



## Frequently Asked Spine Questions

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### **What is a Spine Surgeon?**

A spine surgeon is a doctor who does operations on the neck and back. Some common types of spine surgery are discectomy, disc replacement, laminectomy, and fusion.

### **How long do you have to go to school to become a spine surgeon?**

Four years of college  
Four years of medical school. After medical school you become a doctor.  
One year of internship  
Four years of residency (on the job training as a doctor usually in orthopedic surgery or neurosurgery)  
One year of fellowship (focusing on the spine exclusively)

### **When did you complete training and start practice?**

I started practice in 2010

### **What is a neurosurgeon? What is an orthopedic surgeon?**

A neurosurgeon performs surgery on the nervous system, including the brain and spine. Orthopedic surgeons perform surgery on the musculoskeletal system, including the spine.

### **Is there a difference between neurosurgery spine surgery and orthopedic spine surgery?**

No. Although the training routes are different, once the training is completed, both types of specialists can competently perform spine surgery. Physicians from both specialties who are properly trained can perform surgery on the nerves (decompression) and/or surgery on the bones (including fusion). In fact, there are several studies that demonstrate no difference in the complications and outcomes of orthopedic surgeons and neurological surgeons. All of the major spine societies feature both orthopedic and neurosurgical specialists.

### **Why do some people think that neurosurgeons do different surgery than orthopedic surgeons?**



That misconception emerged because in the 1960s-1970s there were differences in the approach and training of neurosurgeons and orthopedic surgeons. Orthopedic surgeons primarily did scoliosis surgery. Neurosurgeons primarily did laminectomies. However, recently, spine has emerged as a unique subspecialty. The diagnoses, treatment guidelines, and surgical techniques are common to both specialties. Spine surgery has evolved into its own specialty with its own specific training programs that incorporate elements of orthopedic and neurological surgery. In fact, I have faculty (teaching) appointments in the departments of orthopedic surgery and neurological surgery at Jefferson. I am a member of the American Academy of Orthopedic Surgeons and the American Academy of Neurological Surgeons/Congress of Neurological Surgeons Joint Section on Spinal Disorders.

**What is your practice focus? Do you perform other orthopedic surgeries?**

I exclusively practice spinal surgery. I do not perform any other aspects of orthopedic surgery (such as hip replacement, shoulder surgery) so that I can stay focused on the latest techniques and literature in spine surgery.

**Does you perform nonsurgical treatment such as injections?**

No. I do not perform nonsurgical treatments such as injections, manipulation, chiropractic, acupuncture, physical therapy, or prescribe long term pain medications or cannabis. I can certainly give you some information and prescribe some nonsurgical treatments. However, I also have excellent specialists in my group who focus on non-surgical spine care to whom I can refer you for additional information about options to treat the spine other than surgery.

**What is a pain management specialist?**

A pain management specialist is a doctor who focuses on treatment of pain by means other than surgery. Several different medical specialties train on pain management, including physiatry, anesthesiology, and psychiatry.

**What do pain management specialists do?**

Pain management specialists perform nonsurgical treatments such as injections in the spine. Pain management specialists prescribe and to some extent supervise physical therapy. Pain management specialists also can prescribe and supervise pain medication prescriptions called “medical management.”

**So should I only see you if I want a spine surgery?**

No! In fact, I spend most of my time educating patients on spine problems and advising patients to avoid surgery. My goal is to get you the help that you need to fix your spine problem.

**What is Radiculopathy?**

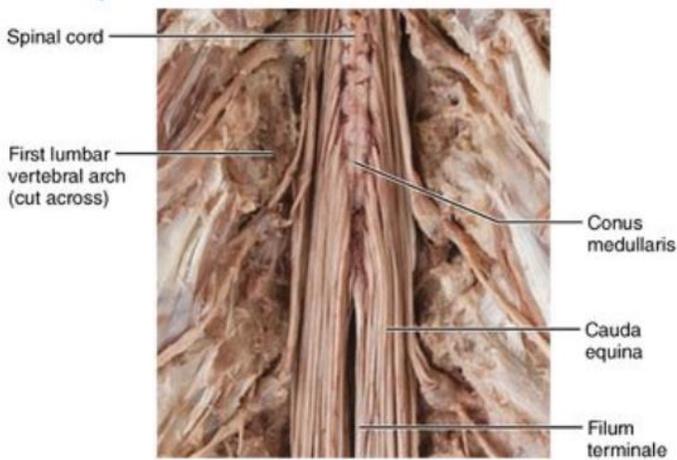
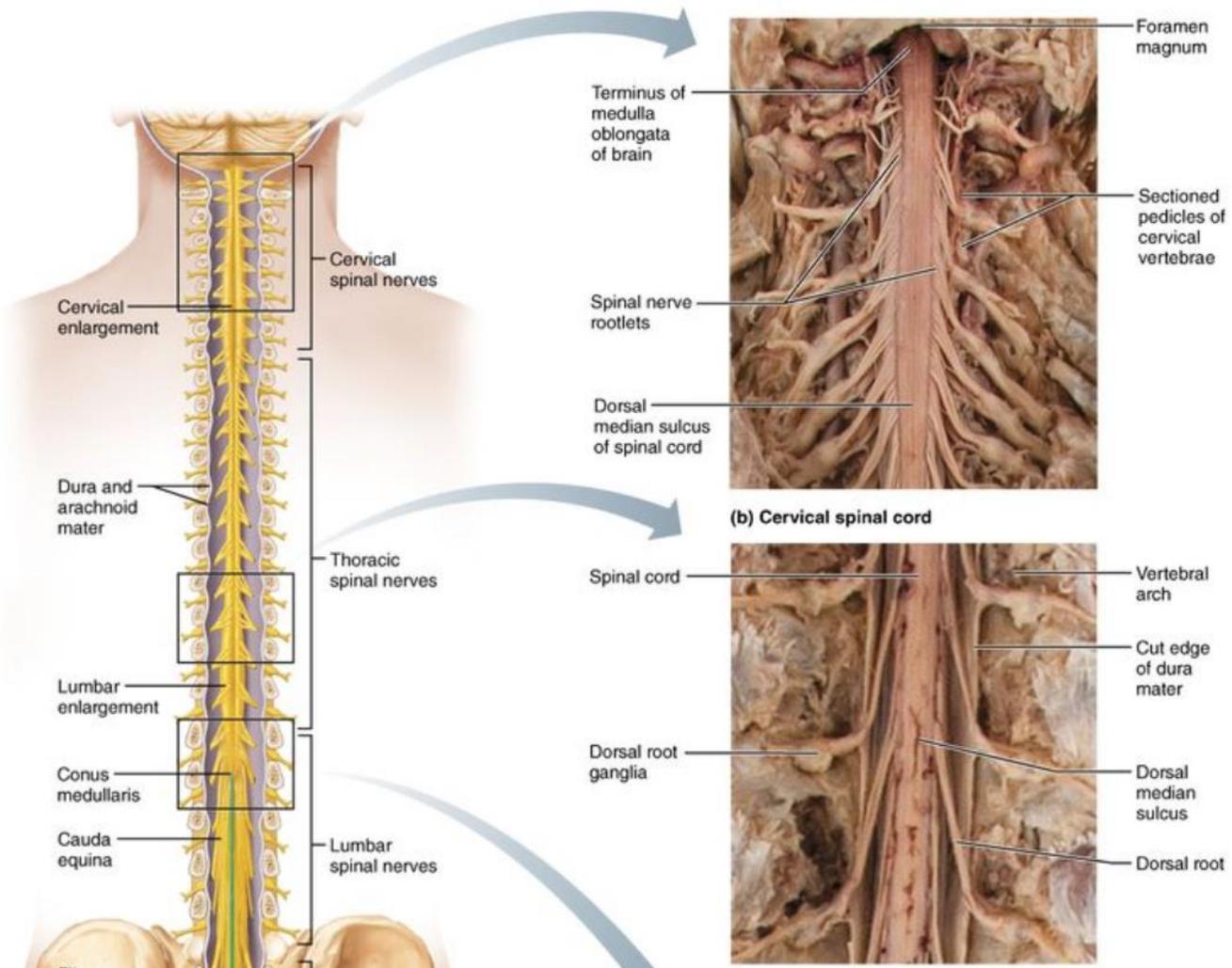
Radiculopathy is the combination of pain, weakness, and numbness from a damaged nerve. The symptoms are felt in the arm or leg in most cases.

