

Understanding Intervertebral Disc Disease in Dogs

INTRODUCTION

The intervertebral disc (IVD) is a shock absorbing and stabilizing structure between the vertebrae (spinal bones). There is a disc between all vertebrae in the neck, back, and tail, except between the first two cervical (neck) vertebrae. Each disc has two components: the outer portion is a thick, interwoven bundle of tough fibrous tissues; the center is a gel-like mix of fluid and cartilage tissue.

In most dogs the discs gradually degenerate over the course of a lifetime. This gradual degenerative process can frequently be seen with radiographs (x-rays) and is called spondylosis. The most characteristic finding is the formation of bony spurs along the bottom of one, several, or most vertebrae. In most dogs this degeneration is not associated with any signs of pain or weakness.

Certain smaller dog breeds (such as the Lhasa Apso, Shih Tzu, Dachshund, Pekingese, Cocker spaniel, Beagle, etc.) are termed chondrodystrophoid (KON-DRO-DIS-TRO-FOYD) because they have been selected for a genetic form of dwarfism. This type of dwarfism is due to a defect in the development and maturation of the cartilage throughout the skeleton including the intervertebral discs in the spine. (This is why most of these dogs have short, crooked limbs, too). As a result, the discs in these dogs are not only prone to the age and wear-related form of degeneration discussed above, but also undergo an additional degenerative process starting in the first year or two of life. Eventually, some of these discs may mineralize (calcify), and this form of degeneration is extremely prevalent in these breeds of dogs. Fortunately, relatively few out of the total number of these dogs ever experience neck pain, back pain, or weakness as a result. But chondrodystrophoid dogs are at greater risk overall for developing symptoms related to their disc disease.

CLINICAL EFFECTS OF IVD DISEASE

As already stated, many dogs can have one or both types of degenerative disc disease without showing any evidence or dysfunction. However, the presence of degenerating discs, particularly in the chondrodystrophoid breeds, can be associated with symptoms. The most common symptom is pain. Neck pain is characterized by one or more of the following signs: reluctance to walk, reluctance to go up or down stairs, reluctance to lift the head or to lower the head to the food or water dish, tenseness or spasm of the neck muscles, vocalizing (spontaneously or when the neck/head is touched or moved), and intermittent elevation of one of the arms as if something were irritating it. Back pain is usually characterized by reluctance to walk, reluctance to go up and down stairs, reluctance to jump on or off furniture, tenseness in the abdomen, restlessness,

vocalization, and sensitivity when playing or when picked up. Some dogs with back pain may appear to the owner to have a belly ache, and may only be correctly diagnosed after several episodes.

In some dogs, the internal degeneration of the disc itself might stimulate sensory nerves and be perceived as a painful stimulus. This is called discogenic pain. However, when dogs with neck pain are carefully evaluated, fewer than 5% are found to have discogenic pain as the cause. The other 95% or more are found to have pain due to the actual displacement of disc material from the space between the vertebral bodies into the space above, called the vertebral canal. The vertebral canal is the tunnel which contains the spinal cord and the nerve roots which leave the spinal cord and extend out to connect to the body. Thus, when the disc is displaced it can put pressure on the nerve roots. This is exactly analogous to the problem people suffer with pinched nerves. The reason some dogs will hold their arm or leg up is that, as the nerve root which supplies the limb is pinched, the brain is fooled into thinking it's the end of the nerve that is being irritated; the animal probably perceives this as a tingling, numbness or pins and needles sensation in its digits.

If enough disc material displaces into the vertebral canal to injure or compress the spinal cord itself, neurologic deficits will develop. The first sign of spinal cord dysfunction is decrease in fine motor skills, coordination, and joint position sense. Clinically, this is recognized as a tendency to trip, stumble, or knuckle over on the digits, and some wobbliness in the gait. With further compression or injury, strength is affected; the dog will have difficulty rising and walking, and may tend to drag one or more limbs. Weakness may progress to the point where the dog is no longer able to voluntarily move its affected limb(s) (paralysis). Spinal cord dysfunction can also affect control over bowel and bladder function resulting in partial or complete incontinence. These clinical effects of IVD disease can develop slowly (over days to weeks), or come on suddenly (seconds to hours). The more rapid and severe the onset, the greater the need for prompt, sometimes emergency, veterinary attention.

