

Guidelines for the performance of fusion procedures for degenerative disease of the lumbar spine.

Part 6: magnetic resonance imaging and discography for patient selection for lumbar fusion

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KEY WORDS • lumbar spine • fusion • magnetic resonance imaging • discography • practice guidelines

Recommendations

Standards. There is insufficient evidence to recommend a treatment standard.

Guidelines. 1) It is recommended that MR imaging be used as a diagnostic test instead of discography for the initial evaluation of patients with chronic low-back pain. 2) It is recommended that MR imaging–documented disc spaces that appear to be normal not be considered for treatment as a source of low-back pain. 3) It is recommended that lumbar discography not be used as a stand-alone test on which treatment decisions are based for patients with low-back pain. 4) If discography is performed as a diagnostic tool to identify the source of a patient's low-back pain, it is recommended that both a concordant pain response and morphological abnormalities be present at the pathological level prior to initiating any treatment directed at that level.

Options. 1) It is recommended that discography be reserved for use in patients with equivocal MR imaging findings, especially at levels adjacent to clearly pathological levels. 2) It is recommended that patients in whom

discography is positive but in whom MR imaging evidence of disc degeneration is absent not be considered candidates for operative intervention.

Rationale

The successful surgical treatment of patients with low-back pain depends on an accurate diagnosis of the source of pain. In the absence of gross deformity or neural compression, the diagnosis of “discogenic” low-back pain may be established using diagnostic imaging and functional studies. Discography has been used as a diagnostic tool for the evaluation of patients with low-back pain with normal spinal alignment and without evidence of neural compression. The purpose of this review is to examine the medical evidence in the literature regarding discography as a diagnostic test for the localization of the source of low-back pain in these patients.

Literature Search

The database of the National Library of Medicine was searched for articles published between 1966 and November 2003. Use of the search terms “discography or discogram” limited to “human” and “English language” resulted in 304 matches. The titles and abstracts of these 304 abstracts were reviewed and duplicates, technical notes, reviews, and other papers that did not describe the use of

Abbreviations used in this paper: CT = computerized tomography; HIZ = high-intensity zone; MR = magnetic resonance; NPV = negative predictive value; PLF = posterolateral fusion; PPV = positive PV.

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discography for the diagnosis and management of patients with low-back pain were discarded. The reference lists of the remaining articles were inspected and several more relevant papers were identified. References consisting of clinical series of patients managed with discography were identified and are briefly described in Table 1. A number of other references served as background information and are included in the bibliography.

Scientific Foundation

Discography has been used for decades for the diagnosis of lumbar intervertebral disc abnormalities in patients with low-back pain.^{17,32} Currently, discography is the only diagnostic test that has a physiological end point used in the assessment of such patients (that is, the reproduction of concordant low-back pain).^{46,60} Proponents of discography argue that the technique is more sensitive for the diagnosis of anatomical disc abnormalities and injuries than plain radiography, myelography, or MR imaging.^{5-7,8-10} Critics of discography claim that the test is not specific because morphological abnormalities do not always correlate with clinical complaints and because intradiscography pain provocation occurs in patients with lumbar pain caused by nonspinal entities.¹¹ Indeed, several studies have demonstrated that severe low-back pain may be elicited by discography in individuals with no prior complaints of low-back pain.^{11,13,24} Controversy also exists as to whether discography adds any diagnostic information to the data provided by MR imaging, a sensitive and specific noninvasive test for lumbar disease.^{3,6,9,16,20,21,25-27,33,34,36,41,43,45,47,49-51,57}