**What is Myelopathy?**

Myelopathy is loss of function (finger coordination, dexterity), balance problems, bowel and bladder problems from spinal cord problems.

**What do the nerves look like?**

See below. The spinal cord is in the center of the spinal canal. It is a thick, solid nerve about the thickness of a baby carrot. There are small branches that emerge from the central spinal cord and travel through the arms and legs. The small branches are called nerve roots. In the lumbar spine (low back), there is no spinal cord. There are only nerve roots.



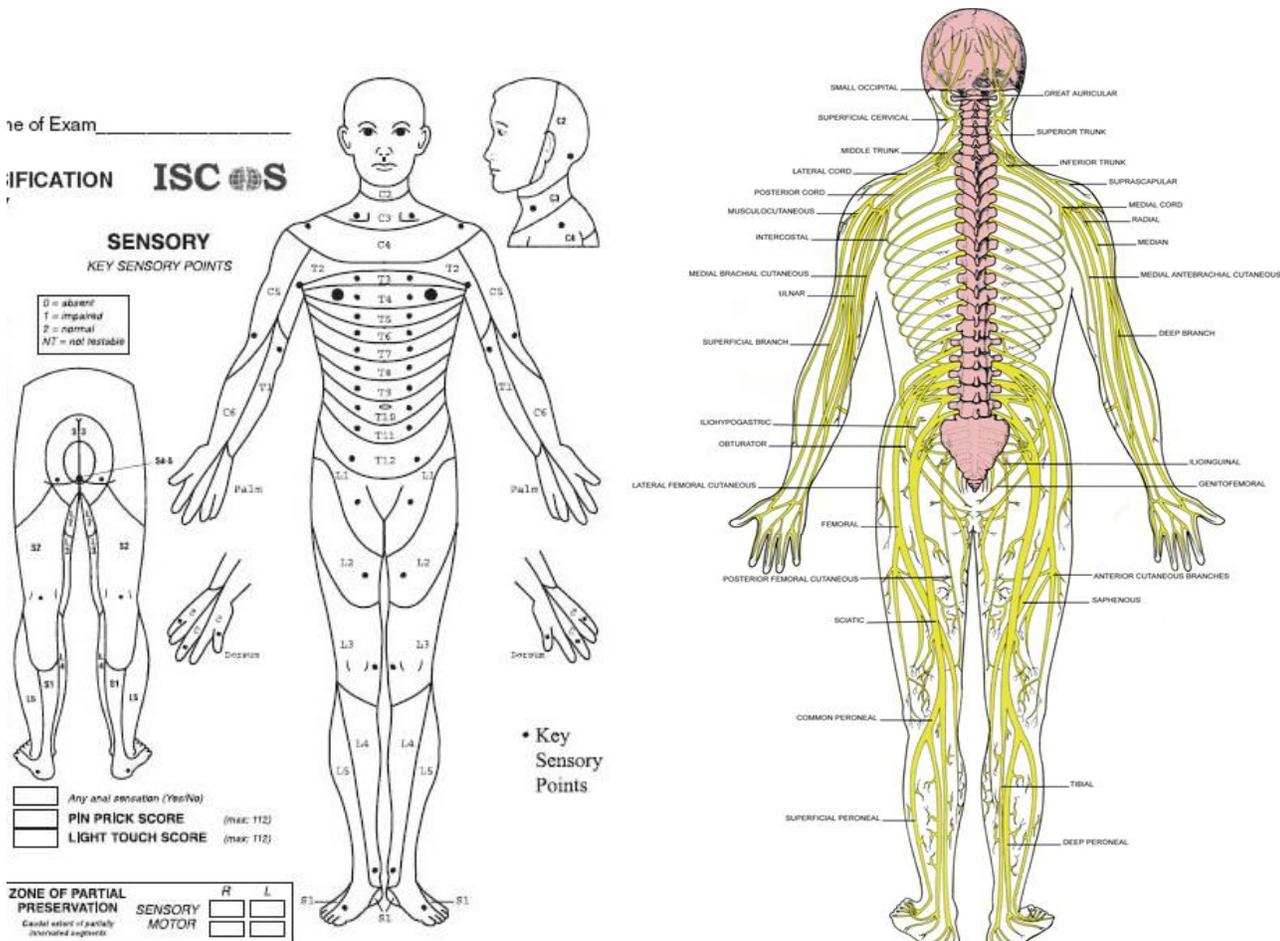
**(d) Inferior end of spinal cord, showing conus medullaris, cauda equina, and filum terminale**



### Why Does My Arm or Leg Hurt If I Have a Spine Problem?

Each spinal nerve controls a different part of the body. Therefore, the pain from pinched nerves is felt in the arms or legs. That pain is called referred pain. A pinched nerve, in medical parlance, means that you have

referred pain in the arms or legs. A pinched nerve typically does not refer to neck or back pain.



**Is it important for me to tell you where I feel pain?**

Yes! The location of the arm and leg pain is very important to confirm the diagnosis. Ideally, together, we can determine a specific nerve that is affected and compressed. The pain location can also help to rule out other problems that mimic spine problems such as carpal tunnel syndrome.

**How do you know if the pain in my arm is due to a spine problem and not a joint problem?**

I will do specific tests to confirm the spine diagnosis. In general, physical examination involves testing strength, sensation, and reflexes in the areas that correspond to particular nerves.

**Can you tell the diagnosis from the MRI report?**

No! The MRI does not tell you the exact diagnosis. Modern MRIs are so sensitive that they often display abnormalities that do not cause symptoms. In fact, 30% of people in their 30s and 90% of people in their 60s with no symptoms have abnormalities on MRI. Therefore, one cannot rely on the MRI alone to determine problems because the MRI frequently over-calls problems.

**Can you just read the MRI report or do you need to see the images?**

As a spine surgeon, I feel that I need to review the images myself. I have more insight into the clinical symptoms and the correlation between symptoms and images than the radiologist. I also know what types of problems respond well to surgery. I may even disagree with the radiologist about their descriptions of various problems.

### What is a herniated disc?

The discs are cushions between the bones. When the discs tear, stretch, or become unusually shaped, they are called a “herniated.” In most cases, the herniation is simply stretching of the disc out of the normal shape. In most cases, there is no obvious hole where the jelly or nucleus of the disc has leaked.



### What causes herniations?

Herniations can occur following a major injury (such as a car crash), a minor injury (such as sneezing), or nothing at all! Herniations can also develop without any specific injury as part of the process of spine arthritis. In most cases, there is no way to tell from the MRI what caused a specific herniation.

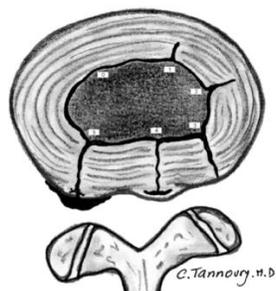
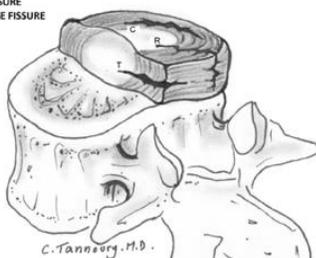
### Can the herniated material be gently put back into place?

No. There is no way to put the herniated material back into the disc space.

### What is an annular tear?

An annular tear is a small weak spot or hole in the lining of the disc. Although it is called a “tear,” many experts believe that term is inappropriate because it implies that an injury has occurred. You can have an annular tear without having had an injury. Annular tears can be part of arthritis and can even be asymptomatic.

C: CONCENTRIC FISSURE  
R: RADIAL FISSURE  
T: TRANSVERSE FISSURE



### What is a common example of an annular tear?

Instead of a hole in a jelly donut, think of a worn-down tire.

