The Functional Anaesthetic Discogram: Description of a Novel Diagnostic Technique and Report of 3 Cases

Todd Alamin, MD,[a] Farbod Malek, MD,[a] Eugene Carragee, MD,[a] and Mi-Jung Kim, MD, PhD [b]

ABSTRACT

Background
The diagnostic evaluation of patients with presumed discogenic low back pain is controversial; recent studies have brought the specificity of the traditional technique, provocative lumbar discography, into question. One of the explanations for the relative lack of predictability in treatment outcomes for patients with discogenic low back pain may be a corresponding lack of certainty in the diagnosis.

Purpose
A new diagnostic technique is described for the evaluation of patients with presumptive discogenic low back pain; the cases of 3 patients in whom the technique was used are presented.

Study Design/Setting
Case report; university practice.

Methods
A technique is described in which an anaesthetic catheter is placed into putative symptomatic lumbar discs, the patient elicits his or her typical pain via a position or activity, and anaesthetic or placebo is delivered to the disc. The effect of the injected substance on the patient's pain is then noted.

Results
In one patient, the new test was confirmatory of the results of the provocative discogram; in two patients, the test results were divergent.

Conclusions
These case studies and technical description are presented as a first step in examining this method of preoperative assessment. Further study of the technique will allow us to make more definitive recommendations with regards to its validity and utility.

Level of Evidence
Level 4 – Case Series

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[a]Orthopaedics Surgery, Stanford University, Stanford, California; [b]Physiatry Department, Hanyang University, Seoul, South Korea

Address correspondence to Todd Alamin, MD, Stanford University – Orthopaedic Surgery, 300 Pasteur Drive, Room R-171, Stanford, CA 92405

Todd Alamin, MD, is a consultant to Kyphon Inc.; Todd Alamin, MD, receives royalties from Kyphon in relation to the FAD catheter.

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INTRODUCTION

Recent US Food and Drug Administration approval of the first lumbar disc replacement has focused clinical and media attention on discogenic low back pain, the severity and import of the clinical syndrome, and the difficulties entailed in its surgical treatment. Much of this attention has been directed to the different but commonly applied treatment modalities (surgical versus physical therapy, fusion versus disc replacement), and their respective likelihood of achieving clinical success. Yet clearly this likelihood is significantly impacted by the certainty of the pretreatment clinical diagnosis. It is commonly accepted that there is, unfortunately, no "gold standard" test to confirm that a lumbar disc or discs is the primary cause of a given patient's low back pain. This fact complicates the ability to assess the effectiveness of any surgical strategy to treat the condition. Careful analysis of the results of fusion for discogenic low back pain suggests a bimodal distribution of outcomes, which can be interpreted as an outcome effect due to error in diagnosis.[1-3] The likely prevalence of errors

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in diagnosis limits the possible effectiveness of any specific treatment modality: any treatment method (even one that is 100% effective) will fail clinically at a rate that is at least the false-positive rate of the method of securing the diagnosis, minus the placebo and nonspecific response rates.

In considering surgical options, it is important to obtain a correct and specific diagnosis of disabling low back pain when only common degenerative changes are found on imaging studies. Currently available diagnostic techniques have a number of limitations. Provocative discography is a commonly used and controversial diagnostic technique that has been used since the 1940s.[4] Provocative discography involves the insertion of a needle into an intervertebral disc and the injection of contrast agent into the nucleus pulposus under pressure. The clinician then assesses the radiographic appearance of the disc, and more significantly, the patient's pain response to injection, which may be severe and similar to or exactly like their usual symptoms. Recent literature suggests that the onset of pain at a lower injection pressure is more suggestive of a "true positive" test result.[5,6]