WHAT IS HAPPENING?

When the disc degenerates, the central gel loses its fluid, and is less resilient to normal wear and tear. Additionally, the fibers in the outer portion of the disc weaken, stiffen, and fray. As a consequence, the normal strains of everyday life might cause the central part to rupture up into, or through the outer layer. This is referred to by many people as a slipped disc. Actually, the whole disc does not slip; rather, a portion displaces upwards, and puts pressure on the overlying nerve roots and spinal cord. Your veterinarian may use other terms, such as bulging, herniation, prolapse, rupture, or extrusion to describe this phenomenon. We will use the simple term displacement to avoid any confusion. Sometimes this occurs slowly and the resultant symptoms are mild. Conversely, if a portion (even a tiny fragment) of the disc ruptures rapidly and with high velocity, it can impact into the spinal cord with a force similar to a gun shot. This might result in a sudden onset of complete and irreversible paralysis.

In most dogs with IVD disease there is no single event which causes the disc to displace. Many owners search for some reason, such as jumping, rough play, or external trauma to account for their dog's symptoms. However, in most cases the disc displaces owing to the combination of normal activity and an already degenerated and weakened structure. Also, many discs will displace in stages. Hence, while some dogs may develop sudden paralysis, most will have a progressive deterioration over a few hours to a few days.

It is also quite common for dogs to have recurrent bouts of pain, or pain and neurologic deficits over weeks, months, or even years. It is critical, for the owner and veterinarian alike, to realize that most recurrent episodes of IVD disease are due to displacement of the same disc each time, rather than multiple discs. While some dogs do have multiple disc displacements concurrently or consecutively, most do not.

DIAGNOSIS OF IVD DISEASE

IF your pet has signs of pain or pain and weakness, your veterinarian will perform a thorough physical and neurologic examination. This will provide many clues as to the cause (IVD disease or something else?), and the location of the problem.

Most dogs affected by IVD disease are in the chondrodystrophoid group. Since their discs are already degenerating in the first year or two of life, it is not uncommon to see some of these dogs as symptomatic patients as early as 2-3 years of age. The peak age of the onset for clinical IVD disease is between 4 and 8 years of age. Thus, a young or middle-aged chondrodystrophoid dog brought into the veterinarian with signs of neck pain, back pain, or neurologic deficits is extremely likely to be suffering from IVD disease. Certainly there are other conditions which can affect the spine and spinal cord, and if your veterinarian suspects something else, he or she may recommend some diagnostic tests to distinguish the cause.

The purpose of x-rays (radiographs) in IVD disease is to help make decisions regarding treatment choices. If IVD disease is the suspected cause, then radiographs are not critical except to a surgeon. The goal of spinal radiography is to demonstrate the precise location of the displaced disc. If a dog is going to be treated medically (see management of IVD Disease), then knowing the precise location is unimportant. And even for dogs where surgery is warranted, plain radiographs are rarely sufficient to provide the precise localization demanded of a surgeon, and may just as easily only demonstrate red herrings: lesions that are unrelated to the current symptoms. However, if there is reason to suspect something other than a displaced disc (such as a vertebral tumor, infection, or fracture), then x-rays are wholly appropriate. Your veterinarian should discuss with you the purposes and need for any spinal x-rays.

The results of spinal radiographs can sometimes be misleading. The normal disc, and most degenerating discs, are invisible (as are the spinal cord and nerve roots) on plain x-rays. Only if the disc has calcified will it be evident on plain x-rays. Thus it is common for a disc to displace and produce no radiographic clue as to its precise location. Moreover, remember that disc calcification is common, even in degenerating discs that

have not displaced (i.e. are asymptomatic). This combination can lead to an incorrect identification of the disc causing problems. It takes a practiced eye to read through the subtleties and artifacts on a spinal x-ray, and even then the exact diagnosis may be in doubt. Furthermore, obtaining good quality spinal x-rays requires the patient to be completely immobilized, and this usually means employing a general anesthetic.