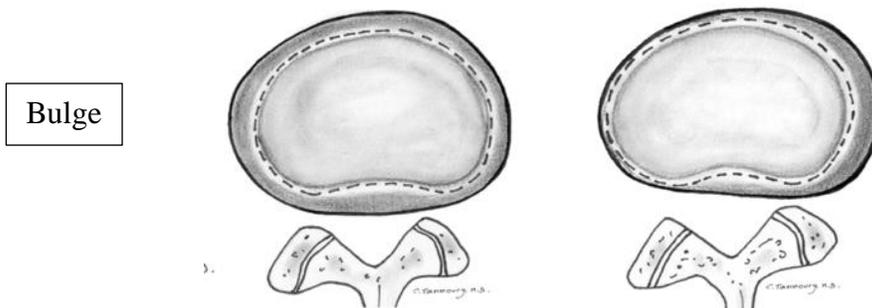


### Can an annular tear be repaired?

No. Repairing the degenerated annulus does not work.

### What is a bulge?

A bulge occurs when more than 25% of the edge of the disc overhangs the edge of the vertebral body. A bulge is gentle, broad rounding of the disc over the edge of the nearby bone. Such bulging involves greater than 25% of the circumference of the disc and typically extends a relatively short distance, usually less than 3 mm, beyond the edges of the bones.

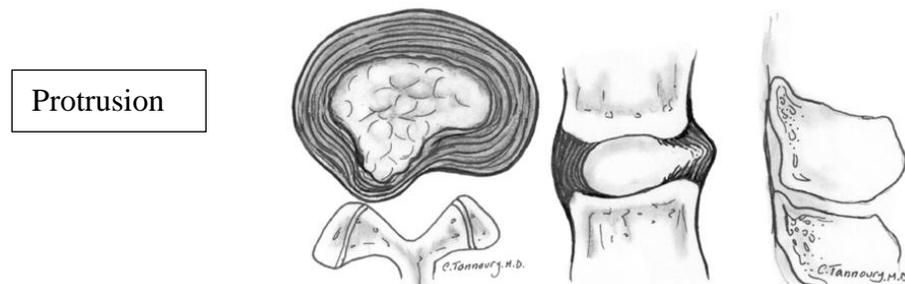


### Is a bulge a herniation?

Bulging, by definition, is not a herniation. It is simply a disc that has spread out and widened more than what is commonly seen. Therefore, a bulge can be a normal finding with ageing.

### What is a protrusion?

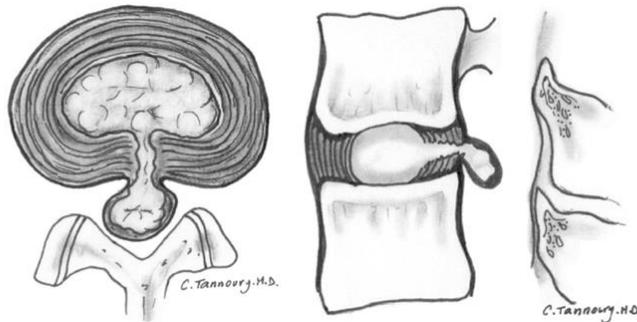
A protrusion is the most common type of disc herniation. It is triangular in shape. A protrusion occurs when one corner of the disc sticks out beyond the edge of the nearby disc. In general, a protrusion involves less than 25% of the overall circumference of the disc. Protrusions do not travel or migrate throughout the spinal canal.



### What is an extrusion?

An extrusion is a mushroom shaped disc herniation. In an extrusion, the cushioning material inside of the disc (nucleus) actually travels through the outer membrane and is inside of the spinal canal. However, an extrusion type of disc herniation remains attached to the disc. The extrusion herniations can travel.

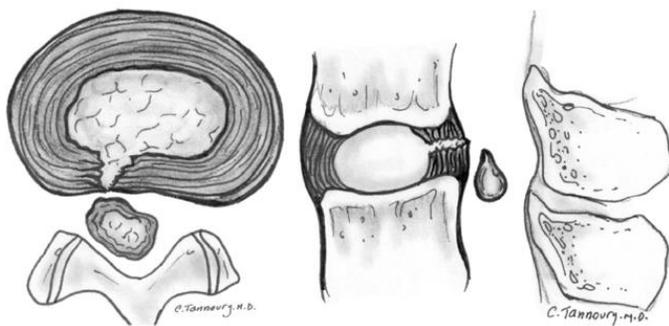
Extrusion



**What is a sequestration?**

A sequestration is a type of herniation in which some of the cushioning has broken off. The piece of nucleus is no longer attached to the rest of the disc.

Sequestration



**Do all disc herniations cause symptoms?**

No. Most disc herniations do not cause any symptoms at all.

**Are asymptomatic disc herniations common on MRI?**

Yes. A recent study demonstrated that high numbers of pain free, normal volunteers have abnormalities on their MRI. The finding is related to age. (AJNR 2015; 6:811-6)

For under 40 years:

The following findings are so common in normal, pain-free volunteers that while we report their presence, they must be interpreted with caution and in the context of the clinical situation. Among people under the age of 40 who do **not** have back pain, an MRI will find that about:

- 5 in 10 have disk degeneration
- 3 in 10 have disk signal loss (desiccation)
- 3 in 10 have disk height loss



- 4 in 10 have a bulging disk
- 3 in 10 have a disk protrusion

Note that even 3 in 10 means that the finding is quite common in people without back pain.

For between 40-60 years:

The following findings are so common in normal, pain-free volunteers that while we report their presence, they must be interpreted with caution and in the context of the clinical situation. Among people between the age of 40 and 60 years who do **not** have back pain, an MRI will find that about:

- 8 in 10 have disk degeneration
- 7 in 10 have disk signal loss (desiccation)
- 6 in 10 have disk height loss
- 6 in 10 have a bulging disk
- 3 in 10 have an annular fissure
- 3 in 10 have a disk protrusion

Note that even 3 in 10 means that the finding is quite common in people without back pain.

For over 60 years:

The following findings are so common in normal, pain-free volunteers that while we report their presence, they must be interpreted with caution and in the context of the clinical situation. Among people over the age of 60 who do **not** have back pain, an MRI will find that about:

- 9 in 10 have disk degeneration
- 9 in 10 have disk signal loss (desiccation)
- 8 in 10 have disk height loss
- 8 in 10 have a bulging disk
- 4 in 10 have an annular fissure
- 4 in 10 have a disk protrusion
- 4 in 10 have facet degeneration
- 3 in 10 have spondylolisthesis

Note that even 3 in 10 means that the finding is quite common in people without back pain.

**What percent of people without pain or other symptoms have spine problems ?**

**Table 2: Age-specific prevalence estimates of degenerative spine imaging findings in asymptomatic patients<sup>a</sup>**

Imaging Finding	Age (yr)						
	20	30	40	50	60	70	80
Disk degeneration	37%	52%	68%	80%	88%	93%	96%
Disk signal loss	17%	33%	54%	73%	86%	94%	97%
Disk height loss	24%	34%	45%	56%	67%	76%	84%
Disk bulge	30%	40%	50%	60%	69%	77%	84%
Disk protrusion	29%	31%	33%	36%	38%	40%	43%
Annular fissure	19%	20%	22%	23%	25%	27%	29%
Facet degeneration	4%	9%	18%	32%	50%	69%	83%
Spondylolisthesis	3%	5%	8%	14%	23%	35%	50%

**Why would some disc herniations cause no symptoms?**

We need more research to answer this question. It is likely that, in addition to mechanical compression, there is often inflammation associated with disc herniations. Disc herniations cause pain when there is inflammation and mechanical compression.

**Which MRI findings are likely clinically important?**

A recent study also separated the MRI findings into those which are likely clinically important (causing pain, numbness, or weakness) and those which are likely not causing any symptoms and are just age-related. [JAMA Netw Open](#). 2020 Sep; 3(9): e2015713.

