



**Ettinger: Textbook of Veterinary Internal
Medicine, 7th Edition
Canine Cushing's Syndrome
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What is Cushing's syndrome?

Human beings, dogs, cats, and almost all other species of animals naturally have cortisone in their blood and in every tissue of their bodies. This cortisone is produced by a small pair of glands called the *adrenal glands*, one located near each kidney. In appropriate quantities, cortisone is necessary for health. If an individual (person, dog, or cat) does not have enough cortisone, they usually become ill and can eventually die. Too much cortisone in the system (Cushing's syndrome) also causes illness, although it does not cause the type of sudden death that often results from not having enough cortisone.

Dr. Harvey Cushing was a physician who practiced medicine in the 1920s and 1930s. He had many areas of expertise; among these was pathology. It was in his capacity as a pathologist that he wrote a paper describing a group of people, each of whom had died from an apparently similar cause. Each person had become ill and then died after what is now understood to be the consequences of having too much cortisone in their systems over a long period of time. Respecting his discovery, the term Cushing's syndrome was applied to the clinical condition that results from chronically having excess cortisone in the system. As Dr. Cushing's observations became known to physicians, they also became known to veterinarians. This problem (Cushing's syndrome) has since been identified in a variety of animal species, including dogs and cats.

What causes too much cortisone in the system?

Too much cortisone in the body can occur because your pet was given cortisone in excess. Cortisone containing drugs include, but are not limited to the following:

- Prednisone
- Prednisolone
- Methylprednisolone
- Triamcinolone
- Dexamethasone

Regardless of whether it is given by injection, pill, or a steroid-containing topical skin cream or eye medication, cortisone has specific effects that dictate the diseases for which they are used. Development of Cushing's syndrome means that your pet has received too much cortisone but does not indicate that your veterinarian gave too much cortisone by mistake. Rather, cortisone is an important and common drug that

commonly causes side effects. *That* form of Cushing's syndrome, the one caused by your pet receiving excess cortisone, is simply treated by discontinuing your pet's exposure to such medication.

When Cushing's syndrome occurs naturally, the changes (abnormalities) that take place internally, as well as the external symptoms, can be identical to those secondary to your pet being given too much cortisone-containing drugs. The final common denominator in Cushing's syndrome is too much cortisone in the body, whether it occurs naturally or as a result of medical treatment. The natural form of Cushing's syndrome in dogs and cats represents a relatively common problem in older dogs but is quite uncommon in cats. A small percentage of dogs and cats ([tilde]15%) with naturally occurring Cushing's syndrome have a tumor in one of their two adrenal glands. The tumor persistently produced cortisone in excess and eventually causes "Cushing's syndrome."

Most dogs and cats with naturally occurring cortisone excess (85% to 90%) have a small tumor located in an area at the bottom of the brain called the *pituitary gland*. Animals and humans with this problem have tumors that persistently send a message to the adrenal glands "asking" for cortisone production and release into the circulation. The message being sent is in the form of a protein placed into the blood stream and delivered to the adrenal glands.

This message (called "ACTH"):

- Is produced in excess
- Does not turn off
- Causes both adrenal glands to grow
- Causes cortisone to be produced excessively, without abatement
- Results in the development of Cushing's syndrome

What are the symptoms of Cushing's syndrome?

Chronic excesses of cortisone in the system of dogs can result in a variety of symptoms. Not all dogs have the same symptoms but most have at least two or three of the more commonly observed abnormalities.

These more commonly observed symptoms include the following:

1. Development of profound excesses in urine volume. Many of these dogs urinate for longer time periods than normal or they urinate more frequently. Some produce so much urine that there is leakage when the pet sleeps. Many previously "housebroken" pets begin urinating indoors. In concert with the production of excess urine is excess thirst, which is usually not as worrisome to pet owners as the urination problem.
2. Loss of hair with no regrowth, whether hair simply falls out or is shaven. Hair loss is most commonly observed along the back, tail, and the back of the rear legs. Hair loss can result in a thin hair coat or it can cause complete hair loss and a bald appearance. Dogs with Cushing's almost never lose the hair from their heads or their feet.

3. Development of muscle weakness. This may be seen as a dog having trouble climbing stairs or difficulty jumping onto furniture or into a car. Muscle weakness may cause these dogs to be unable to go for long walks without simply "running out of gas." It can also cause dogs to have difficulty rising after they have been sitting or lying down. Muscle weakness may also cause a "pot-belly" appearance to the abdomen.

Dogs with Cushing's syndrome virtually always have an excellent appetite and some are abnormally ravenous for food. In contrast, these dogs rarely have problems with vomiting or diarrhea. They do, however, often pant excessively.

What tests are needed?

In addition to owner-observed abnormalities, veterinarians may detect additional problems. Veterinarians may observe the following:

- Thin skin
- Skin infections
- Muscle atrophy
- Large liver on abdominal palpation

Routine blood and urine testing often reveals various abnormalities. The urine from dogs with Cushing's syndrome is often dilute and infections of the urinary tract are common. Abnormal liver test results are common, especially in those dogs that also have an enlarged liver. Despite these potentially worrisome liver test results, dogs with Cushing's syndrome do not have a "sick" liver and these dogs almost never become ill or die from liver problems. Dogs with Cushing's syndrome do have high blood cholesterol concentrations and they also commonly have high blood pressure.

Veterinarians usually recommend taking radiographs of the chest because dogs with Cushing's syndrome are often older and it is important to be certain that such dogs do not have unexpected abnormalities in or near their lungs.

Either radiographs or ultrasound of the abdomen are recommended for several reasons:

1. About 50% of adrenal tumors can be seen on radiographs of the abdomen and more than 90% of adrenal tumors can be visualized with ultrasonography.
2. Adrenal glands in dogs with the pituitary form of Cushing's undergoing ultrasound examination are either normal ([tilde]50% of the time) or enlarged ([tilde]50% of the time).
3. Abdominal examination with either tool (radiographs or ultrasonography) is also used to assess this body cavity for both expected (big liver, fat accumulation) and unexpected problems.
- 4.

Once this "battery" type of testing has been completed, assuming that your veterinarian still suspects that your pet has Cushing's syndrome, specific hormone testing to

"confirm" this diagnosis is usually recommended. The tests usually used are the **ACTH stimulation** test, the **urine cortisol creatinine** test, and the **low dose dexamethasone** test (LDDST). Each of these tests is common and relatively effective. Each has advantages and disadvantages. Further, depending on these results and those of abdominal ultrasonography, tests may be recommended that aid in discriminating dogs with the pituitary form of the disease from those with an adrenal tumor.

What treatment is needed?

Two common questions asked are the following: "Do I really need to treat my dog?" and "What if I don't treat my dog?" The answer to the first question is one that only an owner can decide. However, untreated dogs do tend to be weak, abnormally addicted to food and water, and generally not happy, playful, or active. If you, the owner, do not see any abnormalities in your dog and you believe that your pet is well, treatment is not recommended. Untreated dogs with true Cushing's syndrome are not seen as being healthy by their owners. Treated dogs can become quite normal and for this reason, correction of this condition is usually suggested.

Based on test results, your veterinarian may recommend surgery or oral drugs to attempt to treat the natural form of Cushing's syndrome. The surgery is not easy and is often best attempted by a specialist. Oral treatment involves use of potentially toxic agents. However, successfully managed dogs, regardless of the recognized treatment chosen, far exceed the treatment failures. Owners therefore are encouraged to consider treating their pets.