When a patient is determined to need surgery, and plain x-rays fail to clearly identify the level of the disc displacement, a more refined form of diagnostic evaluation is called for. Usually this means performing a myelogram, MRI, or CT scan. A myelogram is a spinal x-ray taken after a contrast agent (dye) has been injected into the cerebrospinal fluid which normally surrounds the spinal cord. Because it outlines the previously invisible spinal cord, a myelogram is usually able to pinpoint the precise location for the surgeon to operate on. Although it is an invasive procedure (requiring a spinal tap), it is done under general anesthesia in dogs (therefore, no concerns about undue discomfort or inadvertent movement), and is only uncommonly a cause of severe complications. A computed tomography or CT scan (CAT scan) is a very specialized x-ray technique that can produce cross-sectional images of the spine and discs. It is especially useful when used in combination with a myelogram, since the former may be hampered by swelling in the injured spinal cord, rendering interpretation more difficult. Combining a CT with a myelogram usually circumvents problems associated with swelling. The sine qua non of spinal cord imaging is the magnetic resonance imaging scan (MRI). This technique is non-invasive and produces the most detailed images currently available of the spine, spinal cord, nerve roots, and discs. It also permits examination in multiple planes (side-to-side, top-to-bottom, and front-to-back) so that no macroscopic lesions escape detection, and it permits the most precise surgical planning.

MANAGEMENT OF IVD DISEASE

The goals of treatment are to eliminate all symptoms caused by the disc degeneration/displacement, and to hopefully prevent recurrence at a later time. This can often be accomplished with medication alone, but sometimes may require an operation.

When signs are mild (i.e. pain alone, or very minimal neurologic deficits), and not progressing rapidly, medical treatment is indicated. The purpose is to provide symptomatic relief, and allow time for the body to heal itself by resorption of displaced disc material. This usually requires a period of strict rest and confinement along with treatment using a variety of drugs. Typical medications prescribed for IVD disease include nonsteroidal anti-inflammatory drugs (including such aspirin-alternatives as carprofen, meloxicam, deracoxib, and so forth), or corticosteroid medications such as prednisone (cortisone) or dexamethasone. In addition to having anti-inflammatory effects, steroids may actually help prevent and reverse some of the injury to the spinal cord caused by contusion and compression. (Note: Corticosteroids are not the same as the anabolic steroids sometimes abused by athletes. While they can have some side effects (such as causing increased appetite, thirst, urination, and GI upset), their use in low doses for short periods of time is totally appropriate for IVD disease, and need not cause undo worry). Some dogs are also benefited by treatment with muscle relaxants. In an effort to

prevent or lessen any GI upset from the other medications, your veterinarian may also prescribe a GI protectant agent such as an antacid. If there is any bladder dysfunction your dog may also be treated with an antibiotic. Medications may be given either orally or by injection depending on the needs of the patient. Where pain is severe and not adequately controlled with the listed drugs, various narcotic analgesics can be employed as well.

When dogs are brought to the veterinarian with more severe signs (i.e. weakness or paralysis), or mild signs progressively worsen, then more aggressive treatment is required to prevent permanent disability. This may entail higher doses of medication or a switch to different medications. However, if there is not a prompt response to aggressive medical management, the patient should be considered a candidate for surgical treatment. (See Surgery for IVD Disease).

One perplexing problem is how best to manage the dog who has recurrent bouts of mild signs from IVD disease. Certainly, medical management can be repeated if it has been effective in resolving past episodes. However, remember that recurrent signs are usually due to a single disc which is displacing in stages over time; this disc is like a time bomb, and it is more likely to suddenly rupture one day resulting in acute paralysis. Therefore, if a dog is experiencing similar signs of neck or back pain, or mild neurologic deficits for the 3rd or 4th time, it may be time to consider surgery. Keep in mind too that the severity of the symptoms is not directly correlated with how much disc material has displaced. Some dogs who are completely paralyzed may not benefit from surgery because the disc displacement may be small, but the energy with which the spinal cord was hit may have been quite high. Conversely, many dogs with signs of pain alone (no weakness or wobbliness) have tremendous amounts of nerve root and spinal cord compression. How is this possible? If slowly compressed, the spinal cord has the ability to adapt and function normally (up to a certain point). Hence, the dog who has mild, recurrent signs might have a large disc displacement and surgery would be more effective for both short and long-term control of symptoms. An appropriate imaging study (see Diagnosis of IVD Disease) is necessary to determine the correct course of action for these patients.

