



Scientific basis for nucleoplasty

Vijay Singh, MD

KEYWORDS:

Nucleoplasty;
 Coblation;
 Discectomy;
 Percutaneous disc
 decompression;
 Discitis;
 Discogenic pain

Effective treatment of low back pain has been a challenge for physicians and patients alike. After the description of herniations by Mixter and Barr, attempts were made to account for back pain in the absence of a frank herniation. Painful discs with a normal external morphology and not causing nerve root compression were first described by Dandy as a “concealed ruptured intervertebral disc.” Crock later introduced the term “internal disc disruption” for a damaged intervertebral disc which included annular tears, nuclear displacement and contained herniations. The inflammatory response to an internally disrupted intervertebral disc can be acute or progress to chronic inflammation with pain and permanent damage. Pain from activation of this inflammatory process may be severe enough for patients to consider surgical intervention. Open surgery, however, may not be applicable for pain from contained herniations nor does it always yield a successful result. Many patients are not good candidates for surgery or choose not to undergo spinal operations for pain. In the past, few options existed for these patients. Disc decompression by partial removal of the nucleus was shown to decrease pressure in the disc and relieve pain. Nucleoplasty is a newer minimally invasive procedure used to treat lumbar discogenic pain by percutaneous disc decompression. The scientific rationale, patient treatment evidence and indications for nucleoplasty are presented, along with a discussion of antibiotic prophylaxis in minimally invasive procedures.

© 2005 Elsevier Inc. All rights reserved.

Since the publication of the findings of Mixter and Barr, several treatments for patients with symptoms from disc herniations have been reported.¹ Surgery has usually been the only treatment option once conservative therapy failed. Surgery is not without risks and failure rates are not insignificant. Long-term medication use as an option carries its own risks and costs, and does not guarantee freedom from pain. With the introduction of chemonucleolysis in 1963, development of minimally invasive treatments offered another choice to patients. The treatment of discogenic pain has evolved considerably since that time. This report details the most recently developed minimally invasive treatment, nucleoplasty, and presents evidence for its efficacy and safety in treatment of discogenic low back pain from contained disc herniations.

Epidemiology of low back pain

Low back pain is a common problem with many etiologies. Its prevalence in the US ranges from 8% to 56%, and 28% of people are reported to experience disabling low back pain at some point in their lives. The lifetime

prevalence of low back pain is anywhere from 65% to 80%.² Ideas, belief systems and “common knowledge” have created many misconceptions about low back pain, in the perception of the lay public as well as in the medical community. While many believe that most episodes will resolve, studies in the last decade have revealed that complaints of chronic low back pain persisted in 35% to 79% of patients for up to a year.³

Risk factors for low back pain are numerous with varying degrees of pertinence and applicability for the individual. Age, gender, obesity, smoking history and occupational stresses are among the most frequently examined. This is an area of discussion and controversy and multiple combinations of several factors may be contributory in a complete description of the problem.

Age-related changes in the intervertebral disc contribute to most of the causes of impairment and pathology found in this structure. Bernick reported that age changes in the annulus first were observed in patients from 41 to 60 years old and that these became progressively more pronounced with advancing age from 60 to 83 years.⁴

Low back pain is reported to have the highest frequency between the ages of 35 and 55 years, and studies in this group have concentrated on occupational factors. A survey of US physician visits among those patients 75 and older found that low back pain was the third most commonly

Address reprint requests and correspondence: Dr. Vijay Singh,
 1601 Roosevelt Road, Niagara, WI 54151.
 E-mail address: vs@netnet.net.

reported symptom. In the older population, the fastest growing segment of the US and world population, Bressler noted that there was an under-representation of the elderly in the literature and the prevalence of low back pain was not reported with certainty. His work determined a range of low back pain for the elderly to be 13% to 49% in the general community and 24% to 51% in the medical practice setting. These wide ranges underscore his point.⁵

Gender accounts for a small degree of difference in the majority of epidemiological studies in the prevalence of low back pain. Some studies report men have the highest incidence of low back pain and others report that finding with women. Recent conclusions seem to validate the occurrence of low back pain is more related to occupational factors than to gender alone.