Several studies have examined the sensitivity, specificity, and predictive value of MR imaging compared with the morphological findings on discography. In a large series of patients Bernard² compared MR imaging and discography and reported that the PPV of an abnormal MR image for a morphologically abnormal discogram was 92%. The NPV of a normal MR image in the same series was 88%. Using T₂-weighted MR imaging and discography to treat 101 disc levels, Schneiderman and colleagues⁵¹ reported that MR imaging was 99% accurate in predicting abnormal morphological findings on discography. One group reported complete agreement between abnormal MR imaging findings and stage-two or stage-three disc disruption identified on CT discography (Dallas Pain Questionnaire).^{37,46} Separate small studies by Lonergan, et al.,³⁴ and Gibson, et al.,²⁰ noted an approximate 90% concordance rate between abnormalities identified on MR imaging and discography. Although discography may, on occasion, identify abnormalities in patients with normal MR imaging findings, the significance of these findings is unclear. Current evidence indicates that MR imaging is a very good imaging tool for the determination of abnormal disc morphology and that it avoids the expense and invasiveness of discography.^{19,29,52} For these reasons, lumbar MR imaging is recommended as the neuroimaging study of choice for the evaluation of patients with low-back pain.

The clinical significance of MR imaging- or discography-identified morphological abnormalities of an intervertebral disc has been questioned. Both modalities are sensitive to disc abnormalities. The frequency of disc abnormalities identified by discography is quite high in patients with low-back pain. Grubb, et al.,²² reported that

78% of patients undergoing discography assessment for low-back pain had morphologically abnormal discs at one or more levels despite normal plain spine radiography and myelography. Similarly, Schwarzer and colleagues⁵³ described abnormal discographic findings in 39% of 92 patients evaluated for low-back pain. Park, et al.,⁴² also noted abnormal discographic findings in patients whose radiological evaluation for low-back pain was otherwise unremarkable. Morphologically abnormal discograms, however, have also been observed in 17 to 37% of asymptomatic patients.^{13,24,60}

In an attempt to improve the diagnostic utility of discography, Walsh and associates⁶⁰ required that discography result in the production of pain identical or very similar to the patient's usual pain complaints to be considered "positive." The authors also required that this pain response occur in association with demonstrable morphological abnormalities of the disc space in question. The severity of the patient's pain, as determined using a visual analog scale as well as observation of patient behavior, must also be severe (three of five, or six of 10 on the visual analog scale).^{14,60} The authors' description of a "positive" discogram has been adopted by most investigators and authors as a "concordant" discogram.

Several comparisons between disc morphology and concordant pain provocation during discography have been performed. These studies have revealed a discrepancy between morphological disc abnormalities and pain perception during discography. Antti-Poika and colleagues¹ reported that 13% of patients they reviewed reported pain on injection of morphologically normal discs. Millette and Melanson³⁸ reported that only 37% of patients with abnormal disc morphology experienced concordant pain with injection. Five percent of patients reported pain despite the presence of normal morphology.⁴⁰ Sachs, et al.,⁴⁶ reported a 13% incidence of abnormal disc morphology identified by discography in which concordant pain provocation was absent in their large series. Saifudin, et al.,⁴⁸ found that only annular tears could be reliably associated with the provocation of pain during discography and that other degeneration patterns were not necessarily associated with a pain response during injection. These studies indicate that disc morphology, as assessed by discography, does not adequately predict the provocation of symptomatic low-back pain. Therefore, the presence of abnormal discography-documented morphology in the absence of a concordant pain response should not be used to justify intervention at that disc level.

Abnormal disc morphology identified on MR imaging, including loss of T₂ signal intensity, disc space collapse, modic changes, and HIZs, are commonly observed in patients evaluated for low-back pain.^{9,43} As with discography, these disc space abnormalities are also seen frequently on imaging studies obtained in asymptomatic patients.¹² The correlation of MR imaging abnormalities and pain provocation during discography has been examined in several series. Linson and Crowe³³ performed a prospective comparison of T₂-weighted MR imaging and discography findings. They found a likelihood ratio of 30 for an abnormal MR image and concordant pain provocation during discography. In another study, Braithwaite and colleagues⁶ reported that modic changes on MR images were a specific, but not necessarily sensitive, predictor of con-