SURGERY FOR IVD DISEASE

Dogs with severe pain or those with neurologic deficits that are not responding to medical therapy, and dogs with recurrent signs of IVD disease, are all potential candidates for surgical treatment. Like medical management, the goals of surgery are to relieve the current symptoms, and prevent worsening or recurrence. Neurosurgery on dogs requires special equipment, training and skills. Most veterinarians do not do these surgeries themselves, and instead refer to doctors who have been board-certified in veterinary neurology or surgery. Surgery on dogs with IVD disease can be very rewarding, and most dogs will walk and lead normal lives even after being completely paralyzed.

The need and type of surgery for any given patient is based on the examination findings and the results of one of the aforementioned imaging studies (MRI, CT or myelogram). Plain x-rays alone, even if obtained under general anesthesia, are adequate in only a small

number of cases. You should not be dismayed or surprised if the surgeon needs to take additional x-rays, even if you just had x-rays done by your regular veterinarian.

In those rare instances where a dog has neck pain alone and the imaging study shows no compression of the nerve roots or spinal cord, the dog may be diagnosed as having discogenic pain (see Clinical Effects of IVD Disease). For these dogs in whom medical therapy has failed, a limited form of surgery called fenestration may be recommended. This operation removes the degenerate center of the disc, and should result in eventual resolution of symptoms. Because most of the discs are undergoing similar degeneration, and because the specific painful disc is not known, this operation will usually be done on 4-6 cervical discs at the same time (all via a single incision).

However, for most dogs, including those with pain as their only sign (no neurologic deficits), they will have actual displacement of disc material into the vertebral canal or the space surrounding the nerve roots. For these dogs, fenestration is not usually helpful since it does not allow access to the portion of the disc which has displaced. Dogs with evidence of spinal cord or nerve root compression require treatment which results in removal of the displaced disc material. This is called decompressive surgery.

Unfortunately for the surgeon, the spinal cord and nerve roots are surrounded by the protective bone of the spine which forms the vertebral canal. Thus, decompressive surgery requires removal of a portion of the bone in the affected area to allow access to the spinal cord, nerve roots, and displaced disc material. Operations which remove bone from the upper or back side of the spine are termed laminectomies. This is the typical surgical approach for IVD disease in the back, and occasionally in the neck. Since most disc displacements occur on the bottom or floor of the vertebral canal, especially in the neck region, an alternative approach for cervical IVD disease is called the ventral (or anterior) slot. Unlike fenestration, which only removes a portion of the disc between the vertebral bodies, ventral decompression requires removal of some of the bone on either side of the disc creating an opening to the floor of the canal from underneath.

ARE THERE ALTERNATIVES TO DRUGS AND SURGERY FOR IVD DISEASE?

Although some dogs will recover from IVD disease without any treatment, the severity of symptoms and the tendency for recurrence usually demand something be done for humane reasons. Medical therapy with drugs and surgery where indicated, are still the most proven methods of achieving the goals of short and long-term control. For some dogs who are poorly responsive to medication, who cannot tolerate medication, or for whom surgery is not an option because of other medical or financial reasons, acupuncture therapy is sometimes effective. Although the exact mechanisms are not fully understood, acupuncture performed by certified veterinarians has helped dogs with IVD disease. Because it is relatively non-invasive (and dogs tolerate the needles surprisingly well!), it is certainly a reasonable alternative to try prior to surgery. Its use is sanctioned by the American Veterinary Medical Association. Acupuncture will be most successful in dogs who have signs of pain alone, or only mild neurologic deficits.

Some people are inclined toward non-traditional therapies such as holistic healing or homeopathy which rely on a mix of spiritualism, physical manipulation, and treatment with various herbs, vitamins, and other concoctions. Some of these therapies may be harmless, while others may actually be deleterious; none have any proven scientific merit. If this course of treatment is desired for the dog with IVD disease, it should be done under the guidance of and monitoring by a licensed veterinarian.