<b>eTable 6. Imaging findings likely clinically important vs. not likely clinically important</b>	
<b>Likely clinically important<sup>a</sup></b>	<b>Not likely clinically important<sup>a</sup></b>
• Moderate or severe stenosis <sup>b</sup>	• Annular Fissure
• Disc extrusion	• Disc height loss
• Nerve root displacement or compression	• Mild stenosis (central, lateral recess or foraminal)
• Endplate edema (Type 1 endplate change)	• Nerve root contact without displacement/compression
• Grade 2 or higher listhesis	• Grade 1 listhesis
	• Disc desiccation
	• Disc bulge
	• Disc protrusion
	• Facet degeneration (any severity)
<p>a. Note that none of the health systems used structured reporting and findings were derived using natural language processing (NLP) techniques.</p> <p>b. Central, lateral recess or foraminal.</p>	

**What are the symptoms of a disc herniation?**

Symptomatic disc herniations tend to push on the spinal nerves and cause referred pain in the arms and legs called radiculopathy. The arm and leg pain is called “radiculopathy” and it follows a pattern described above.

**Do disc herniations cause back pain also?**

No. Back pain is caused by the discs failing to work as a shock absorber. Usually, the back pain occurs as the discs dry and lose fluid and thus shorten. When the discs are shorter, the bones are uncomfortably close to one-

another and thus can bump into each other. The bones bumping into each other causes back pain. That is called “discogenic” back pain.

A person can have a large herniation that compresses the nerves and yet does not cause back pain. Conversely, a person can have severe back pain from a loss of fluid in the discs without having a herniation.

**Can disc herniations cause stenosis?**

Yes. Stenosis is the narrowing of the space for the nerves. Disc herniations can narrow the space for the nerves. Disc herniations can cause stenosis. Stenosis can occur from factors other than disc herniations such as bone spurs, cysts, or thickened tissues.

**Is stenosis the same as compression?**

Yes. Stenosis is the same as compression, narrowing, impingement, effacement. Those are all words that you may see on your MRI report.

**So is surgery intended to treat stenosis or disc herniations?**

Both. Removing the symptomatic disc herniations relieves the stenosis. Surgery is intended to treat stenosis.

**How do you know which disc herniations need surgery?**

The history and physical are critical for figuring out which levels need surgery. One cannot make the decision for surgery based on the MRI alone (because asymptomatic herniated discs are so common). I use the levels of your arm and leg pain to figure out which discs are causing symptoms.

**Can you tell from the MRI which levels are causing neck and back pain?**

No. Normal appearing discs on the MRI can be painful. Very abnormal appearing discs on the MRI can be painless.

**What is spine arthritis?**

Discs separate bones in the spine. Discs are made of cartilage. Cartilage is a wet, slippery tissue that coats the joints and enables painless movement. Cartilage contains a lot of water. Spinal arthritis means that the cartilage within the discs lose water. The discs then become less effective "separators" of the bones. The bones bump into each other. The bones contacting each other causes back pain or neck pain.

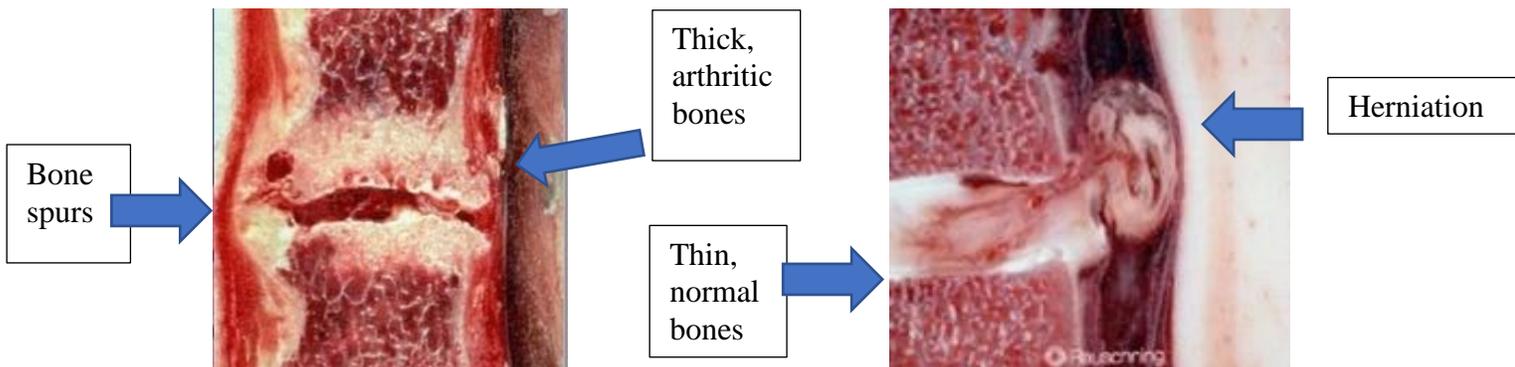
As the loss of water progresses, the bones themselves can become thickened (called sclerosis). Other tissues and ligaments can thicken (called hypertrophy). The bones can become mal-aligned. The changes can also cause nerve root compression (called stenosis).

**Are disc herniations a form of arthritis?**

Yes. The injury to the cartilage in the discs from a herniation can cause early arthritis to develop.

**How Does Arthritis Differ from Disc Herniations?**

In this case, the arthritis bone (disc on the left) is thickened (extra white) and there are pointed bone spurs present on the left side of the disc that look like a cone. In contrast, the disc on the right has normal thickness bones.



### Can you have spine arthritis without knowing it?

Absolutely! The early phases of arthritis (Wearing down of cartilage) and early loss of lubrication can be asymptomatic.

### Does spine arthritis make you more likely to have herniated discs?

Yes. Discs that are losing cartilage and lubrication are more likely to rupture and herniate.

### Why do spine problems seem to re-occur in some patients and seem to travel up and down the spine?

Because herniated discs can cause spine arthritis and can be caused by spine arthritis, once one disc wears out, the other discs are also likely to wear out. All of our discs are the same age. All of our discs have also been exposed to almost the same forces (car accidents, falls, etc.) and the discs also have been exposed to the same health conditions (obesity and smoking, for example).

### Is Disc Degeneration Transmitted through Genes?

Yes. Identical twin studies have demonstrated that about 25-33% of herniated discs can be linked to genetic factors.

### What are other names of spine arthritis?

Arthritis is also called (on MRI reports) spondylosis, disc space collapse, sclerosis, and degenerative disc disease.

### Is spine arthritis curable?

No. There is no cure for spine arthritis. The arthritis can be treated but not reversed. There are no injections (such as collagen, rooster combs, shark fins, stem cells, plasma etc.) that treat spine arthritis.

### What are the symptoms of spine arthritis?

There is not one specific symptom of the arthritis. The arthritis can cause back pain or arm/leg pain.

### What is a slipped vertebrae or slipped disc?

A slipped vertebrae or slipped disc is called a spondylolisthesis in medical terms. A slipped vertebrae is a form of spine arthritis? Sometimes, the slipped vertebrae can be associated with fluid buildup in the spine called a facet cyst.

### In general, what surgery is performed for spine arthritis?

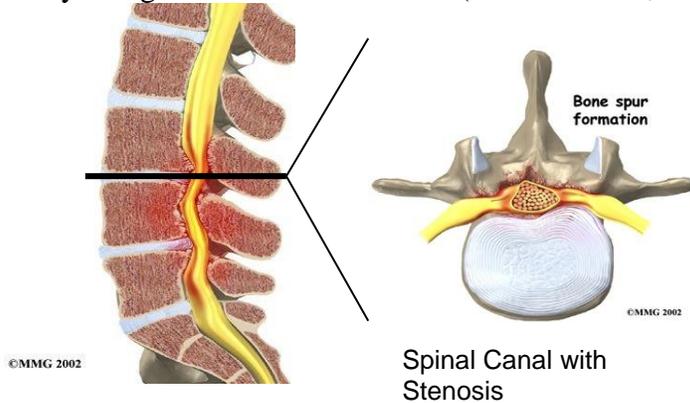
In general, spine arthritis is treated with spinal fusion. Artificial disc replacement does not work well in patients with advanced spine arthritis. The disc replacements do not move normally in an arthritis spine. The disc replacements perform best and should be performed in patients without arthritis.

