



# Spinal injuries 101

Anatomy, spinal trauma, diagnostic testing, and rebuttal of common defense arguments



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Spinal injuries, even those resulting from low-impact accidents, can be among the most painful and disabling of all trauma to the body, with the pain often lasting a lifetime. This article presents an overview of spinal anatomy and terminology, looks at common spinal injuries and the diagnostic testing used to evaluate them. We conclude with some common defense arguments and steps that can be taken to rebut these arguments.



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## Spinal anatomy

The human spine consists of 33 vertebrae; the four coccygeal bones that form the tailbone, five fused vertebrae, which form the sacrum, and the lumbar (five vertebrae), thoracic (12 vertebrae) and cervical (seven vertebrae). The vertebrae in the lumbar, thoracic and cervical spine are separated by 23 discs. The separation of vertebrae by discs allows for flexibility. Discs are made up of the nucleus pulposus and the annulus. The annulus is the exterior of the disc. The nucleus pulposus is the most absorbable tissue in the human body.

The spine protects our spinal cord. The spinal cord begins at the base of the brain and runs throughout the spine down to the level of the lumbar spine, where it exits and forms the cauda equina ("horse's bundle"). Nerve roots branch off of the spinal cord to innervate the body. Nerve roots exit the spinal column through openings in the vertebrae known as the neuroforaminal openings. The nerve roots innervate corresponding areas of the body. The nerve roots extending out of the cervical spine innervate the upper extremities. The lower extremities are innervated by nerve roots extending out of the lumbar spine and the cauda equina.



## Evolution of the spine without trauma

As humans age, the spine ages also. Aging of the spine commences with drying out of the discs, a process known as desiccation. As the annulus weakens, it loses its ability to retain moisture, and the spine begins to destabilize. To compensate, the body develops osteophytes, bony growth, to protect against this instability.

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Commonly, this is referred to as degenerative disc disease. However, many people will have severely desiccated discs and degenerative disc disease without pain or limitation on activity. When these conditions are present, however, persons become vulnerable to injury at lower forces.

As a disc desiccates, disc height decreases. This is why humans “shrink” as they get older. Desiccation leads to a narrowing of the neuroforaminal openings which can cause nerve root impingement. Nerve root impingement in the cervical spine will lead to problems including weakness in the upper extremities. Nerve root impingement in lumbar spine will lead to weakness in the lower extremities, sciatica. Because the thoracic discs are contained within the area spanned by our rib cage, they have less mobility than the lumbar and cervical spine and are therefore less inclined to injury.

### Imaging studies and diagnostic testing of the spine

Imaging studies of the spine include x-ray, Computerized Tomography (CT), Magnetic Resonance Imaging (MRI), discography, nerve conduction velocity and electromyography.

X-rays provide a two dimensional view showing the bony structures; however, they do not allow for visualization of the discs. X-rays will show fractures, arthritis – loss of cartilage leading to reduced space between the bones, and osteophytes or bone spurs.

MRI allows for visualization of soft tissue including discs. Functional MRI can be performed potentially showing disc bulges with movement. 3T MRIs are now becoming more common and provide greater resolution than their predecessors, 1.5T MRI machines. On MRI, healthy discs with lots of fluid in them will appear whitish, known as attenuation. As the disc desiccates, it will darken in appearance reflecting reduced moisture content. Where an injury occurs to a healthy well-hydrated disc, desiccation will not show up on MRI for at

least a few months. Thus, MRI should be repeated sufficiently after the accident to see if desiccation has occurred.

CT is the creation of a three dimensional image from computerized processing. With regards to the spine, CT is most commonly used with interventional procedures such as epidurals, nerve blocks and facet blocks to allow the clinician to see where they are placing the needle.

Discography utilizes injection of contrast material to identify annular compromise. Also, the disc is pressurized in an effort to determine whether pain complaints can be reproduced. The clinician communicates with the patient during the procedure to obtain feedback. If the test reproduces the patient’s pain, it is said to be concordant. This provides objective evidence that the patient’s pain is indeed caused by a disc injury at that respective level. Discs themselves are innervated. Discography is particularly useful in identifying discogenic pain (pain caused by injury to the disc itself, as opposed to a herniation or extrusion impinging a nerve root). Occasionally, patients will have little if any disc bulge but severe back pain. When this occurs, discography can be very useful to establish the existence of the injury.