Another alternative some might be inclined towards is chiropractic treatment. This also has shortcomings when applied to dogs with IVD disease. Although there are similarities between IVD disease in people and dogs, the two are not exactly analogous. Because the spinal cord is longer in dogs than humans, displaced disc material in dogs almost always involves some degree of spinal cord compression and injury. In people with lower back pain only nerve roots are affected. Chiropractic manipulation in dogs may be dangerous since it may promote further spinal cord injury. The anatomy of the spine (number of vertebrae, normal curvature, standing posture) is very different in humans and dogs. Since chiropractic relies on understanding this anatomy for manipulation, its use in dogs requires a thorough understanding of normal canine spinal anatomy and physiology. Very few chiropractors have any veterinary training that can assist them in this regard, and there are few if any chiropractic courses taught in any accredited veterinary schools. Thus, neither chiropractors nor veterinarians routinely possess the appropriate knowledge to utilize this form of therapy in dogs, even if one was a believer in its principles. For those who might still desire chiropractic manipulation of their pet in spite of these warnings, keep in mind it is illegal for a chiropractor to treat a dog for compensation unless under the supervision of a licensed veterinarian. Your best route is to ask your veterinarian if there is a veterinarian with chiropractic training in your area.

WHAT TYPE OF HOME CARE IS REQUIRED FOR DOGS WITH IVD DISEASE?

Dogs with mild signs (pain alone, or pain and very mild neurologic deficits) can be treated as outpatients. Usually this entails the administration of one or more drugs (see Management of IVD Disease), and enforcement of strict confinement and rest. Medications may make the dog feel better, and so it is crucial that dogs not be allowed to run, jump, play or be overly active during the healing process, usually several weeks. Strict rest usually requires keeping the dog confined to a small crate, including feeding in the crate. Activity should be limited to being carried outside to go to the bathroom, and then being carried back to the crate. For dogs with cervical IVD disease your veterinarian may recommend permanently switching from a collar to a harness as well.

Dogs with more severe signs or those recovering from decompressive surgery may require substantially greater amounts of care. For dogs that are paralyzed, care usually includes medication (which is gradually reduced and eliminated over time), physical therapy, general hygiene, and management of incontinence. Physical therapy may entail such things as flexing and extending the paralyzed limbs, massaging limb muscles,

hydrotherapy, and assistance with walking using slings to support the paralyzed portion of the body. We are fortunate nowadays that there has been an explosion in the availability and knowledge of individuals and whole centers devoted to animal rehabilitation. They have many techniques at their disposal that can be used and taught to clients which result in faster and better recoveries. General hygiene includes observation for and protection from bedsores, sores due to dragging the limbs, and bathing as needed for accidental soiling with urine or feces. Dogs with paralysis usually also suffer from bowel and bladder incontinence. In most cases, there is a tendency for urinary retention, which can result in discomfort, bladder wall injury, and infection. Although the bladder will eventually empty reflexively, this is insufficient to prevent these complications. Owners may therefore be required to assist their dog by manually expressing the bladder several times daily. Once the dog recovers voluntary limb movement (even if not yet able to stand or walk), incontinence usually resolves. Fortunately, most dogs do not require any assistance with bowel movements.

Some dogs, in spite of the best medical and surgical care, are permanently paralyzed by IVD disease. Unfortunately this is the nature of spinal cord injury. The spinal cord has minimal capacity for healing, and so can only withstand injury up to a point. Injuries which result in severe damage to the spinal cord are likely to be irreversible, regardless of treatment. In this way, trauma from disc displacement is no different than that sustained after a severe spinal fracture. Many owners faced with a permanently paralyzed, incontinent dog will elect to have the animal euthanized (put to sleep). Others, especially those with small dogs, or dogs who live largely outside, may wish to continue keeping these dogs as pets indefinitely. As long as the animal is not suffering with pain and can be given a reasonable quality of life, this is a humane decision. Such animals can be aided by the use of a device called a K-9 Cart, which is essentially like a wheelchair for dogs. These devices allow dogs to ambulate with the use of their arms, while their hindquarters are suspended in a frame with wheels. Dogs adapt very well to this lifestyle, and can run and play almost normally.

CONCLUSIONS

Intervertebral disc disease in dogs is a serious, and sometimes devastating problem. Because of the many factors discussed here, treatment varies, and needs to be constantly reassessed. Your veterinarian is the first source to turn to for diagnosis, stewardship, and advice. Because of its complexity, the management of IVD disease often requires consultation with or referral to a board-certified neurologist or surgeon. Your veterinarian's willingness to seek this expert assistance is testimony to their dedication to you, to your pet, and to the principle of providing the most modern and appropriate care for their patients.