**Does shaving or cutting down the disc work well for spine arthritis?**

No. Discectomy (including shaving or removing the disc) does not work well for spine arthritis. The underlying cartilage will still be abnormal and deteriorated.

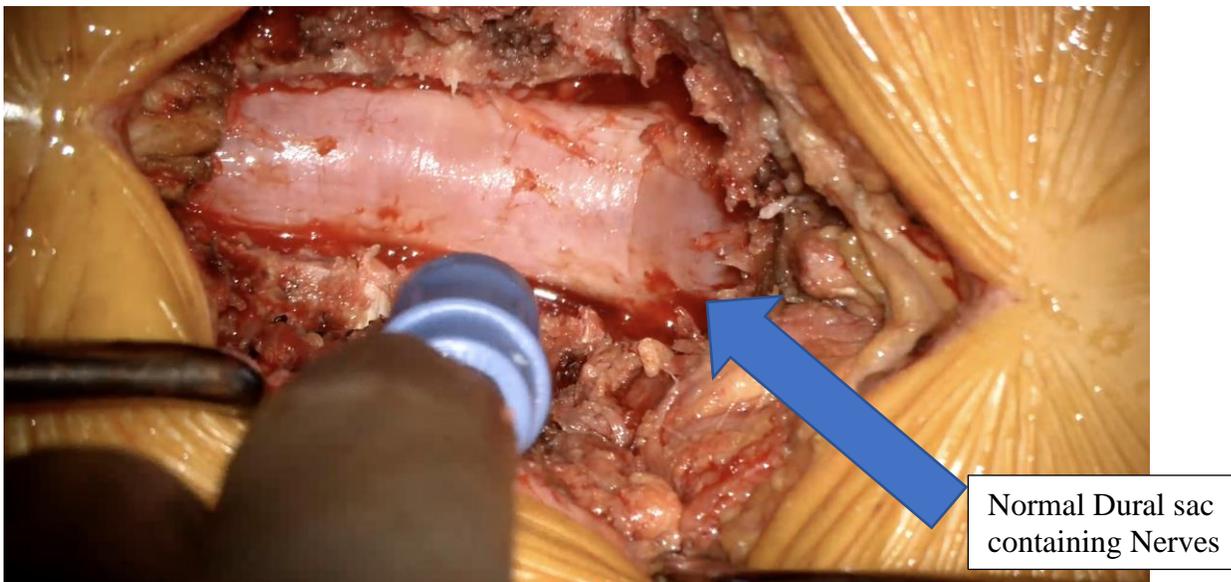
**What is stenosis?**

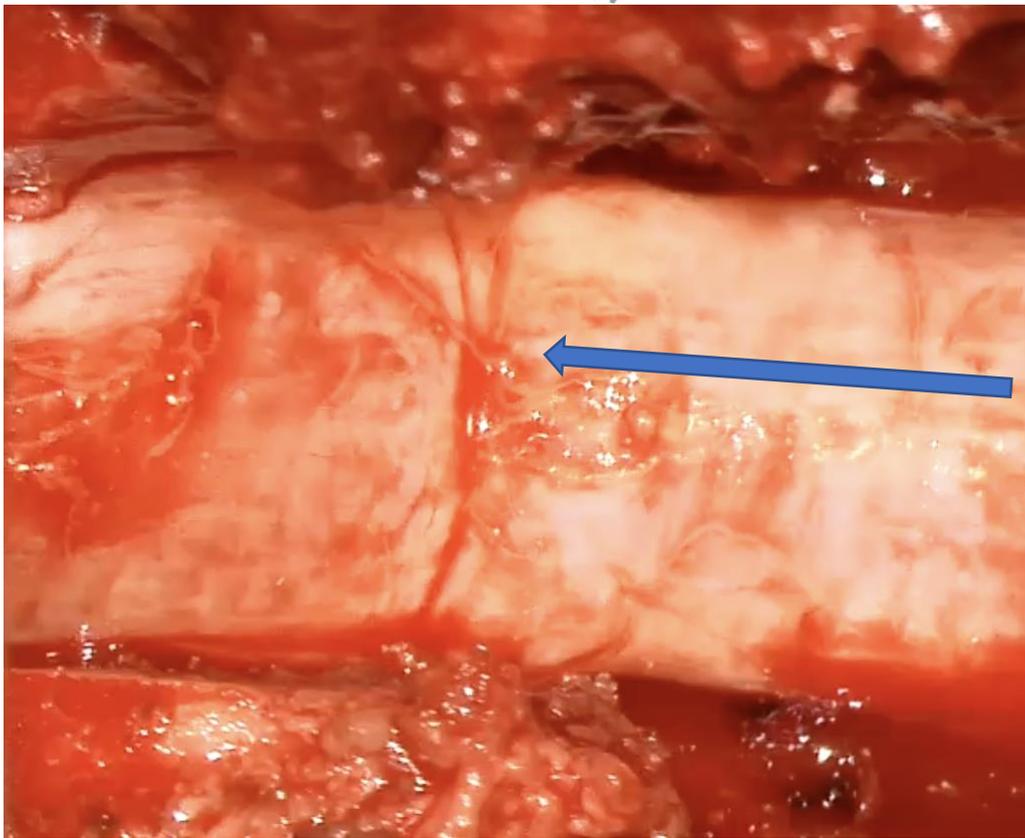
Stenosis is narrowing of the space for the spinal nerves. Stenosis is commonly caused by a herniated disc, but it can be caused by a large number of conditions (herniated disc, slipped vertebrae, arthritis, facet cyst).



**What does stenosis look like?**

The thin blue sac holding the nerves develops a dent or kink in it similar to a kink in a garden hose. The indentation can be temporary or permanent. The narrowing of the space for the nerves causes irritation and pain in the nerves. Ideally, once the pressure is removed from the nerves, the pain reduces. However, that does not happen in all cases.





Dural sac with folds and indentations due to stenosis

**What are the symptoms of lumbar stenosis?**



Standing and walking provoke symptoms



Leaning forward while walking eases symptoms



Sitting relieves symptoms

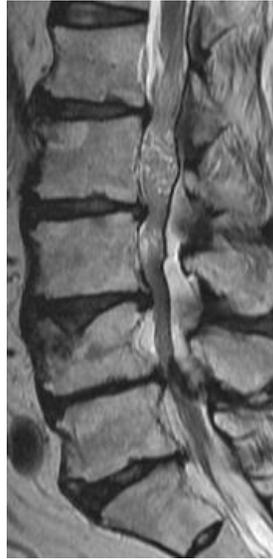
**What can you see on an MRI? What can you see on a CT scan?**

With an MRI, I can see the spinal nerves and discs. CT scan is better for seeing the bones and hardware. The discs and nerves cannot be seen on a regular CT scan. If you cannot have an MRI, you will need a CT myelogram. The following are examples of a common MRI view. The patient is facing to the left. On most MRIs, fluid is white. The long gray line in the middle is the spinal nerves. The rectangles just off center are bone.

