of blood would occur in the small vessels if there were no mechanism for dissolving clots. Apparently one reason that sighthounds bleed to death after surgeries, even when all testing for clotting disorders is normal, is this clot fragility. The dog forms normal clots after the procedure, but after 12-48 hours, the clots become fragile and dissolve, allowing the animal to bleed to death. We are very fortunate that, along with this knowledge, we also know that aminocaproic acid, or Amicar, a drug from the human side which is used to strengthen blood clots, works to prevent this problem in Greyhounds, and we believe by extension, Deerhounds. Using this drug after Deerhound surgery, usually starting the evening after, at about 8 mg per pound three times a day for five days may seem like overkill to you, but losing a dog after a minor procedure like a neuter to post-operative bleeding happens often enough to make it a good insurance policy.

A thorough physical examination is essential to assess health on the day of the procedure. You'd be surprised how many people complain about paying for "another" physical exam when the patient was examined two weeks before for his routinely scheduled health visit. Temperature and auscultation of the heart can reveal issues on *this* day that didn't exist two weeks ago. If arrhythmias are suspected after auscultation, a quick electrocardiogram can be run—I can do one with my iPhone! If an arrhythmia is confirmed,

unless the procedure is an emergency, a cardiac ultrasound should be considered to rule out occult cardiomyopathy.

Anesthesia is divided into three phases: premedication, induction and maintenance. Most of the veterinarians I read with anesthesia as a specialty recommend acepromazine as a *premedication* for sighthounds, and if the dog is extremely anxious, I would probably do the same. I mostly use butorphanol as a premedication as it not only sedates but controls pain. Antibiotics might be administered if dentistry is to be performed or infection is a part of the dog's condition.

During the *induction* phase, a drug or combination of drugs is given to cause immediate unconsciousness and allow us to place an endotracheal tube. The induction agents used today are usually so short acting, they are long out of the system before the procedure is finished. Drugs given intramuscularly to induce general anesthesia include Domitor and Telazol. I personally reserve their use for dogs that are so aggressive I can't put in an IV catheter. You cannot control depth nor duration of anesthesia with these agents.

During the *maintenance* phase, a drug or combination of drugs is given to keep the dog unconscious for as long as necessary. Continuous administration of a gas anesthetic through the endotracheal tube is the maintenance agent of choice nowadays because anesthesia can be maintained for as short or as long a time as needed, and when administration ends, recovery is very rapid.

My own protocol for sighthounds has changed over the years. When barbiturates were the induction drug of choice, sighthounds didn't do so well. Even cutting the dosage in half could result in prolonged recovery times. I used to use ketamine and diazepam in a 50/50 combination IV for induction, then intubate and maintain on isoflurane. Now, with the arrival of propofol on the scene, it's hard not to use that for *all* breeds, not just sighthounds. I give butorphanol at .1cc per 10 pounds as a preanesthetic either intramuscularly ten minutes prior to induction or IV immediately before, then induce with propofol, at a dosage of .3cc per pound, though I start with a maximum dose of 20cc, then give more if needed. Isoflurane or sevoflurane are both safe and effective maintenance agents to use for as long as needed. Propofol alone can be used for very short procedures, like removing a fish hook from a lip or a stick wedged between the upper molars of a chewing puppy. I have found that it's sometimes difficult to maintain evenly deep anesthesia with sevoflurane. Very large dogs like Deerhounds will sometimes begin to wake when stimulated. Giving butorphanol intravenously rather than intramuscularly helps to prevent this. Many veterinarians prefer to use several drugs for preanesthesia, the philosophy being that you may then be able to use smaller doses of each drug to achieve the desired effect. My own philosophy is that the fewer drugs used, the lower the risk of a reaction to one of them. I did a Veterinary Information Network search to see how other veterinarians anesthetize sighthounds, and many of them like to use acepromazine because sighthounds are so sensitive to external stimuli. Read "weenies". I thought the philosophy was good, but I don't use it for the reason stated above. It has fairly profound respiratory and cardiac depressive activity as

well.

Cardiac, respiratory, temperature and blood gas monitoring are all part of safe anesthetic management, and administration of intravenous fluids during any general anesthesia helps to reduce the depressive effects of anesthesia on blood pressure. It also facilitates the metabolization of the drugs. Every pet under general anesthesia in my practice is administered IV fluids throughout the procedure.

I surveyed a few veterinarians who own Deerhounds or other sighthounds and so have had occasion to anesthetize them. Their observations follow.

Dr. Anne Midgarden, who has bred, shown and coursed Borzoi for many years and also owns a Deerhound, writes the following. "I find deerhounds respond to anesthesia much like borzoi and greyhounds. They are mostly sensitive to pre-meds like acepromazine, xylazine, and domitor. I am also not a big fan of atropine as I don't like anything that might induce ileus in a bloat sensitive breed. Some of the newer opioids are reportedly fine, but I have no experience with them.

