Operative and Nonoperative Treatment Approaches for Lumbar Degenerative Disc Disease Have Similar Long-Term Clinical Outcomes Among Patients with Positive Discography

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Key words
- Degenerative disc disease
- Discogram
- Discography
- Fusion
- Lumbar
- Outcomes
- Spine
- Surgery

Abbreviations and Acronyms
BMI: Body mass index
DDD: Degenerative disc disease
HRQOL: Health-related quality of life
MCS: Mental component score
MRI: Magnetic resonance imaging
NRS: Numerical rating scale
ODI: Oswestry disability index
PCS: Physical component score
SF-12: Short form-12

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OBJECTIVE: **It remains unclear whether fusion for lumbar degenerative disc disease with positive discography produces better outcomes compared with nonoperative treatment. The aim of this study was to compare outcomes of patients with discography-concordant lumbar degenerative disc disease electing for fusion versus nonoperative treatment.**

METHODS: **We retrospectively reviewed consecutive patients with back pain and concordant lumbar discogram who were offered fusion. Follow-up questionnaires included pain score, Oswestry disability index, short form-12, and satisfaction scale. Patients were stratified based on whether they elected for fusion or nonoperative treatment.**

RESULTS: **Overall follow-up was 48% (96/200). Patients lacking follow-up were slightly older ($P = 0.021$) and less likely to be smokers ($P = 0.013$). Between patients with and without follow-up, there were no significant differences in pain score at initial visit, body mass index, or gender ($P \geq 0.40$). The 96 patients for whom follow-up was obtained included 53 in the operative and 43 in the nonoperative groups. At baseline, there were no significant differences between these groups based on age, pain score, body mass index, smoking, or gender ($P \geq 0.25$). Mean follow-up was 63 months for operative and 58 months for nonoperative patients ($P = 0.20$). The mean pain score at last follow-up improved significantly for operative and nonoperative patients ($P < 0.001$). At follow-up, operative and nonoperative groups did not differ significantly with regard to pain scores, Oswestry disability index, short form-12, or satisfaction scale.**

CONCLUSIONS: **Comparison of long-term outcomes for patients with back pain and concordant discography did not demonstrate a significant difference in outcome measures of pain, health status, satisfaction, or disability based on whether the patient elected for fusion or nonoperative treatment.**

INTRODUCTION

Chronic back pain, with an annual prevalence of 15%–45%, results in enormous health-related expenditure without a consistent improvement in physical, mental, and functional health-related outcomes (32). Chronic low back pain has been attributed to degenerative disc disease (DDD) in a subset of patients, and provocative discography has been proposed as a decision-making guide to better select patients who could potentially benefit from interventional/surgical procedures for relief of back pain thought to be secondary to DDD (31). Discography involves injection of a "contrast" material into the disc space to provide information on disk morphology and to assess whether the injection elicits a "provoked" pain response. Although morphologic alterations may be readily appreciated on discography, their presence alone does not necessarily implicate the disc as a pain generator (1, 31, 33). As a result, considerable importance is given to the provoked pain response, which, when reported by the patient to be similar to their symptomatic pain, is considered as evidence of a symptomatic disk. There is extensive debate in the spine literature with regard to discography, with one of the major concerns being a high false-positive rate of the provoked pain response in asymptomatic and symptomatic individuals (5, 7, 8, 24, 40, 52). However, a recent meta-analysis of false-positive studies using the International Spine Intervention Society standard suggested that discography has a specificity of 0.94, after setting certain patient selection criteria (52).

Multiple studies have tried to determine the correlation between discography results and treatment outcomes (9, 10, 20, 26, 30, 37, 46, 51). The results have been inconsistent, with variable outcomes regarding pain, functionality, and quality of life. The question whether surgery should be performed for back pain relief for those with a positive discogram still remains without a clear answer. Some investigators recommend surgical intervention after a positive discogram only for patients who also have associated abnormal magnetic resonance imaging (MRI) findings (37-39). The controversy is further compounded by recent translational and clinical evidence documenting damage and progression of disc degeneration as a result of dye injection as part of the discography procedure (6, 21, 22, 25). Interpretation of evidence regarding efficacy of presurgical discography becomes difficult with divergent views among various investigators.

