The Prevalence and Clinical Features of Internal Disc Disruption in Patients With Chronic Low Back Pain

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Study Design. This was a cross-sectional analytic study of patients with chronic low back pain.

Objective. To investigate whether the criteria for internal disc disruption, as adopted by the International Association for the Study of Pain, could be satisfied in patients with chronic low back pain and to test whether there were any conventional clinical features that could identify this condition.

Summary. Background Data. Internal disc disruption herniation has been postulated as an important cause of low back pain. To diagnose this condition, the International Association for the Study of Pain taxonomy requires that pain be reproduced on provocation discography and that computed tomography discography reveal internal disc disruption, provided that as a control, stimulation of at least one other disc fails to reproduce pain.

Methods. Ninety-two consecutive patients with chronic low back pain and no history of previous lumbar surgery were studied. Each patient underwent a standard physical examination. Computed tomography discography was performed at a minimum of two levels.

Results. The diagnostic criteria for internal disc disruption were fully satisfied in 35% of patients, most commonly at L5-S1 and L4-L5. None of the clinical tests used could differentiate between those patients with internal disc disruption and other patients.

Conclusions. A diagnosis of internal disc disruption can be made in a significant proportion of patients with chronic low back pain, but no conventional clinical test can discriminate patients with internal disc disruption from patients with other conditions. [Key words: clinical signs, disc, internal disc disruption, low back pain] Spine 1995;20:1876–1883

In principle, any structure in the lumbar spine that receives an innervation is a possible source of pain. The disc is such a structure. The outer third of the annulus fibrosus is richly innervated,6,19,32 and nerve fibers may extend as deeply as the middle third of the annulus.19 This innervation constitutes the anatomic substrate for discogenic pain.

In the present context, “discogenic pain” does not refer to nerve root pain caused by disc prolapse. It expressly refers to pain arising from the disc itself. Although controversial in some quarters, this notion is not new. It was espoused as early as 1947 by authorities as eminent as Inman and Saunders.16 Subsequently, Lindblom18 and later Hirsch13 and other investigators11,12 noted that discography could produce low back pain and somatic referred pain, even in patients with no evidence of disc prolapse or nerve root compression.7,11,12,17,22,23,30,31

Discography is a controversial issue, largely because its place has been misunderstood. In contemporary practice it is not used to demonstrate disc prolapse, and therefore it does not compete with computed tomography (CT) or magnetic resonance imaging (MRI) in the diagnosis of this condition. Discography also is not a test of so-called disc degeneration. Various patterns of disc degeneration may be evident on discography,1 but none can indicate a painful disc.

Discography is a physiologic test that explicitly determines whether a disc is painful. Its specificity in this regard has been clearly established by an elegant and scrupulous study.29 This study superseded the previous study by Holt,14 which purported to discredit lumbar discography but which itself has been resoundingly discredited on methodologic grounds.27

The key feature of discography is the patient’s response to disc stimulation, not the appearance of the disc. In this regard, discography is rarely,20 if at all,29 painful in asymptomatic individuals, even in those with degenerative discs, but it is frequently painful in patients with low back pain. Therefore, discography determines whether a degenerative disc has become symptomatic.

For discography to be positive, stimulation of the disc must reproduce the patient’s pain, irrespective of the morphology of the disc.

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Conspicuously, many lumbar discs that are painful upon disc stimulation are intact externally. They exhibit a normal or near normal contour and no evidence of herniation or prolapse. These features prompted Crock to define the pathologic entity of internal disc disruption (IDD). In this condition, the affected disc is rendered painful by changes in its internal structure, while its external appearance remains normal.

The characteristic pathologic features of IDD are radial fissures through the anulus fibrosus. These are not readily apparent on conventional discograms, but are rendered clearly evident by CT discography. The initial discogram scale recognizes three grades of fissure, and there are strong correlates between pain on discography and a fissure that reaches the outer (innervated) third of the anulus fibrosus.

These various features provide for a working definition of IDD—a painful condition in which the internal architecture of the disc is disrupted, even though its external appearance remains essentially normal. The clinical features of this condition are protean in nature. Pain and guarded movements are the cardinal features. Otherwise, the condition is characterized by essentially normal radiology and CT images. The definitive diagnosis relies on two tests: 1) provocation discography to reproduce the pain and 2) CT discography to reveal the internal disruption.

These criteria may be rejected by some, as a matter of principle, but they have been adopted by the International Society for the Study of Pain in its taxonomy.

More explicitly, the criteria require that disc stimulation reproduce the patient’s pain, provided that as a control, stimulation of at least one, and preferably two other discs fail to reproduce pain. This measure serves to eliminate false-positive responses to disc stimulation. In addition, the criteria for IDD require the demonstration of a grade 3 radial fissure.

The present study addressed two issues. The first was whether IDD could be identified in a sample of patients with chronic low back pain by satisfying the criteria specified. The second was whether there were any conventional clinical features that indicated, if not diagnosed, this condition. The two null hypotheses tested were that IDD is not seen in patients with chronic low back pain, and that no clinical features are diagnostic of IDD.

**Patients and Methods**

The study population consisted of 92 consecutive patients with low back pain referred for discography between April 1992 and October 1992. The study population was drawn from a series of 176 consecutive patients with chronic low back pain seen at one of two referral practices—a private radiology practice in New Orleans specializing in the diagnosis of spinal pain, and a specialty spine center in San Francisco. The patients were drawn from the metropolitan area of New Orleans or San Francisco, but also included several interurban and interstate referrals. All had been referred by neurosurgeons, orthopedic surgeons, or physiatrists because noninvasive investigations had not been diagnostic and, in the opinion of the referring physician, the patient’s pain was severe enough to warrant invasive investigations. Patients under 18 years old or over 80 years old and those who had previously undergone lumbar spinal surgery or who exhibited neurologic signs were excluded. Patients included in this study were restricted to categories 1, 2, or 3 in the classification used by the Quebec Task Force for activity-related spinal disorders.

