

# vet TOPICS



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## A Better Image for Lower Back Pain

When Dr. Cindy Shmon talks to owners whose dogs have a confirmed diagnosis of *degenerative lumbosacral stenosis* (DLSS), the small animal surgical specialist doesn't sugar coat the truth for her clients.

"I use the word 'variable' to describe the success rate for surgically treating this spinal disease," says Shmon, a veterinary professor at the Western College of Veterinary Medicine's Department of Small Animal Clinical Sciences.

"About 75 per cent of our patients will do well after surgery, while in 25 per cent of the dogs, the symptoms reoccur within two years. Estimates are conservative, but still, it means one in four dogs will become painful again. When you look at it that way, the results could definitely improve."

In the next few years, WCVN specialists hope to better those odds through two research studies supported by WCVN's Companion Animal Health Fund. Besides Shmon, the research team includes two medical imaging specialists — Drs. Kimberly Tryon and John Pharr — plus Dr. Susan Taylor, a veterinary internal medicine specialist and clinician at WCVN's Small Animal Clinic.

In both projects, the College's new *magnetic resonance imaging* (MRI) unit will play an important role in helping researchers better understand the dog's *lumbosacral* (lower back) region and the effects of decompressive surgery on the stability of dogs' spines.

### Lingering pain

DLSS, a degenerative disease in middle-aged, large breed dogs, causes painful compression of the nerve roots within the *lumbosacral joint* — the point where a dog's back and tail join together. In the past decade, surgeons have developed a range of surgical techniques to alleviate nerve compression. Since 1996, WCVN specialists have also used MRI technology to accurately diagnose the disease and pinpoint the degree of compression and its exact location.

"We formerly used an invasive radiographic technique (an epidurogram) where we injected an iodine-based contrast material around the spinal cord. It would tell us if we had compression of the spinal cord's *cauda equina* (nerve

"Generally speaking, I think we're usually happy after the surgery is done: we've 'unsquished' the nerves and taken the pain away. But we're concerned about whether it's going to stay that way, or if we're going to see the symptoms return."

— Dr. Cindy Shmon



roots), but it didn't tell us what was causing the compression," explains Pharr. As well, specialists couldn't determine from the test if nerve roots were compressed as they left the spinal canal.

"With DLSS, we need to know what's going on with bone and with soft tissue. Because we can see the variation in soft tissue characteristics on an MRI, it does a better job than any other imaging technology of telling us what's causing the compression."

Based on information from MRI scans, surgeons can then "customize" surgery to remove all sources of compression in each of their patients.

Despite improvements in diagnoses and surgical treatment, too many dogs that undergo DLSS surgery initially do well before becoming painful again. So why do the symptoms reoccur in so many of the dogs? In some cases, surgeons

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speculate the disease continues progressing after decompressive surgery. “The other thing we don’t know is whether the surgery itself may contribute to the problem: for example, the surgery may create scar tissue that compresses the nerve roots,” says Shmon.

She adds that a previous WCVM research project conducted by small animal surgical resident Dr. Mark Smith (see the Winter 2003 issue of *Vet Topics*) showed that more aggressive surgical techniques cause more instability in the lumbosacral joint.

“What that study didn’t answer was whether that instability is important in an actual patient,” points out Shmon. “If it is, it may mean that certain dogs need their lumbosacral joints fused while other dogs will be all right with less aggressive surgery. We hope these studies will help us recognize those differences.”