Our objective in the present study was to assess the long-term clinical outcomes of patients with a positive, concordant lumbar discogram who were offered spinal fusion and either accepted or declined this surgical treatment. Our hypothesis was that, compared with the patients electing for nonoperative treatment, the patients treated with lumbar fusion would have better health-related quality of life (HRQOL) and satisfaction scores at long-term follow-up.

METHODS

This study was a retrospective review of consecutive patients who were referred for a diagnostic lumbar discography procedure between 2003 and 2009 at a single institution (Thomas Jefferson University, Philadelphia, Pennsylvania, USA). Inclusion criteria for the present study were symptoms of axial low back pain, attempted conservative therapy for a minimum of 6 weeks, and a one level or a two adjacent level positive discogram that was concordant with lumbar DDD based on MRI. All patients expressed interest in surgery and felt to be surgical candidates before obtaining discography. Patients presenting with discogenic back pain along with other surgical indications (e.g., spondylolisthesis, tumor, infection, and stenosis, and patients who had undergone previous lumbar decompression/discectomy or a previous lumbar fusion) were excluded. In general, a discogram was ordered after documentation of abnormal MRI findings, and surgery (instrumented lumbar fusion) was subsequently offered to those who had a one level or a two adjacent level positive discogram that was concordant with lumbar DDD based on MRI scans. Patients who declined surgical intervention were generally offered nonoperative treatment modalities, including physical therapy, epidural injections, and medications. Before study initiation, internal review board approval was obtained through Thomas Jefferson University Medical Center.

For patients meeting inclusion criteria, medical records from initial presentation were reviewed, and extracted information included patient age, gender, body mass index (BMI), smoking status, surgical dates if surgery was performed, and baseline back pain numerical rating scale (NRS) score. The NRS score ranged from 0 to 10, with 0 representing no pain and 10 representing the most unbearable pain. This information was collected as part of the standard medical record.

For the present study, patients were contacted by telephone and/or mail and asked to complete disability and functionality questionnaires including Oswestry disability index (ODI) (18), satisfaction scale (14, 29), and the short form-12 (SF-12) surveys (48). Patients who provided incomplete information, denied a telephone interview, or could not be contacted were not included in the present study. Baseline parameters were compared between patients for whom follow-up was achieved and those for whom follow-up could not be obtained to assess for potential confounding factors related to follow-up.

The satisfaction scale includes six questions regarding satisfaction with the overall result of the back operation, including pain relief, walking ability, ability to do housework or employment, and strength in the lower extremities and steadiness in an upright posture (14, 29). These questions are each scored on a 4-point scale: 1 (very satisfied), 2 (somewhat satisfied), 3 (somewhat dissatisfied), and 4 (very dissatisfied). The satisfaction scale score is obtained by summing the score for each answered question and dividing by the number of answered questions. Thus, the final score can range from one to four.

Baseline demographics and NRS pain scores, as well as outcomes scores at follow-up, were compared between the patients treated with lumbar fusion versus those who declined surgical treatment. Because patients who initially declined surgical treatment could subsequently elect for surgical treatment, we chose to analyze the data using two different approaches. For the first data analysis approach, patients were classified into the operative and nonoperative groups based on the initial management plan; specifically, patients were classified as operative only if they underwent lumbar fusion within 6 months of the initial evaluation and discography. All other patients were classified into the nonoperative group, including those who elected for lumbar fusion more than 6 months after initial evaluation. For the second data analysis approach, patients were classified into the operative group if they were treated with lumbar fusion at any point between the time of initial evaluation and the time of last follow-up. Only patients who had not undergone lumbar fusion as of the time of last follow-up were classified into the nonoperative group.

Statistical Analysis

Frequency distributions and summary statistics were calculated for all clinical, operative, and radiographic variables. For categorical variables, cross-tabulations were generated, and the Fisher's exact or Pearson χ^2 test were used to compare distributions. For continuous variables, *t*-tests were used to investigate differences between subsets of patients classified by categorical data. Multiple regression analyses were performed using each of the outcomes measures (NRS pain score, ODI, SF-12 mental component score [MCS], SF-12 physical component score [PCS], and satisfaction score) as a dependent variable and patient demographic and clinical parameters as independent variables. Statistical tests were two-sided, and $P < 0.05$ was considered statistically significant. All data recorded were analyzed by R version 2.15.2 software (R Foundation for Statistical Computing, Vienna, Austria; available at: http://www.r-project.org/).