

The Role of Lumbar Intervertebral Disc Innervation in Chronic Pain: Studying the Link Between Spinal and Visceral Pain

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DESCRIPTION

The intervertebral discs in the lumbar spine are innervated by a complex network of nerves, which play an important role in the transmission of pain signals. This network has several interactions with the sympathetic nervous system, which is part of the autonomic nervous system that regulates involuntary bodily functions. One of the primary sources of pain in the lumbar spine comes from the sinuvertebral nerve, a branch of the ventral ramus of the lumbar spinal nerve. This nerve carries nociceptive (pain) signals from the posterior part of the intervertebral disc and its fibers also give rise to a secondary branch known as the grey ramus communicants. The grey ramus communicants connect to the sympathetic trunk, facilitating cross-communication between the sensory and autonomic systems.

The innervation of the lumbar intervertebral disc is not uniform. The posterior and posterolateral regions of the disc, where the annulus fibrosus (the outer layer of the disc) is thinner and weaker, are particularly sensitive to pain. These regions are more likely to experience disc lesions such as annular tears, disc herniation, or bulging. The posterior and posterolateral aspects of the disc are primarily innervated by the sinuvertebral nerve, making them the primary source of pain in conditions like disc herniation and lower back pain. The lateral regions of the disc receive innervation from the grey ramus communicants, while the anterior part of the disc is directly innervated by branches from the sympathetic trunk or its ganglia.

The high concentration of nociceptors in the posterior and posterolateral regions of the lumbar disc suggests that these areas are more susceptible to pain and possibly to the development of chronic back pain. Indeed, the majority of disc-related pathologies, including herniation and annular tears, occur in these areas due to the mechanical stresses placed on the spine and the relative weakness of the annulus fibrosus in these regions. In contrast, disc bulges or herniation in the anterior and anterolateral regions are far less common, although they do occur, typically to a lesser extent. When these parts of the disc

are affected, the nerve fibers involved in transmitting pain signals can also stimulate the sympathetic chain, where pain sensations related to the abdominal and pelvic viscera are processed.

Visceral pain arising from anterior and anterolateral disc herniation is a particularly underappreciated phenomenon. This type of pain can often mimic abdominal or pelvic pain, leading to a potential misdiagnosis. In some cases, patients who present with symptoms of chronic visceral pain, such as cramping or spasmodic discomfort, may undergo a battery of tests, including diagnostic laparoscopies or laparotomies, with no clear diagnosis. This is often because physicians are not fully aware of the possibility that lumbar intervertebral discs, particularly in the anterior and anterolateral regions, can be a source of such pain. These symptoms, which are often mistaken for abdominal or pelvic pathology, may not immediately suggest a spinal origin, especially when initial imaging of the abdomen and pelvis, such as ultrasound or Computed Tomography (CT) scans, show no abnormalities.

Given this, it is essential that the medical community be made more aware of the potential role that lumbar intervertebral discs can play in causing visceral-like pain. If initial abdominal or pelvic investigations fail to reveal a clear cause for the pain, it is important that healthcare providers consider the possibility of a disc-related pathology. The next logical step would be to perform spinal imaging, especially if the clinical presentation points to a spinal origin. Magnetic Resonance Imaging (MRI) of the lumbar spine, ideally without contrast, is the most effective imaging technique for identifying disc bulges, protrusions, or other structural abnormalities, particularly in the anterior or anterolateral aspects of the disc.

In cases where MRI reveals disc pathology, further diagnostic techniques such as discography or lumbar transformational epidural steroid injections can be used to confirm the lumbar disc as the source of the pain. Once a definitive diagnosis is made, treatment options can be considered based on the severity and duration of symptoms as well as the degree of disc degeneration. Conservative management is often the first

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approach, including physical therapy, medications for pain relief and possibly chiropractic interventions. In more persistent or severe cases, lumbar epidural steroid injections may offer relief. If these treatments do not provide adequate pain control, more invasive options, including minimally invasive surgery or open surgical decompression, may be necessary to address the underlying disc pathology.

CONCLUSION

In conclusion, understanding the complex innervation of the lumbar intervertebral discs and their connection to the sympathetic nervous system is essential for accurately diagnosing

and treating chronic low back and visceral pain. While the posterior and posterolateral regions of the disc are the most common sources of pain, it is important not to overlook the potential for anterior and anterolateral disc herniation to cause visceral-like symptoms. Improved awareness among healthcare providers can lead to more accurate diagnoses and more effective treatment strategies, ultimately improving patient outcomes and reducing the need for unnecessary invasive procedures. By considering lumbar disc pathology in the differential diagnosis of chronic abdominal or pelvic pain, physicians can better address the underlying cause and provide appropriate, targeted treatment.