Many vets feel that they need to use a sedative to keep the dog from having a rough recovery, but I would much rather a rough (and fast) recovery than no recovery at all. I just hold them during the excitement phase and enjoy the chance to sit down for a couple of minutes. My favorite cocktail is 1/2 dose of Propofol IV quickly followed by intubation and inhalant anesthesia. I don't find the

temporary respiratory depression to be an issue. I haven't seen any inhalants except isoflurane and sevoflurane in years and they both seem to be fine in sighthounds.

Telazol alone or with inhalants also seem to be fine – although a bit rougher recovery. Diazepam/ ketamine -much the same. Again I tend to dose low.”

Dr. Michelle Cowan has owned and bred Deerhounds for a number of years. She says: “Not that I've done a ton but I use a Butorphanol, ace, glycopyrrolate mix for preanesthesia. At half the dose I use on other breeds. Propofol for induction and Isoflurane. I have used Ketamine/Valium for induction as well. I have also used Domitor/Antesedin satisfactorily.” [BAG, butorphanol, ace, glycopyrrolate. Mix 4 ml Torbugesic, .5 ml Ace (10mg/ml) and 5 ml Robinul and 10.5 ml saline or sterile water to make 20 ml of solution. Dosed at .1 ml per kg, SQ 20 to 30 minutes before induction. For Deerhounds I usually cut the dose in half. Full dose for small dogs/hyper dogs, lower dose for larger dogs.] Propofol I use at 3 to 5 mgs per kg. Ketamine/Valium I use a one to one solution by volume at .1 ml per kg.

The following is a short discussion about preventing hyperthermia in Greyhounds, and I think it applies well to Deerhounds, too.

Steps to take to reduce the likelihood that hyperthermia will be a problem:

1. Schedule these patients to undergo sedation and anesthesia as

soon as possible after admission.

2. Plan to discharge them from hospital as soon as they are ambulatory
3. Premed in the owner's presence and ask owner to stay until chemical restraint is on board
4. Skip the hydromorphone unless the patient is in acute pain on presentation
5. Use butorphanol premedication in combination with acepromazine

Given that you cannot eliminate the incidence of hyperthermia 100% it is essential to *measure temp on a regular basis*.

Should your patient develop hyperthermia intra-op despite your best efforts, using a high oxygen flow rate will encourage heat dissipation from the respiratory tract which may be sufficient on its own to bring temp down. Alcohol topically will help as well if more aggressive intervention is required.

Remember that acepromazine is your friend when you are delivering anesthesia to sight hounds.

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Recovery from anesthesia should be carefully monitored for several reasons. Temperature should continue to be monitored regularly until the patient has fully recovered. So should the heart, as arrhythmias post-anesthesia can occur. The endotracheal tube is left in place until the swallow reflex returns, and I find that Deerhounds will often fall asleep after a procedure with the tube in place. If stimulated, they'll sometimes have an excitable phase, so I like to move them swiftly from the surgical suite to a well padded recovery area and designate someone to sit by the dog's side monitoring heart and respirations and keep as quiet as possible. More often than not, a Deerhound will simply sleep for up to fifteen or twenty minutes, ample time for all the anesthetic drugs to be metabolized. If awakened at that time, the tube can be gently removed, and often the dog is able to stand and walk immediately. Failing this situation, as soon as the dog begins to regain the swallow reflex or begins to chew the tube, it needs to be gently removed and the dog should be attended by a calm individual who can stroke and reassure him. I do sometimes allow the dog's owner to be that person, although sometimes owners are too nervous to be good attendants. If the dog is struggling to stand, confinement to a run, cage or ex-pen might be necessary. Depending upon the procedure, release to the owner and home can be accomplished as soon as the dog is steady on his feet. For more serious conditions like bloat surgery or amputation, the owner is not likely to be allowed into the surgical area until recovery has taken place, as intensive care will be required.

Postoperative pain control is standard today, and NSAIDS like Rimadyl or Metacam may be prescribed, as well as other drugs such as Tramadol or gabapentin. While most of the veterinarians I consulted who do a lot of Greyhound medicine believe that those dogs are weenies and need a lot of extra pain control, I have not found that to be the case with my own dogs, but that may be because I'm very matter of fact about it, and Deerhounds do take the lead from us. If your Deerhound seems to be in a lot of pain after surgery, please consult your veterinarian. And when giving NSAIDS, it never hurts to give a gastric protectant as well to prevent ulceration. Famotidine works fine and is inexpensive. Veterinarians often neglect to mention this.

One observation I'd like to make is this: an excitement phase has always been a part of barbiturate anesthesia, and the advent of propofol has mercifully delivered us from that side effect. However, on rare occasions with other breeds and fairly often with Deerhounds, something very similar happens with propofol. This doesn't outweigh its superiority in just about every other aspect, though. It is fast, safe, and recovery is short and rarely violent. It is metabolized so rapidly that it makes an excellent induction agent even for C-sections.

And a final note on a subject about which I've heard nothing until now. There are two case reports of Greyhounds which developed high potassium levels during anesthesia. Elevated potassium causes slowing of the heart rate and eventually cardiac arrest, which in the report was fatal in one case, but treated in time to reverse the clinical signs in the other. Whether or not this will prove

to be a Deerhound issue as well remains to be seen.