There were 61 men and 31 women, with a median age of 36.7 years (interquartile range, 30.6–42.8 years). All had low back pain of 3 months duration or more, with a median duration of 18.5 months (interquartile range, 8.0–30.0 months). The cause of back pain was work-related in 56%, and had followed a motor vehicle accident in 21%. Pain of other causes accounted for the remaining 23% of patients. Worker’s compensation or third party insurance cover was present in 79%. Pain was unilateral in 54%, central in 11%, and bilateral in 35%. The denominator population has been described previously and was similar to the study population.

Patients were questioned regarding whether their pain was aggravated or improved by sitting, standing, or walking. They also were asked whether referred pain occurred in the groin, buttock, thigh, calf, or foot on each side. A physical examination also was performed. Patients performed movements and reported whether these aggravated their pain. The assessment included forward flexion, extension, rotation of the trunk to the right and left, rotation to the left with right extension, rotation to the right with left extension, and whether straight leg raising in the supine position aggravated their back pain or their leg pain.

 Patients were examined primarily by one examiner, but three others also performed examinations on some patients. To test interobserver reliability, 20 patients were randomly selected and examined by the principal investigator and one of four other examiners, so that a mean of five patients was examined by each second observer. The findings of each observer were recorded independently. None of them had knowledge of the findings of the principal investigator.

As part of the routine investigation, all patients had CT and MRI of the lumbar spine at L2–S1. Discogenic pain was investigated using provocation discography.

Provocation discography was adopted as the test for discogenic pain, according to the Position Statement on Discography of the Executive Committee of the North American Spine Society, on the grounds that there is no other way to establish whether a disc is painful. The diagnostic criteria adopted were those specified by the taxonomy of the International Association for the Study of Pain, namely that for a disc to be deemed the source of pain, provocation of that disc should reproduce the patient’s accustomed pain, provided that provocation of an adjacent disc did not reproduce their pain. Furthermore, to ensure that patients with discogenic pain had structurally abnormal discs, the criteria for IDD had to be satisfied—that is, discogenic pain coupled with morphologic abnormalities on CT discography.

Discography was performed using the technique described by April (Figures 1 and 2). Discography usually was initiated at the lower two lumbar levels or higher if the patient’s pain was centered above the lumbosacral junction. At least two
In two patients, the discographic studies were incomplete. In one patient, MRI demonstrated a disc protrusion and sequestered fragment at L4–L5, so discography was not performed at this level. Discograms were negative at two adjacent levels. In the other patient, discography was not considered technically feasible because she had a grade 3 spondylolisthesis in conjunction with a severely degenerated disc at L5–S1. Discograms at two cephalad levels were negative.

There was no statistically significant difference between the examination findings of the principal investigator and the other investigators. The Kappa scores for comparisons between observers ranged from 0.69 to 1.09. The P values for each of the Kappa scores was less than 0.01, making the observed agreement for all clinical tests significantly better than expected by chance alone.

There was no statistically significant association between historical or examination findings and whether patients had a positive discogram (Tables 1 and 2). Sitting, standing, and walking neither exacerbated nor relieved pain in patients whose pain was discogenic more than in patients whose pain was of some other origin. Based on the presenting pain patterns, 19 patients with bilateral pain (59%) and 22 patients with unilateral pain (44%) had IDD, whereas this diagnosis was made in only one patient with central pain (10%).

Based on pain referral patterns, patients with discogenic disease could not be differentiated from those without (Table 3).

Application of logistic regression did not result in a significant model. This was consistent with the lack of association between the clinical variables and the diagnosis of IDD.

**Discussion**

The present study shows that the criteria laid down for IDD can be followed and satisfied. Furthermore, it shows that in the type of patient studied, the prevalence of IDD is not negligible. The sample size studied allowed for a reasonable certainty of the prevalence estimate. Using 95% confidence limits, the prevalence of IDD lies between 30% and 50%.

One potential criticism of this study is that the majority of patients studied had sustained injuries related to work or to a motor vehicle accident. This could potentially introduce a selection bias, and the results could be seen as not reflecting patients in other categories. However, in demographic terms, the patients studied in the present study were typical of the patients with chronic low back pain who defy investigation by conventional, noninvasive means. Consequently, there are no grounds for suspecting that the present study and the results stemming from it are not representative of patients with chronic low back pain. With a prevalence of 40% ± 10%, the likely presence of IDD in these patients cannot be overlooked or denied.

To opponents of discography, the prevalence of IDD reported in this study may seem disappointingly low. If this is the case, the explanation lies in the application of stringent criteria. If lesser criteria were adopted, particularly if the need for a negative control disc were relaxed, the apparent prevalence would rise. But lesser criteria enable false-positive responses to amplify the prevalence.

Opponents of discography may simply dismiss or ignore the results of the present study because they confront preconceived objections, but denial does not constitute scientific refutation of the present data. There is no justification for denying, *ex cathedra*, the existence of IDD. The present study has taken the criteria for IDD and shown that they can be fulfilled. Moreover, it has shown that IDD is a common, but by no means universal entity in patients for whom no rubric is available other than “low back pain of unknown origin.”