In degenerative lumbar spine disease, recent studies have supported the clinical usefulness of discography, especially when used with computed tomography (CT) scanning. The role and capabilities of magnetic resonance imaging (MRI) are currently evolving and being defined. This study reviews a series of patients with prolonged disabling symptoms who had normal MRI scans and abnormal discography. Discograms and discographic-CT scans may at times allow detection of clinically correlated and significant pathology (usually annular disruptions) not suggested by MRI scanning. This fact should be considered in patients with normal MRI scanning and continuing unexplained symptomatology. [Key words: low-back pain, normal MRI, discography, annular disruptions]

The indications for and interpretation of magnetic resonance imaging (MRI) have developed greatly recently, and studies have shown that MRI reflects the hydration of intervertebral lumbar discs. Recent reports by McCutcheon and Thompson, Vanharanta et al, Sach et al, Grub et al, and Adams et al suggest the possible usefulness of discography in some clinical situations. The purpose of this article is to further elucidate the diagnostic indications for MRI scanning and discography at the present state of technology.

It is well known that pain on discography is not always related to degree of degeneration. A positive correlation exists, however, if one looks at the specific pattern of degeneration. This is possible with computed tomography (CT)-discography. As was shown in the study by Vanharanta et al, in 225 discograms, 77% of discs with exact pain reproduction had annular disruption. Only 37% of pain reproducing discs had severe degenerative changes. This implies that peripheral annular tears are a common cause of pain on discography. The young patients in the study represent people with low grade degeneration and high scores of annular disruption who would not show desiccation on MRI scanning. They conclude “... even small amounts of deterioration changes may be the cause of a disc being painful on discogram.”

Conversely, Schneiderman et al, in their study on 36 patients with low-back pain, concluded that MRI accurately reflected the presence or absence of degenerative changes seen on discography in low-back pain patients, and that discography is not indicated in patients who demonstrate normal MRI signal intensity.

Contrast tracking to the periphery of the disc through an annular tear is most frequently related to pain reproduction, in our experience. This also was reported by McCutcheon and Thompson at 87% frequency. They showed 14 of 16 patients with undiagnosed low-back pain and sciatica, who had symptoms reproduced by discography, had discographic-CT correlation with their symptoms.

This study demonstrates that some of these lesions may occur in the presence of minimal or no MRI-detectable abnormalities even when symptoms have been present for many months or years.

**CLINICAL SERIES**

This series includes 18 patients in which MRI scanning did not accurately reflect internal disc architecture, or predict response to disc injection. These patients were treated at a tertiary spine referral center between August 1987 and May 1988. All patients had three discs injected, with two of the three discs being absolutely or relatively pain-free. There were seven men and 11 women, with mean age of 33 years and a range of 24 to 52 years. Sixteen patients had no prior surgery, and two had had previous surgery at lower levels. The range of MRI scan to discogram lag time was 1 day to 10 months, with a mean of 2.5 months. Duration of symptoms prior to testing was 3 months to 5 years, with an average of 1.2 years. All patients had peripheral annular tears with or without small herniations and degenerative changes on discogram or discographic-CT scan, with MRI scans that were considered normal. All films were reviewed by a spine specialist radiologist (JK).

Case 1. A 30-year-old woman injured her back on August 30, 1983 while lifting a heavy object. Her symptoms persisted over 2 years and she had another lifting injury in 1985, with increased severity of low-back and bilateral lower extremity pain. Neurologic examination was normal. In February 1988, MRI was normal. Discography performed 3 weeks later evoked symptom reproduction and showed posterior extension of contrast greater than usual. Discographic-CT scan the same day showed a posterior fissure with leakage and a very attenuated annulus. Flexion-extension discograms show extension of the nuclear border posteriorly (Figure 1A-G).

Case 2. A 29-year-old woman developed severe low-back pain after falling on her buttocks in 1986. Conservative care over the next year failed. Magnetic resonance imaging scan was interpreted as normal in September of 1987, but there was a high signal intensity region posteriorly in the L5-S1 disc. Discograms 6 weeks later caused moderate concordant back pain at L5-S1, and a small fissure could be seen on the flexion-extension discogram. Posterior extension of contrast is evident on the discogram-CT scan (Figure 2A-D).

Case 3. A 29-year-old woman developed the insidious onset of low-back and right leg pain after a lifting episode in January of 1987. In September 1987, MRI scan was normal. The discogram done the same month showed posterior extension of the nucleus and concordant pain reproduction. The discogram-CT scan showed a right-sided peripheral annular tear and slight extension of intradiscal contrast into the spinal canal (Figure 3A-E).
Fig 1. Case 1: A, T1-weighted MRI scan is normal. B, T2-weighted MRI scan is normal. C, T2-weighted MRI scan is normal. D, T2-weighted MRI scan is normal.
DISCUSSION

Patients with pain reproduction on discography without abnor-
mal morphology (2-3% incidence per disc injected, in our experi-
ence) were not included in this study. This series demonstrates only
that some structural lesions may not be perceivable on MRI scan-
ing. Further study on the clinical relevance of these lesions will
be the subject of future papers. Presently, the relationship between
pain reproduction on discography, abnormal morphology, and their
clinical significance are not fully elucidated, but recent studies sug-
gest that clinically meaningful information can be gleaned from
discography in some patients.

Radiologic interpretation of MRI scanning is somewhat subject-
ive, especially in the interpretation of so-called “normal.” This
lack of uniform interpretation standards may have great signifi-
cance in the management of occasional patients. A T2-weighted
high signal intensity area that extends through the posterior an-
nulus to the posterior-most vertebral border may signify annular
disruption or attenuation. This pattern was noted in several pa-
tients.

If disc deterioration or annular disruption are considered as
criteria in the decision of what levels are to be incorporated in
fusions, MRI scanning is not infallible for this assessment.

Patients who present with low-back pain (LBP) that is suggestive
of a discogenic origin, who are refractory to conservative care,
and who have normal MRI scans should still be considered for
discography. This will shed light on the origin of the pain in some
of these patients despite the MRI findings. Discogram-CT scans
are the most sensitive indicator of internal disc architecture at this
time.

Fig 1. Continued. E, Discogram 3 weeks later shows L5-S1 in-
tradiscal dye extension into spinal canal most marked on extension
lateral view. F, Intradiscal contrast CT scan at L5-S1 reveals bilat-
eral annular peripheral tears posteriorly and leakage of dye centrally
through posterior tear. G, A right foraminal contained herniation and
central protrusion with leakage is identified.
Fig 2. Case 2: A, T1-weighted MRI images are normal. B, T2-weighted MRI images are normal. C, Note the high signal intensity region extending to the posterior-most disc boundary (arrow) at L5-S1. D, Discogram-CT scan 6 weeks later shows extension of intradiscal material into the spinal canal, filling a right slightly paracentral contained herniation. Marked posterior annular attenuation can also be seen.
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