**What does lumbar spinal stenosis look like on MRI?**



NORMAL



STENOSIS

**What does a lumbar disc herniation look like on MRI?**



NORMAL

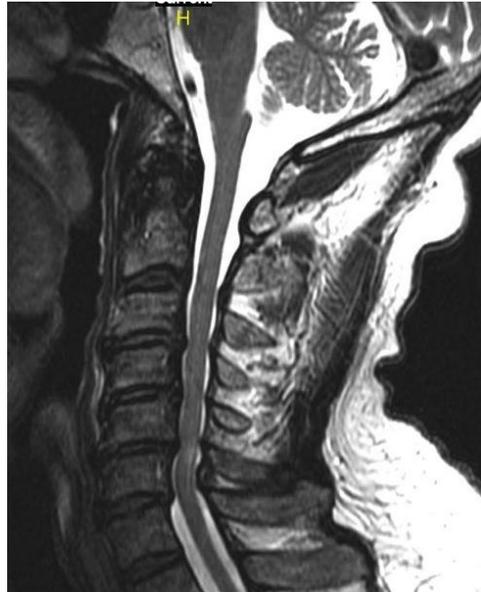


Herniation

**What does cervical stenosis look like on MRI?**

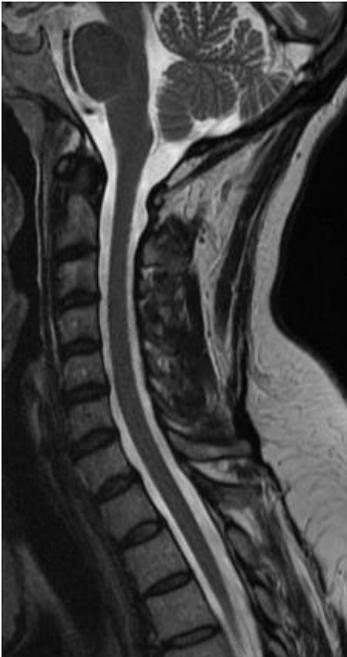


NORMAL



STENOSIS

**What does a cervical disc herniation look like on MRI?**



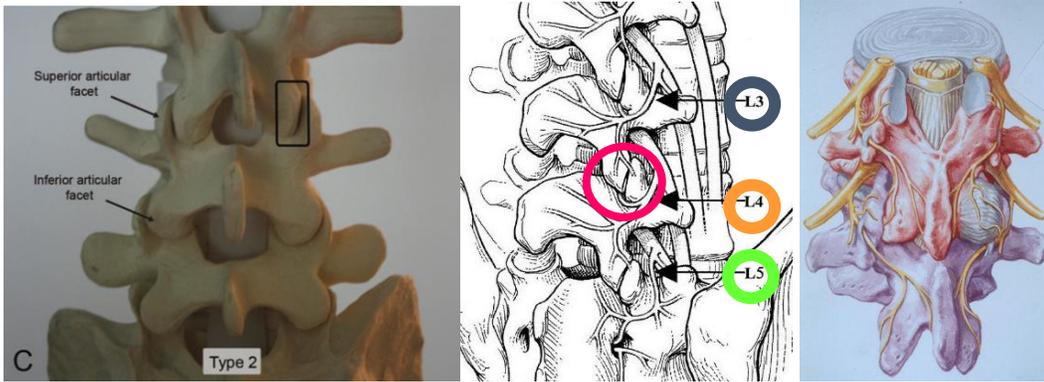
NORMAL



Herniation

**What are facet joints?**

The facet joints are small joints on the back of the spine. They contain cartilage. They can become arthritis or break down. They have nerves running across them. Often, pain management specialists will burn away the nerves to those joints (called a rhizotomy).



### What is the sacroiliac joint?

The sacroiliac (SI) joint is the connection between the spine and the pelvis. The SI joint is a common, undiagnosed source of pain in the back and upper thigh.

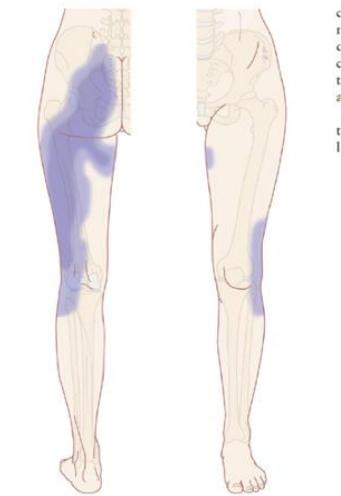
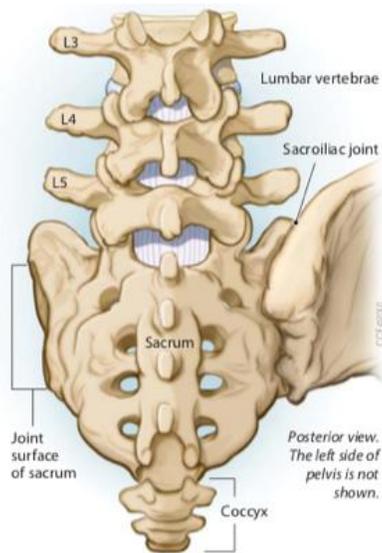
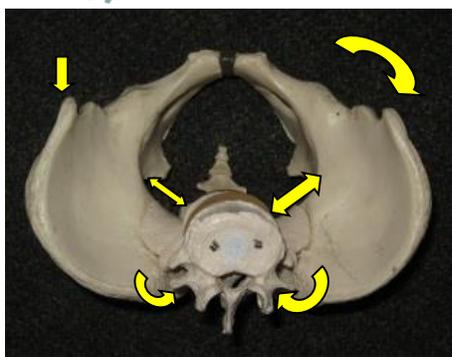


Figure 1. Typical pain referral pattern of sacroiliac joint pain (illustration: Rogier Trompert Medical Art <http://www.medical-art.nl>).

### How is the sacroiliac joint tested?

The sacroiliac (SI) joint is tested by rotating the leg and pelvis while the spine is still. If rotating the leg and pelvis produces pain even when the spine is not moving, then you may have an SI joint problem. The second diagnostic test (after physical exam) is your response to a cortisone injection into the SI joint. There is no imaging study (such as MRI or CT) to diagnose SI joint problems. It is a clinical diagnosis only.



### **Where does Dr. Radcliff do surgery?**

Capital Health Medical Center (Hopewell). 1 Capital Way, Pennington, NJ 08534. (800) 637-2374.

<https://www.capitalhealth.org/>

Robert Wood Johnson (Hamilton). 1 Hamilton Health Pl, Hamilton Township, NJ 08690. (609) 586-7900.

<https://www.rwjbh.org/rwj-university-hospital-hamilton/>

Shore Medical Center 100 Medical Center Way, Somers Point, NJ 08244 (609) 653-3500

<https://shoremicalcenter.org/>

Thomas Jefferson University Hospital, 132 S 10th St, Philadelphia, PA 19107, 215-955-6000,

<https://www.jeffersonhealth.org/index.html>

Atlanticare Mainland Division, 65 West Jimmie Leeds Road, Galloway, NJ 08205

609-652-1000 [www.atlanticare.org](http://www.atlanticare.org)

### **What is Laser Spine Surgery?**

A laser is used in spine surgery to shrink herniated discs. It is placed into the spine through a needle (similar to an epidural injection). The laser burns herniated disc. The surgeon does not directly see the spinal nerves or the herniated disc.

### **Do your hospitals have lasers?**

Yes. All hospitals above have operative lasers.

### **Do you use lasers in your surgeries?**

No. Contrary to the advertising and commercials, the laser does not work well in spine surgery. The recurrence rate is unacceptably high in the recent medical studies (over 52% of patients needed another surgery in a recent study). The laser also gets so hot that it can burn tissues in the spine.

**TECHNICAL CASE REPORTS**

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**A CASE OF NERVE ROOT HEAT INJURY INDUCED  
BY PERCUTANEOUS LASER DISC DECOMPRESSION  
PERFORMED AT AN OUTSIDE INSTITUTION:  
TECHNICAL CASE REPORT**

**Iliac Artery Perforation Following Lumbar Discectomy  
With Microsurgical Carbon Dioxide Laser**

A Report of a Rare Case and Discussion on  
the Treatment

Sang-Hyeop Jeon, MD,\* Sang-Ho Lee, MD, PhD,<sup>†</sup> and Won-Chul Choi, MD<sup>†</sup>

**What do doctor groups and research say about laser spine surgery?**

The largest spine society in the world (the North American Spine Society) recently reviewed the literature on laser spine surgery and found that it was not recommended. If a Laser were that successful, we would of course use one.

**NASS COVERAGE POLICY RECOMMENDATIONS**

**Scope and Clinical Indications**

**Clinical Indications for the Procedure**

Laser spine surgery in the cervical or lumbar spine is NOT indicated at this time. Due to lack of high quality clinical trials concerning laser spine surgery with the cervical or lumbar spine, it cannot be endorsed as an adjunct to open, minimally invasive, or percutaneous surgical techniques.