### Anatomy through MRI’s eyes

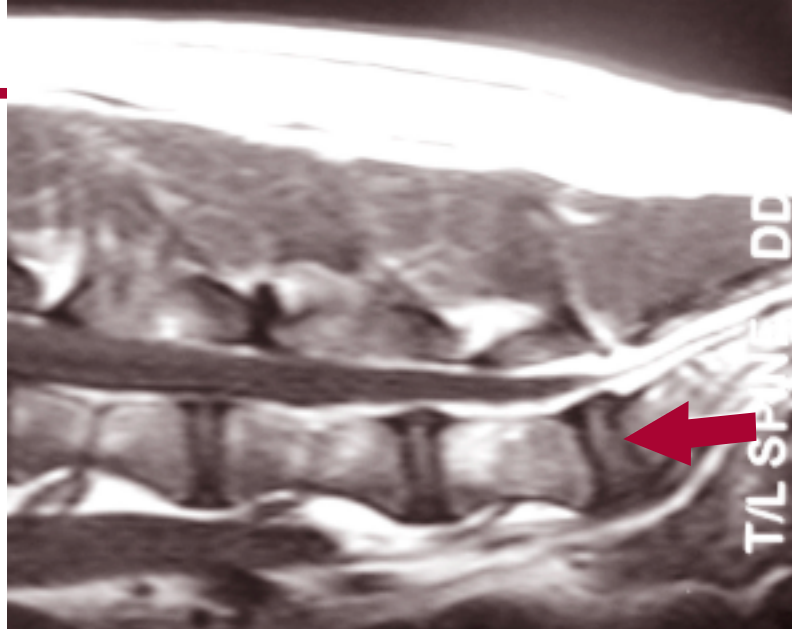
Initially, Shmon only planned to conduct a prospective clinical study of dogs with DLSS that had undergone decompressive surgery at WCVM. But when Shmon approached Tryon with her research plans, they soon realized there was no adequate resource for any in-depth interpretation of MRI scans showing the normal dog’s lumbosacral region.

“A lot of research articles describe animals that have disease in their lumbosacral region, but very few describe it in normal, healthy dogs,” says Tryon. “We need to be familiar with how MRI depicts the animal’s normal anatomy, and so far, no one has completely described the anatomy of the dog’s lower back.”

To answer those questions, the research team will conduct a series of MRI studies on seven canine cadavers (obtained through the Saskatoon SPCA’s routine euthanasia program). The same MRI studies will be repeated on three live, large breed dogs but with one difference: medical imaging specialists will inject each live dog with an MRI contrast agent before undergoing the scans.

“By comparing the images of the dogs’ lumbosacral region, we can determine the structures that are normally visible on MRI scans and those structures that are enhanced when we use the contrast agent,” explains Tryon. The complete series of studies will also give medical imaging specialists a more

complete picture of the lumbosacral region’s anatomy in normal dogs. In a second part of the anatomy study, the research team members will place the anesthetized dogs in different positions during the MRI scans.



These MRI images illustrate the anatomical differences in a healthy dog and a dog with DLSS. Image 1 (above) shows a dog’s normal lumbosacral junction (in both MRI images, the head and lumbar spine are to the left while the tail and sacrum are to the right). The normal intervertebral disc (arrow) between the seventh lumbar vertebra and the sacrum may bulge slightly upwards into the spinal canal, as it is a flexible ‘shock absorber’ between the bones; however, above the disc the tapering dark spinal cord and nerves should remain surrounded by bright white protective fat as they are here.

This will allow researchers to gain a comprehensive “view” of the lumbosacral region and the degree of nerve compression from varying perspectives.

“The lumbosacral joint doesn’t move like an elbow, wrist or knee — but it does move when you flex and extend the hind limbs relative to the spine, and different positions can change the lumbosacral junction’s configuration,” points out Tryon.

Those changes may also influence diagnosis. When specialists used radiological techniques in the past, a flexed, extended or neutral position could often make a dog’s condition look better or worse. “Now we need to determine if the same thing happens during MRI studies,” says Tryon.

“We’re basically looking at the effect of positioning on the amount of pressure we see on the nerves,” adds Shmon. “For example, if the dog’s tail is down and the legs are forward, will we see less compression than if the tail is up and the legs are back? We’re trying to judge what effect these different positions have on the amount of compression.”

Testing different positions will also allow specialists to determine how unstable a patient’s lumbosacral region is and how this will influence the outcome of surgery, says Shmon.