Nerve conduction velocity and electromyography are commonly done in tandem. Nerve conduction velocity testing determines whether one has nerve damage or destruction. The rate at which the electrical impulse travels along the nerve is compared against expected values to determine whether there is insult. Electromyography can help differentiate primary muscle conditions from muscle weakness caused by neurologic disorders such as diabetes causing a peripheral neuropathy.

### Disc injuries

Trauma to discs can lead to annular tears, bulges, herniations and extrusions. Annular tears will lead to desiccation. Thereafter, the disc is weakened and tears, bulges and extrusions can ensue.

A bulging disc means the disc is misshapen but the nucleus pulposus remains within the annulus. A herniated disc means a portion of the nucleus pulposus is outside of the annulus. An extrusion means a portion of the nucleus pulposus has broken off from the remainder of the disc. This can be an emergency if the extrusion has gone centrally as it can lead to paralysis. If the extrusion has gone into a neuroforaminal opening, severe symptoms will result.

### Common defense arguments in spine injury cases

The defense will commonly argue all of plaintiff’s spinal injuries were pre-existing; insufficient forces from the subject incident occurred to cause plaintiff’s injury (a full discussion of this topic is the proper subject of an entirely separate article), or a combination of both. To this end, the defense will seek all prior medical records of the plaintiff in an effort to find alternate explanations for any spinal injury. The defense will retain physicians to opine about pre-existing injuries and accident reconstructionists to opine regarding forces from the incident.

### Rebutting common defense arguments

#### Pre-existing condition:

The defense will seek to establish plaintiff’s injury existed prior to the subject accident. The defense will scour all prior records for reports of symptoms consistent with pathology at the level of the spine to which plaintiff currently claims injury.

Preliminarily, plaintiff’s counsel should obtain all of plaintiff’s medical records, review them in great detail and prepare a chronology. A medical professional can be very helpful in this process of reviewing medical records. If there are records documenting similar symptoms or suggesting pathology at the level for which plaintiff is seeking damages, counsel needs to address these facts. Many people will have intermittent back or



neck pain. However, the vast majority of these incidents resolve and have no long-term impact.

Counsel should evaluate plaintiff's level of functioning prior to the subject accident. If appropriate, marshal evidence to establish plaintiff's pre-incident functioning through witnesses not vulnerable to attack for bias. Was plaintiff a member of a gym? Did plaintiff regularly engage in physical activity? If so, identify witnesses to establish these facts. Even if plaintiff had a pre-existing condition, a defendant is responsible for all aggravation of same. You can also use this to your advantage by having experts say plaintiff was more vulnerable to injury (an "eggshell" plaintiff) and the injury was worse than it otherwise would have been because of the pre-existing condition.

Counsel should consider retention of a radiologist to interpret plaintiff's imaging studies, providing both the radiology report and imaging study. Careful review of all of the studies is essential. Where just a couple of discs are injured, the inference is that this was traumatically induced. Often, MRI will establish a desiccated disc adjacent to a healthy disc. This is compelling evidence [that] trauma is the cause since, if it were aging, all discs should be similarly affected. A radiologist may be able to testify the pathology pre-incident was benign and/or not likely to lead to limitations in plaintiff's lifetime absent insult. The degenerative disc disease reported by a treating physician may become "normal for plaintiff's age." The radiologist can interpret the studies and discuss projections related to evolution of the injury throughout plaintiff's lifetime. Likewise, a neurosurgeon or orthopedic surgeon can evaluate the patient and diagnostic studies to opine about future medical care necessitated by the insult, causation and related issues. A desiccated disc in a young person may not be presently causing any symptoms. However, as the disc collapses, nerve root impingement will result. A surgeon can testify "to a reasonable degree of medical probability" [that] the desiccated disc will

advance to the point of requiring surgery within plaintiff's lifetime to allow for the recovery of a future spine surgery. Disc replacement or fusion surgeries can cost up to \$250,000.