**Coverage Recommendation(s)**

**Cervical and Lumbar Laser Spine Surgery**

There are no high quality studies to support a recommendation for cervical or lumbar laser spine surgery. When evaluating efficacy of a newer therapy, randomized controlled trials (RCTs) with long-term follow-up that compare the investigated treatment versus current standard practice are paramount in deciding utility of the new therapy. To achieve a quality clinical study, an RCT needs to possess the following elements:

**Laser Spine  
Surgery**

**NASS** DEFINING APPROPRIATE  
COVERAGE POSITIONS

North American Spine Society, 7075 Memorial Blvd., North Ridge, IL 60070



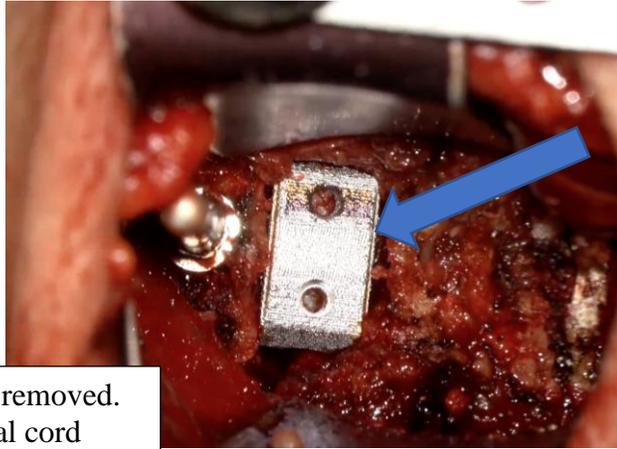
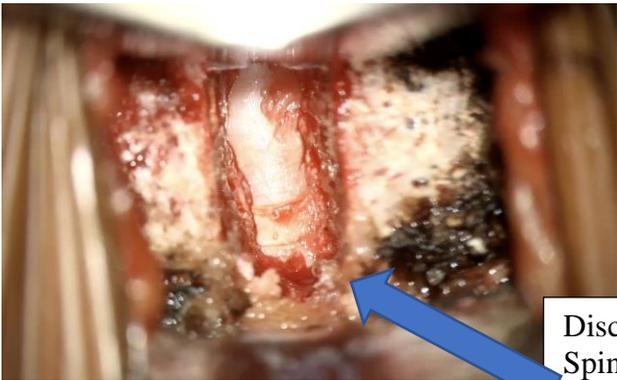
**What does a disc replacement look like?**

A disc replacement is a ball and socket joint usually made of metal and plastic.



**What are cages?**

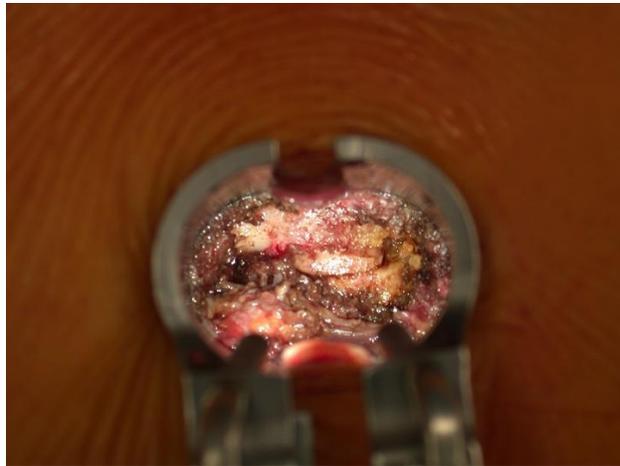
Cages are small metallic or plastic spacers that separate bones and hold open a space. For example, in the neck there is a space created between the bones after a disc is removed.



Disc removed.  
Spinal cord  
visible and  
decompressed

**What does a microdiscectomy look like?**

Here is a small incision view through an operating microscope



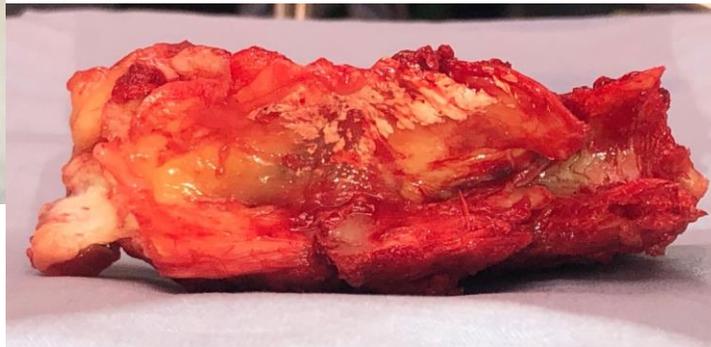
**How much of the spinal cord do you see in surgery?**

In some cases, I am able to look directly at the nerves. Looking directly at the nerves is often the safest way to work around them.

**What does a laminectomy look like?**

Here is a view of the front of the lamina in an arthritic spine. I have removed three bones in this case. You can see the irregular contour of the front of the bone and swollen tissues from longstanding arthritis. This surface

would lie directly above the nerves and would compress them.



### **Why do some people say “Do Not Have Spine Surgery”?**

Any surgery can make a patient better, the same, or worse. In the past, the results of spine surgery were disappointing for many patients probably because of both education and some technical factors. Patients had limited understanding of the invasiveness and limitations after spine surgery. Physicians also may not have done a good job of communicating the risks and expected benefits. I think that, for the most part, spine surgery has become much more safe and effective.

### **So it is ok to have spine surgery now? What changed?**

Yes. Spine surgery has evolved. There has been a great deal of research in spine surgery focused on the best patient selection, surgical technique, postoperative pain management, reducing complications, and postoperative rehabilitation. Our institution has done some of that research to help educate ourselves and our colleagues on best practices. Of course, with any procedure, there are still patients who may not improve as much as we would like. However, for the most part, we are much better at predicting outcome.

### **What is the likely outcome of surgery?**

In general, surgery is most effective at reducing pain in the arms and legs. Spine surgery does not (in general)

work as well for treating back and neck pain. There are a couple of good calculators to input your symptoms and identify a predicted postoperative outcome.

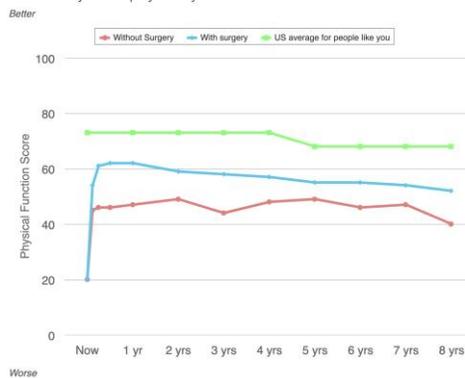
For example, here is the predicted outcome for a sample patient with severe pain from spinal stenosis from the Sport online calculator. The odds of pain relief and improvement in function change as the symptom severity before surgery changes. (<http://spinesurgerycalc.dartmouth.edu/calc/introduction.html>).

### Physical Functioning

Your ability to be physically active over time



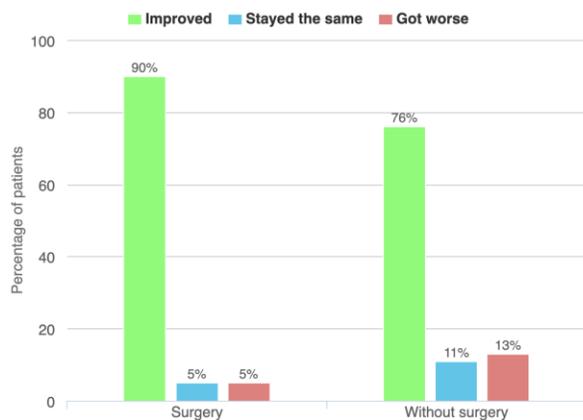
Your ability to be physically active over time



THE GRAPH ABOVE shows how your ability to perform daily physical activities over time may change depending on whether you had surgery or non-surgical treatment. Based on your responses the results above are the average physical function scores over time for people like you.