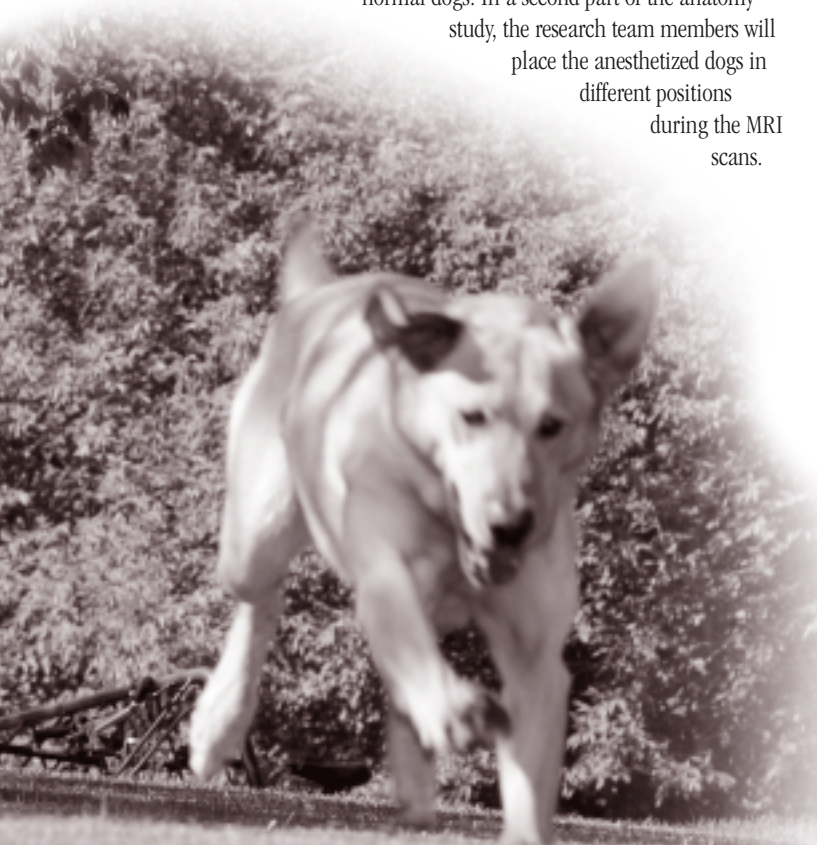
### Lessons from failure and success

In the clinical study, the College’s research team will conduct a series of MRI scans on 10 large breed dogs that are being treated for the disease at WCVM’s Veterinary Teaching Hospital.

“Right now, we only perform followup MRIs after surgery when the patients have a relapse. Since we’re not repeating MRIs on the successful cases, we don’t know what differentiates the successful cases from the ones where clinical signs have returned,” explains Pharr.

He and Tryon will perform three MRIs on each dog: one before decompressive surgery, another immediately after surgery, and a third MRI either when clinical signs of the disease reoccur or two years after surgery. “Through this project, we can finally follow up on all of the dogs that have had this surgery so we can see the differences and learn from them.”

Results from the two sets of postoperative MRI scans will also help surgical specialists judge the immediate effects of decompressive surgery “because if the second set of MRIs



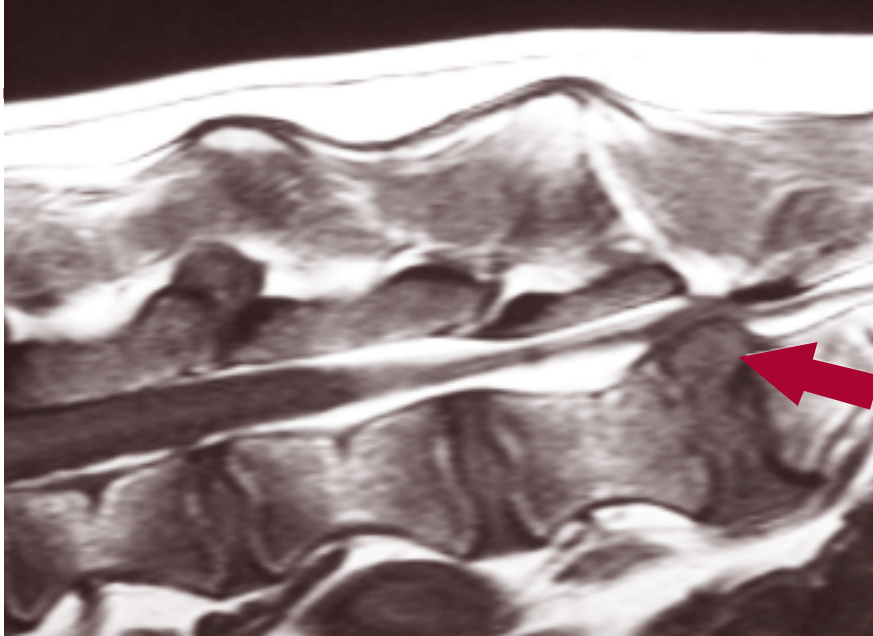


Image 2 (above) confirms that this canine patient has DLSS from disc prolapse. Here the degenerated intervertebral disc (arrow) between the seventh lumbar vertebra and the sacrum bulges markedly upwards into the spinal canal. The bright white fat above and below the dark spinal nerves (cauda equina) is pushed away, and the nerves are compressed between the bulging disc and the bony roof of the spinal canal.

