

# **A General Overview of the Anatomy and Other Facts Related To Lumbar Disc Herniation**

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### **Purpose**

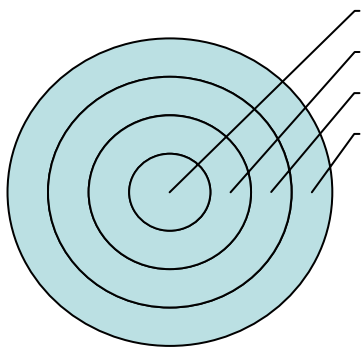
The purpose of this article is to discuss the general causation, anatomy, differing opinions, symptoms, and current treatments of a herniated disc.

### **General Causation**

Approximately up to 80% of the population will suffer some form of general low back pain. Middle aged men are more likely to experience some form of trauma to the low back or general idiopathic low back pain. Youth low back injuries especially herniated discs are associated primarily with contact sports with either the female or male population. Again the literature reports that the male population is at a much higher incidence with football injuries being at the top of the list. Cheerleading has seen a dramatic rise in low back injuries for the female population over the past two decades because of the repeated high impact stresses to the lumbar spine. Gray's Anatomy reports that a herniation is highly unlikely below the age of 20 years of age because of the strength, and flexibility of the disc at this age. Spondylolisthesis which is a fracture of the pars which is located on the spine is very prevalent in the youth population. This malformation may lead to discal problems, instabilities and osteoarthritic changes in the spine in later years. On the other end of the spectrum degenerative disc disease (DDD) of the disc and arthritic changes of the bone may cause other pathological issues related to low back pain. It is suggested that between 30-40 years of age female or male that many of the lumbar discs are in the initial stages of compromise with a loss of discal height and nutrients being received by the disc in general. This loss of nutrients plays a major role especially in the lumbar spine where stresses to the discs are very high. This can be seen on MRI usually indicated by a darkening of the inner and outer portions of the disc. Stenosis generally may be a result of the loss of nutrition to the disc. This loss of nutrition and discal height eventually effects movement and the ability of the spine to distribute load forces properly. Congenital malformations of the spine such as Spina Bifida play a small role in actual causation of lumbar pain or the eventual herniated disc when compared to trauma related low back pain.

Schmorl's nodes is the most common congenital malformation that may lead to eventual herniation of the disc. Exact percentages of congenital malformations contributing to low back pain range from 19% to 33% depending on the specific type of pathology.

### **Anatomy**



**A** A: in the inner most portion of the disc called the  
**B** Nucleus Pulposus. B is the next most portion of the  
**C** disc is the middle Anulus Fibrosis and C is the outer  
**C** most portion of the Anulus Fibrosis.

The section known as the Nucleus Pulposus is the center or inner most portion of the disc. This portion is made up of 70-90% H<sub>2</sub>O, 65% proteoglycans a H<sub>2</sub>O binding substance, 15-20% type 1 collagen and is considered to be one of the ligamentous structures of the spine. The nucleus may rupture through the anulus fibrosis. This area can be deformed but not compressed completely. It is like a water balloon. This area is also strongly attached

to the vertebral body which is termed the end plate. The area marked B to C is termed the Anulus Fibrosis. This area is 60-70% water, 50-60% collagen, 20 % proteoglycans, 10 % elastic next to the attachment of the end plate. Collagen is highly ordered in this section into concentric circles. This outer ring is thick anterior and lateral and thin posteriorly.

The fibers run at a 65-70 degree orientation for the resistance of sheer and rotary forces and for the diffusion of nutrients coming into the disc from the vertebrae. Generally the blood supply to the disc is minimal especially to the center. Discs vary in size and shape. However the function of the discs remains the same throughout the spine. The main functions of the disc are to increase stability through the increase in surface area between the vertebral bodies, increase rotation and decrease sheer forces with movement, absorb weight or act like a shock absorber and transmit a load from one vertebral segment to the next segment while maintaining pressure off the exiting nerves. Discs are in the cervical spine starting at cervical level C2 and run the entire length of the spine into the lumbar area

L5-S1.

The vertebral endplate which is not pictured here is similar to the rest of the disc. It is a layer of cartilage .6-1mm thick which attaches from the nucleus to the anulus. A small percentage of the vertebral end plate is placed up against an area where bone marrow exits for diffusion of nutrients into the disc. Ligaments surround the disc with the ALL anterior longitudinal ligament not attaching to the disc anteriorly and the PLL posterior longitudinal ligament attaching to the disc posteriorly. Muscle attachments are all around the disc on the segments of the spine for additional support. No muscle actually attaches to the disc itself.

## **Differing Opinions**

Varying opinions exist about whether or not a herniation actually is the primary cause of low back pain. Many studies reveal with the help of MRI diagnostic testing that a large percentage of the population may in fact have a herniated disc and remain asymptomatic. That is to say that a person who has a positive MRI for a herniated disc may not be experiencing any low back pain or any other types of symptoms normally associated with that of a herniated disc. Different levels of herniations exist for example; a herniation may be defined as a 1. Prolapsed which is when the nucleus pulposus is ruptured into the anulus fibrosis however is contained. This is the least acute. 2. Extruded is when the nucleus breaks through the anulus fibrosis and lies underneath the posterior longitudinal ligament, this is slightly more acute depending on the level. 3. Sequestration which is defined as a complete break of the disc through the anulus fibrosis and release of the disc material into the spinal canal. This is the most acute. Current research articles that required patients to have no back pain in order to participate in the studies I read were using the most up to date MRI diagnostic evaluation methods. In 3 similar studies up to 50 percent or more were found to have a bulge, 27 % had a protrusion and 1 % had an extrusion. A large variance between MRI diagnoses of disc pathology and patient symptoms did exist in many of the current studies. On the other hand many research articles discussed the correlation between MRI results and subjective reports of typical herniation symptoms reported by patients. Internet information reveals a wide variety of opinions regarding herniations. Many of the web sites I visited were in favor of the herniation being the cause of the low back pain. Out of the 50 sites I visited roughly 15% of the sites rebuked the idea of a disc herniation being the true source of low back pain. A few of the articles or internet sites that did rebuke the idea of a disc herniation causing low back pain did offer an exception. The exception being that of a complete sequestration of the disc. A large percentage of authors did agree that a complete prolapse of the nucleus through the anulus fibrosis may cause pain in the low back with radicular symptoms or burning pain into the leg. Many articles suggested that even though the Magnetic Resonance Imaging (MRI) is not as reliable as once thought, it is currently the gold standard for diagnostic examination of patients with a possible herniated disc.