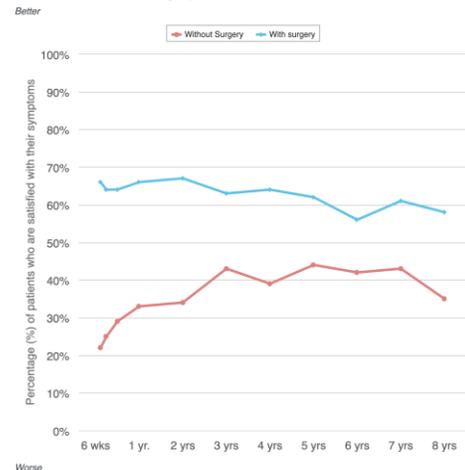
However, it is important to know that your individual outcome may vary. THE CHART BELOW illustrates this by showing what your chance is of clinically improving (10+ points higher than your baseline score), staying the same (within 10 points of your baseline score), or getting worse (10+ points lower than your baseline score) over the next year with surgery or non-operative treatment.

Patient outcomes after 1 year



### Satisfaction with Symptoms

Your satisfaction with symptoms over time



Similarly, there has been a great deal of research about the risks and likelihood of complications following surgery. For example, one recent research study compiled these odds to guide patients about the common risks (complications) of spine surgery.

Complication	Leading to	Odds
Nerve root injury	Pain/weakness/numbness in the arm / leg. The impairment may be temporary or permanent.	1 in 60
Damage to the nerves supplying the bladder (cauda equina syndrome)	No control or reduced control passing urine or faeces. Weakness and/or numbness in the legs.	1 in 100
Tear of the lining of spinal canal (dura)	Headache and a leaky wound. Occasionally a second operation to repair the tear (1 in 300).	1 in 20
Infection	Wound discharge, fever and chills.	1 in 50
Wound swelling (Seroma)	Fluid collection under the skin. Majority amenable to aspiration alone. Occasionally wound is re-opened to drain.	1 in 60
Recurrent disc herniation	Recurrence of pain requiring second operation either within a few days or at any time in the future.	1 in 20
Respiratory	Need for support of ventilation. Occasionally emergency operation to relieve the obstruction (1 in 50)	1 in 30
Oesophageal (gullet) injury	Difficulty with swallowing. Generally temporary. Re-operation to repair the oesophagus may be needed (1 in 100)	1 in 12
Recurrent laryngeal nerve injury	Hoarse voice – temporary (common) or permanent (rare).	1 in 20
Vertebral artery injury	Bleeding	1 in 300
Failure of bone healing (non-union)	Persistent pain. Recurrence of deformity.	1 in 6
Bone graft donor site pain	Pain.	1 in 8
Hardware breakage / loosening, Dislocation of implant	Pain. Recurrent deformity. Probable second operation to re-position or remove any implant.	1 in 100
Pedicle screw malposition	Weakness / numbness / bleeding / lung injury	1 in 25
Intestine (gut) blockage (ileus)	Distended abdomen, vomiting and constipation.	1 in 100
Retrograde ejaculation	Infertility.	1 in 75
Spinal cord injury	Loss of arm and leg function: Quadriplegia / Paraplegia – permanent. Quadriparesis / Paraparesis – may be temporary or permanent.	1 in 250

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### What does the robot look like in spine surgery? What does it do?

The robot does not look like the Terminator or C3PO! It has a single arm that holds a drill guide. The robot can help to point the tools in the right direction. However, the surgeon still has to operate the tools and do the surgery.



### Why did you put this handout together? Where did you get all of these questions?

I think that it is really important that patients understand some of the language and terminology and anatomy. I have listened to my patients over the years. I have my patients to thank. Please ask more questions so that I can



continue to add to the handout.

Glossary:

**acute:** a condition that progresses rapidly

**anesthetic:** an agent that causes loss of sensation with or without the loss of consciousness.

**anterolisthesis:** A forward slippage of one bone onto another bone. It can compress the nerve roots, causing pain.

**axial pain:** pain in the neck or back that does not travel into the extremities (arms and legs)

**bulge:** A broad type of disc herniation that occupies more than 25% of the circumference of the disc

**chronic:** a condition of slow progression that continues over a long period of time.

**central stenosis:** narrowing of the middle of the spinal canal where the nerves travel

**cerebrospinal fluid:** the water-like fluid that bathes the nerves

**corticosteroid:** a hormone produced by the adrenal gland or synthetically. Regulates salt and water balance and has an anti-inflammatory effect.

**cortisone:** the type of steroid used in most injections. Epidural injections involve an injection of cortisone. There are specific brands of cortisone such as depo-medrol, solu-medrol, and methylprednisolone.

**degeneration:** the process of deterioration of cartilage and tissues due to any number of factors. Degeneration can occur as a result of an injury (“My car accident caused my back to degenerative prematurely”), genetic factors (“My entire family has back problems”) or due to work.

**degenerative disc:** A breakdown or aging of the intervertebral disc causing collapse of the disc space, tears in the annulus, and growth of bone spurs. Degeneration is a form of arthritis.

**disc-osteophyte complex:** A combination of disc herniations and bone spurs due to spinal arthritis.

**dura:** the thin membrane surrounding the nerves that holds spinal fluid

**epidural injection:** A steroid injection into the spinal canal intended to reduce inflammation and pain given outside of the dura inside of the spinal canal. Cortisone is the most common type of steroid to be injected. Epidurals are also called nerve blocks. There are a number of different types of epidural injections that are differentiated by the location where the medication is injected. Some common types of epidural injections are interlaminar injections, transforaminal injections, selective nerve root blocks, and caudal epidural injections.

**epidural space:** the area between the membrane surrounding the spinal cord and the vertebral wall that is filled with fat and small blood vessels.

**extrusion:** A type of disc herniation which has a broader dome than a neck and/or extends above or below the disc level (and thus migrates)



**fluoroscopy:** an imaging device that uses x-ray or other radiation to view structures in the body in real time, or “live.” Also called a C-arm.

**foraminal stenosis:** narrowing of the tunnels where the nerves exit the spinal canal

**herniated disc:** The gel-like material within the disc can bulge or rupture through a weak area in the surrounding wall (annulus). Irritation, pain, and swelling occur when this material squeezes out and comes in contact with a spinal nerve. Disc herniations can be subcategorized as “bulge, protrusion, extrusion, or sequestration”.

**interlaminar:** through the lamina.

**lateral recess stenosis:** narrowing of the side of the spinal canal where the nerves travel

**mild stenosis:** something occupying less than 1/3 of the spinal canal

**moderate stenosis:** something occupying between 1/3 to 2/3 of the spinal canal

**myelopathy:** A spinal cord disorder causing trouble with finger coordination, balance, and bowel/bladder control

**osteophyte:** A bone spur. It is a hardened section of disc or an overgrown section of bone

**protrusion:** A type of disc herniation that occupies less than 25% of the circumference of the disc

**radiculopathy:** a pinched spinal nerve causing pain generally in the arms and legs

**retrolisthesis:** A backward slippage of one bone onto another bone. It can compress the nerve roots, causing pain.

**sacroiliac joint injection:** A cortisone steroid injection into the sacroiliac joints (not the spine) intended to reduce inflammation and pain

**sciatica:** pain that courses along the sciatic nerve in the buttocks and down the legs. Usually caused by compression of the 5<sup>th</sup> lumbar or 1<sup>st</sup> sacral spinal nerves. A form of radiculopathy

**scoliosis:** left-right curvature of the spine that can occur in childhood (called adolescent) or in adulthood (called degenerative)

**sequestration:** A type of disc herniation which a piece of disc has broken off and has migrated

**severe stenosis:** something occupying more than 2/3 of the spinal canal

**spinal canal:** the round bony tube surrounding the nerves and spinal cord



**spinal stenosis:** A narrowing of the spinal canal and nerve root canal can cause back and leg pain, especially when walking.

**spondylolisthesis:** A slippage of one bone over another in the spine, causing instability.

**spondylolysis:** A weakness or fracture between the upper and lower facets of a vertebra. If the vertebra slips forward (spondylolisthesis), it can compress the nerve roots, causing pain.

**spondylosis:** Degeneration (“drying up”) of the spinal discs associated with early spine arthritis