Obesity, being 30% or more above an ideal body weight, would seem a ready explanation for low back pain symptoms. A systematic review conducted by LeBoeuf-Yde was done to try to establish whether body weight is associated with low back pain and if the relationship was causal. She reviewed 56 research reports from 1965 to 1997, examining 654 studies for frequency of associations between body weight and low back pain and for the occurrence of positive correlations in relation to study characteristics. The results of this review were that 32% of all studies examined reported a statistically significant positive association between body weight and low back pain. Her conclusion was that body weight constituted a weak risk indicator, and that there were insufficient data to establish body weight as a causative factor.⁶

LeBoeuf-Yde subsequently studied only those studies with sample size of 3000 or more that showed the largest effect, and using only those studies from the general population to avoid bias from a "healthy worker" effect, to examine the existence of a causal relationship between body weight and low back pain. She again concluded from these population-based studies that the association was weak between body weight and low back pain.

In a systemic review of the epidemiological literature on smoking and low back pain, LeBoeuf-Yde reviewed 47 studies between 1974 and 1996. She found a weak association in larger study samples. In these larger study samples, 64% had at least one positive association compared with 47% of the smaller studies with fewer than 3000 participants. She concluded that this analysis showed consistent evidence in favor of a causal link between smoking and low back pain only in the largest samples and that smoking should be considered a weak risk indicator and not a cause of low back pain.

In another cross-sectional postal analysis of over 29,000 people, LeBoeuf-Yde did show a positive association between smoking and low back pain that increased with the duration of low back pain. This association was similarly determined not to be causal, but there was a definite link between smoking and low back pain showing an increase in the duration and frequency of pain.⁶

The effects of smoking have been studied for its possible role in low back pain.

Smoking has been shown by Holm and Nachemson to not only significantly affect the circulatory system at the periphery of the intervertebral disc, where solute exchange

capacity is reduced, but also deteriorates the cellular nutritional uptake rate and metabolic function intradiscally.⁷

Occupational factors are believed to be significant in the development of symptoms of low back pain. Persons experiencing whole-body vibrations such as truck drivers and bus drivers, heavy construction workers, manual workers, persons driving a car for extended periods of time and people engaged in heavy loading and unloading work are found to have the highest incidence of reported low back pain among occupations examined. Data from occupational risk may be hard to interpret because individual characteristics play a part and time spent in a higher-risk activity may vary. Many risk factors probably work in concert and must be considered even if their role in causality is not proven.⁸

The factors noted exemplify the scope of the problem. A great many people will experience low back pain at some point in their lives and many will seek treatment. Some patients will have resolution with medication, some will seek and benefit from physical or manipulative therapies, and some will have persistent pain not responsive to conventional therapies. For these patients, the questions posed are what is the source of pain and what can be done. Many diagnosed with discogenic pain can be identified as candidates for percutaneous disc decompression based on MRI and discographic examination.

Discogenic pain

The term discogenic low back pain is used to refer to pain from a damaged lumbar disc. The disc may be degenerative, internally deranged or have a small, contained herniation. Pain from such a disc is recognized as potentially having multiple causes from damage in the disc itself and not having a mechanical basis. In the nucleus pain can be caused by the actions of matrix metalloproteinases (MMPs), prostaglandin PGE₂, Interleukin-6 (IL-6), nitric oxide (NO) or other mediators of inflammation. In the annulus, pain may be from the actions of MMPs, annular tears or fissures, activation of branches of the sinuvertebral nerve or stimulation of nociceptors derived from the same nerve. Inflammatory chemicals from the response to a damaged disc may activate or injure the dorsal root ganglion. The nerve root may suffer the same effect. Infiltration of macrophages and other inflammatory cells may promote neovascularization in the outer regions of the annulus allowing infiltration by inflammatory cell populations bringing additional cellular inflammatory initiators. Excluded from this description is compression or mechanically caused pain from a large disc herniation.

In contrast, the term radicular pain refers to pain occurring in a specific pattern or myotomal and dermatomal distribution of a spinal nerve, whether caused by mechanical compression from a large disc herniation, or chemical irritation secondary to inflammation of a nerve root or multiple nerve roots. Sciatica is a term commonly used for radicular pain in a lower extremity from insult or injury to one or more roots L3-L4-L5-S1, radiating pain from hip to foot.

The concept of internal disc disruption or IDD as a primary cause of discogenic pain is one of the most important ideas advanced in the field of spinal pain. Crock introduced this terminology in 1970 and the concept of annular

Download English Version:

<https://daneshyari.com/en/article/9101908>

Download Persian Version:

<https://daneshyari.com/article/9101908>

[Daneshyari.com](https://daneshyari.com)