show that the surgery has successfully removed all of the areas of compression, then there must be other things going on that cause clinical signs to return,” says Shmon.

Results from this clinical study could ultimately influence the way small animal surgeons at WCVM and around the world make decisions about treating DLSS in canine patients. By identifying patterns in successful cases as well as in cases where symptoms reoccur, surgical specialists can adjust their treatment techniques to achieve better results. The study’s findings may even show that certain dogs — like people — don’t experience pain even when MRI scans show abnormalities in the lumbosacral region.

As for Shmon, she’s looking forward to the day when she can sit across from a client and confidently answer their questions about surgically treating DLSS. “Right now, I think it’s the same for any surgeon who is treating this problem: we have more questions than we’d like to have before we begin a surgery. It will definitely be nice to have more accurate information so we can give our clients the best advice possible on treating their pets.” 🐾

# Details on DLSS

Small animal surgical specialist Dr. Cindy Shmon answers some commonly asked questions about degenerative lumbosacral stenosis (DLSS).

## Q What is degenerative lumbosacral stenosis?

DLSS is a degenerative disease that involves the lumbosacral joint — the point where a dog’s back and tail join together. Changes over time can bring on stenosis or a narrowing of the spinal canal, and that causes compression of the *cauda equina* (the nerve roots at the end of a dog’s spinal cord).

These nerve roots can tolerate being squished much better than the spinal cord, but when they become too compressed, it’s very painful. Other things like a fracture, a tumour or an infection can cause *cauda equina compression syndrome* (CECS), but DLSS is the most common cause of this condition.

## Q What are the most common symptoms of this disease?

These dogs carry their tails down, and if you try to lift their tails, they cry in pain. They don’t want to jump into a car or climb stairs, and they often have a short, stiff gait with an arched back.

Some dogs show signs of more severe compression: nerve deficits or partial nerve paralysis, muscles wasting away (muscle *atrophy*), an inability to move their tails, or loss of normal bladder or bowel control. Those tend to be the rare cases because we usually see these dogs long before they develop more serious symptoms.

## Q What dogs are most susceptible to DLSS?

It’s common in middle-aged, large breed dogs: German Shepherds, Golden Retrievers, Dalmatians, Labrador Retrievers, Dobermans and Airedale Terriers. A lot of the animals with this condition are working dogs — such as police dogs or guide dogs — that do a lot of jumping and heavy work.

DLSS occurs in a very high motion area, and we think there may be some dogs that are less stable in the lumbosacral region than they should be. As a result, they form arthritis at the top of the lumbosacral joint, or their disks are prone to prolapsing — compressing the nerves from the bottom. Their bodies try and stabilize the area by building up more joint capsule or building up more bone, but that only causes more compression.

## Q How do you confirm that a dog has DLSS?

*Magnetic resonance imaging* (MRI) gives us a definite diagnosis of DLSS. A physical examination and other tests — X-rays, CT (computed tomography) scans and ultrasound — really don’t give us enough information for diagnosis and planning decompressive surgery. An MRI scan can help us locate the compression: whether it’s coming from the top, side or bottom. Details from the MRI scans, combined with what we know from physical and radiological exams, helps us make decisions on where we need to direct our surgery and how aggressive we need to be.

## Q Does joint fusion eliminate the problem?

With joint fusion, you stabilize the joint and encourage a bone “bridge” to form so there’s no longer any motion in that area. The dog loses some flexibility in its lower back and tail, but as long as it’s not painful, this tends not to cause a problem. It’s unknown at this time whether fusion of the lumbosacral joint will improve the long term success of treating this condition. As well, the long-term side effects of fusing this joint are unknown.