## **Symptoms**

Symptoms also vary depending on where the disc is in the spine and the location at that specific segment. Generally if the disc is on the lateral side the symptoms are on the same side of the disc. If the disc is centrally located the symptoms may be into both legs. A small percentage of the time the pain can be on the opposite side of the disc. For example if the disc is at L5-S1 on the R the symptoms will more than likely be in the R leg into the heel and the outside of the foot. This pathway of symptoms is following something called a dermatome and corresponds with the nerve root from the spinal segment of L5 S1. Approximately 90% of all herniations occur at L5-S1 which is the last disc in the low back area. The acuteness of the pain also may dictate the pattern followed by the symptoms. An acute pattern typically will follow the nerve root whereas a chronic pattern may not follow a typical pattern.

Here is a general list of symptoms associated with herniated disc:

1. Pain into the legs burning, tingling, numbness. Pain into both legs.
2. weakness associated with the level- foot drop

3. bowel and bladder problems- patient may have difficulty using the rest room or a problems with incontinence
4. loss of sensation corresponding to the level of the herniation saddle parasthesia  
groin loss of sensation or pain
5. low back pain
6. tightness into the muscles of the legs
7. instability of the segment
8. loss of range of motion on the back or the legs, feet.
9. Deep tendon reflex- hypoactive
10. steppage gait- associated with foot drop
11. Muscle atrophy
12. pain continuation past 6 weeks of conservative care.

These symptoms listed above vary from patient to patient and may only be an indication at best that a herniation is present. Other pathological conditions may exist from these symptoms and should be treated by a medical doctor. The underlined symptoms are the most dangerous and should be treated by a Medical Doctor.

### **Treatments**

Treatments for a herniation depend upon the level of herniation, acuteness, length of time from injury, pain onset date, multi level herniations, bilateral or unilateral symptoms, severity and the overall symptoms reported by the patient. The symptoms that are underlined in the list above are known as red flag symptoms. These symptoms indicate the need for further diagnostic evaluation such as a MRI, CT scan or a Discogram by the physician. If the red flag symptoms persist this is a good indication that surgery is warranted. Physical therapy is an appropriate avenue for patients without red flag symptoms. Physical therapy offers a high success rate (80%-90%) to the patient with either a prolapsed or extruded herniation. Sequestration herniations can pose a challenge to physical therapist and often these patients return to the physician for either surgery or alternative treatments. Many surgical options exist. Choosing the correct surgery depends upon the experience of the Doctor and the needs of the patient.

Here is a short list of surgical options available; explanations are not given about these surgeries in detail because of the size of the information. However internet sites are posted as resources for further reading. Many new approaches and natural remedies are also not mentioned in this article.

### **Surgical Approaches**

1. IDET Therapy- is a invasive procedure where heat is placed into the disc with a electrothermal catheter under an X ray machine in order to stimulate collagen growth. This closes the cracks and seals the disc. Lifting restrictions are placed on the patient and the patient is required to wear a brace for 6-8 weeks. Physical therapy is then prescribed for strengthening.
2. Endoscopic Discectomy- a portion of the disc is removed or scraped off decreasing the inflammatory process around the space of compromise reducing pressure off the nerve.

3. Laminectomy or Laminotomy- a portion or a side of the lamina is removed with the ligamentum Flavum in order to remove th portion of the disc that is causing pressure on the nerve.
4. Open Lumbar Surgery- this is generally reserved for the most severe low back pain and or red flag symptomology. This involves opening of the spinal area to remove the disc or fuse an area that is causing the symptoms.
5. Foraminotomy- opening of the foramen to relieve pressure from the disc.

These are only a few options many of the sites listed below offer a large bank of information regarding these procedures and other procedures.

### **Non operative Treatments**

1. Injections- allow a patient to have generally immediate pain relief. Sometimes a Physician will give these injections and prescribe physical therapy while the patient's pain level is diminished in order to help the patient begin a stability program and other treatments. The amount of relief depends upon the patient's activity level and willingness to continue with exercises while at home.
2. Physical Therapy- has a high rate of success with semi acute herniations through the use of traction, manual therapy, exercise, education, lifting mechanics and modalities in order to combat herniations.
3. Medications- anti-inflammatory medications may help in conjunction with physical therapy relief the pain from herniated discs.
4. Bed rest – this continues to be an alternative form of treatment offered to the patient however research shows this to be very ineffective.
5. Acupuncture- this is from the Asian culture and is now being accepted by the western culture as a treatment for herniated discs.

### **Web Sites**

<http://www.spineuniverse.com>  
<http://www.spineonline.com/>  
<http://www.americanspine.com/web/ispec.html>  
<http://ga.herniateddiscs.net/>  
<http://www.espineinstitute.com/>  
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