Often, trauma will cause focal lesions within the spine. Again, experts can point out that the injury to the spine affects one or perhaps two discs, but is not diffuse throughout the spinal anatomy to rebut arguments that the pathology is something other than traumatically induced. If a disc is substantially worse than others, the inference is that disc sustained some unique trauma.

Both surgeons and radiologists can testify regarding the spinal anatomy, vulnerability of the patient to injury at reduced thresholds due to degenerative disc disease, desiccated discs and osteophytes. The osteophytes may be pinch points impinging nerve roots, possibly worsening with movement. Imaging studies should be analyzed to see if plaintiff has scoliosis, which again could predispose to injury at lower force thresholds.

Conservative treatment for lumbar injuries often include core strengthening exercises. A physiatrist (an M.D.) may be useful in testifying about the efficacy of such exercises. When one sustains a subsequent injury, participation in the core strengthening program and exercise may be reduced or eliminated. This can lead to weakening of the core causing increased pain and weight gain which also exacerbates back pain.

### Rebutting the contention insufficient forces were created in the subject incident to cause injury

While appropriate for a full separate article, I will point out that rebutting this argument requires a detailed analysis of both the subject incident and the basis for the defense argument. The defense will employ an accident reconstructionist to try to determine the forces exerted upon plaintiff in the incident. The defense will then tout studies showing persons were

not injured when forces were exerted upon them greater than those calculated by their reconstructionist. Typically, these studies are not performed upon persons with pathology similar to plaintiff. Therefore, their application to plaintiff is in question. Where the defense employs this argument, plaintiff should probe whether the defense acknowledges an injury, and if so, it's alternate explanation. Plaintiff should also seek to establish any pre-existing condition made plaintiff more susceptible to injury in the subject incident.

### Soliciting help from treating physicians

The defense will commonly seek to gather all records and depose prior treating physicians in an effort to get testimony [that] plaintiff's injuries preceded the subject incident. In doing so, the defense has little regard for the accuracy of testimony it obtains and will seek to get prior treating physicians to opine degenerative disc disease is part of the aging process; will worsen over time; and in plaintiff's case, if appropriate, likely lead to surgical intervention in their lifetime irrespective of any claimed trauma. Plaintiff's counsel should obtain all records and arrange to speak with treating physicians in advance of any defense deposition.

A HIPAA authorization should be provided to the physician's office manager and an offer to compensate the physician for his time to discuss the case will often result in obtaining good information from treating physicians. Counsel should seek to do this well in advance of the deposition to ensure the physician takes the time to review the records and prepare for testifying. Often, treating physicians are willing to assist their patients and review additional materials about the injury, including motor vehicle accident reports. Treating physicians will welcome explanation as to defense attorneys' likely goals at the deposition.

Counsel should explain expert witnesses' opinions to the treating physician in order to determine if the treating



physician will support them. Often, treating physicians merely rely upon radiology reports and do not view the underlying studies. Plaintiff's counsel should determine if this is the case and, if desired, provide the underlying study for the physician in advance of deposition as well as any subsequent imaging studies to show evolution of the pathology. In the case of catastrophic injuries, counsel should seek to have the treating physician consult with a retained life-care planner. The life-care planner can then send a letter to the physician memorializing the discussion which the physician can then rely upon at deposition to prevent inconsistencies in their respective testimony.

## Conclusion

Spinal injuries are exceedingly common. As our population ages and more older but still active persons are involved in accidents, the defense arguments that spinal injuries are merely the evolution of the underlying degenerative disc disease will only increase. Plaintiff's counsel is well served to marshal all of plaintiff's medical records, meet with treating physicians in advance of the depositions to prepare them, obtain necessary diagnostic testing and imaging studies to prove the injuries their clients have sustained, and retain appropriate consultants to diagnose and explain plaintiff's spinal injuries.

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William Veen founded The Veen Firm, P.C. as a sole practitioner in 1975, gradually developing it into a firm of talented attorneys and staff who represent severely injured workers and consumers. He is a member of the American Board of Trial Advocates and honored as the Trial Lawyer of the Year by the San Francisco Trial Lawyers Association in 2003.