

The Intervertebral Disc

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The intervertebral disc is the cushion that separates each of the vertebrae. It is composed of an outer container of tough, symmetrical, interlocking fibrous material, much like a radial tire, referred to as the annular fibrosis. Inside of this fibrous material is a gelatinous spongy material referred to as the nucleus pulposus. This material acts like a hydraulic shock absorber, taking up water when there is little pressure/compression on the discs, such as when you are lying down. When astronauts are in space, they usually obtain a temporary additional 2 inches in height because of the continual absorption of water and distraction of each of the intervertebral discs. The discs are very adherent to each of the vertebra, one above and one below each disc, providing stability of the spine. They are not plastic separate spacers than can “slip out of place”.

Herniated or Ruptured Disc

Confusion exists as to the terminology of a herniated or ruptured disc. Unfortunately, there is no standard medical nomenclature to describe this condition. Some use the word “slipped” disc, others use the word “herniated,” others “ruptured,” or “protruded.”

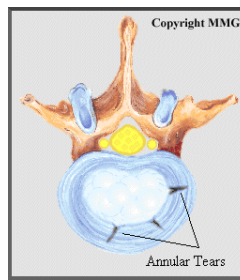
This condition occurs with chronic breakdown over time of the outer radial material, or annular fibrosis. The outer 1/3 of the disc has sensitive nerve structures, so most individuals with this condition will have a history of back pain, known as mechanical back pain. (See back

mechanical back pain pamphlet) When the axial hydrostatic pressure inside the disc exceeds the ability of the outer nuclear rings to contain it, the jelly material will protrude. This is analogous to stepping on a tube of toothpaste with the cap on. As the pressure increases, the paste eventually protrudes through the side of the tube. If the protruding disc material extends far enough and in the right direction, it can displace the major nerve roots that continue behind the disc to supply the muscles and skin of an extremity.

This condition can only be seen with a CT scan or MRI, which describes whether or not the extruded disc material displaces, compresses, or distracts a passing nerve root. It is important to note that this is part of the degenerative cascade, and that no healthy disc, in and of itself, ruptures. It is important to note that often an individual can experience a herniated disc without being able to isolate a given event that caused the injury. Studies have shown that herniated discs are fairly common in the population, and also that incidence increases, as one gets older.

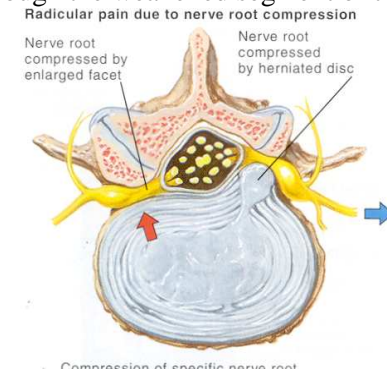
Sources of Pain

The lumbar disc is comprised of three major components: 1. The nucleus pulposus, 2. The annulus fibrosus, and 3. The vertebral end plate. The nucleus has a jelly like material that is contained within a very tough annular material that forms the outer layers of the disc. This annular material or annulus, much like a radial tire, encapsulates the nuclear jelly. Expected changes with aging are referred to as the degenerative



cascade, where over time this tough fibrous material will begin to develop tears or fissures within them.

These, in and of themselves, can give someone back pain, however not the leg pain that is associated with typical sciatica. As the degeneration continues, it reaches a point where an extraordinary amount of stress or load exceeds the annular materials ability to withstand the hydrostatic pressure created within the nuclear material, and the nuclear material protrudes through the weakened segment of the disc.



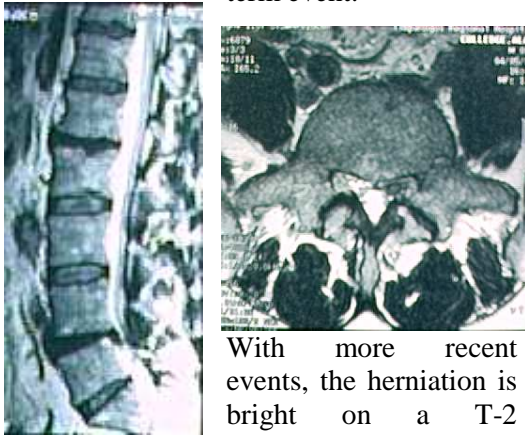
Most commonly, this is in the backwards direction off to the side compressing the nerve root as it exits off of the spinal cord to supply the leg or the extremity with motor or sensory functions. This is typically known as “sciatica”.

Imaging Studies:

X-Rays: Although X-rays can demonstrate bone, they are insufficient to see the disc material or the nerve root that it is compressing.

MRI: An MRI does show in extensive detail the disc space, degenerative changes, both along the spine and its joints, and disc material compressing a nerve root. The composition of a herniated disc on an MRI can be revealing as to the amount of time that has elapsed since the disc herniated,

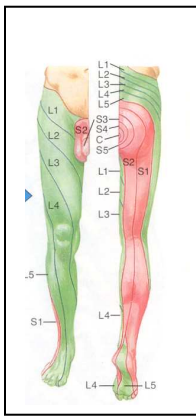
whether this is a fairly recent or a long term event.



With more recent events, the herniation is bright on a T-2 weighted signal with more chronic changes showing the herniation to be dark and fibrotic.

Symptoms associated with a Herniated Disc

It must be remembered that up to 50% individuals over the age of 50 have herniations on MRI findings without having any symptoms at all. This reveals to medical practitioners two important messages, **1.** That herniated discs are a common finding in asymptomatic people, and that MRI images in and of themselves will not explain the patient's pain. The MRI must be correlated with what it is that the patient is presenting with. **2.** The fact that many herniated discs are seen on MRI's of asymptomatic patients tells us that the natural history of herniated discs are that they tend to get better without surgery.



Physical Exam Findings

When a nerve root that supplies the muscles and the sensory component of an extremity is compressed, there are four signs that should be found.

1. Sensation would be changed in the area of the extremity of which the nerve supplies, **2.** Muscle weakness may be found in the muscles of which the nerve root supplies, **3.** Reflexes would be changed in the area consistent with the nerve compression, **4.** Tension or traction signs would be present.

All of these findings should be present to some degree or another before consideration that the MRI findings of a herniated disc are in fact the pain generator.

Treatment for Herniated Disc

There are basically two types of treatment for a herniated disc, conservative and surgical. Conservative treatment includes medication, activity modification, education, and exercise. Passive modalities include chiropractic manipulation, joint mobilization, hot packs, electrical stimulation, ultrasound, and massage. These treatments may be expensive, and although they may provide some short-term relief they have, unfortunately, never been shown to facilitate resolution of a herniated disc above the body's own natural healing processes. Exercise can be beneficial for acute but is critical for long term care. Studies have shown up to 90% of disc herniations will improve with time and most patients do very well.

Surgery is indicated if a patient continues with unmanageable pain or progressive neurologic loss. In comparing the effects of those who have had surgery for a herniated disc and those who have allowed the natural history to take its course, after two years, there does not seem to be much difference. Because a disc that is herniated has lost its integrity, it will undergo the degenerative cascade, leaving the patient, who may or may not have had surgery,

with some chronic mechanical back pain. (See mechanical back pain and degenerative disc disease pamphlet.)

Conclusion

With proper education, understanding, and work, a herniated disc can be managed properly. Surgery has only been performed since 1934, and for ages before, those herniations that were certain to have occurred, appear to have done well by simply allowing Mother Nature to take its course. Surgery appears to be a luxury for those who have intractable pain or progressive neurologic involvement.