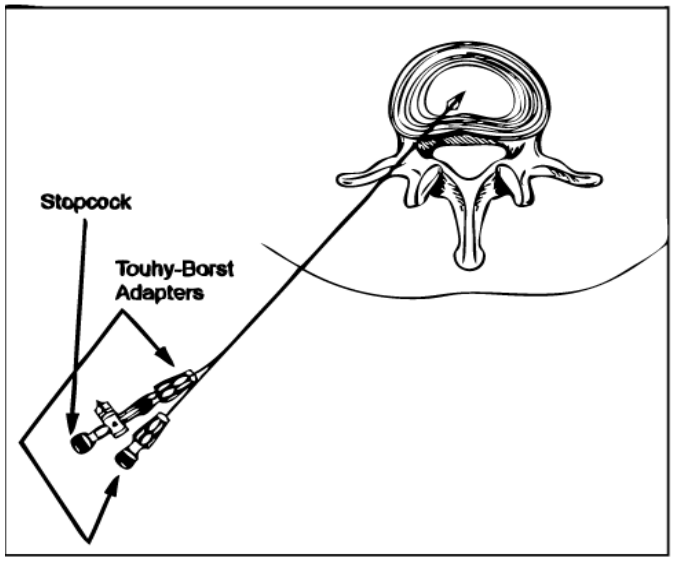
The standard interpretation of the test is that if a discogram is positive according to several commonly used criteria, then the tested disc is the primary source of the patient's pain.[7,8] However, there is no universally accepted definition of the criteria for a positive discogram, and no gold standard to compare competing diagnostic strategies. As a result, the interpretation of discography has been a longstanding controversy. Not only does the test rely on subjective feedback, but results themselves have been shown to have a high rate of false positives and false negatives, with up to 30–40% of patients with no back pain having positive findings on discography.[9,10] Similarly, some patients have reported feeling a replication of their usual pain during discography, even though it is later found that another, non-discogenic cause was the actual origin of the pain. These observations suggest that the test is not highly specific.[11]

The Functional Anaesthetic Discogram

To address this problem with the diagnosis of discogenic low back pain, the primary author (T.F.A.) have designed a new test, the Functional Anaesthetic Discogram (FAD). This test involves first a standard provocative discogram using a 2-needle technique (outer needle 18-gauge (18g), inner needle 22g or 25g). Once candidate painful discs are noted on provocative discography, the next step involves the placement of a catheter into the relevant lumbar discs that were either painful on injection or radiographically highly suggestive of being a possible pain generator.

In the early experience with the technique, the outer 18g needle was then inserted into the center of the involved disc, with care being taken to avoid irritation of the exiting nerve root at this level. An epidural catheter (20-gauge (20g)) was then modified via removal of the distal portion of the catheter including the side ports. The catheter was then carefully threaded into the involved disc, followed by removal of the outer 18g needle while attempting to maintain the catheter position inside the nucleus. A Tuohy-Borst adaptor was then attached to the proximal end of the catheter and contrast introduced to ensure that the tip of the catheter was still intradiscal. The contrast was then flushed out of the catheter with injectable normal saline. Next the catheter was attached to the patient's skin in a sterile fashion (Figure 1), and the patient was allowed to recover from the procedure in the post anaesthesia care unit. A dedicated FAD catheter (Kyphon Inc., Sunnyvale, California) was recently approved by the FDA and is commercially available; it is inserted over a guidewire and has a balloon anchor at its tip, which prevents migration of the catheter out of the disc during functional testing.

Figure 1.



FAD catheter with balloon anchor deployed.

The patient is then allowed to recover from sedation and assume a position or begin an activity that would ordinarily be painful for him or her. It is critical that the patient be able to reliably elicit his or her pain with a particular position or activity. If this is not the case, the findings of the procedure will be difficult to interpret. The seated position is the most common provocative position used for the procedure. An injection of a small volume (0.6 cc) of short-acting local anaesthetic (4% lidocaine) or placebo control (normal saline) is then delivered into the disc, and the response of the patient to the anaesthetic or placebo is recorded (Figure 2). The authors chose a volume of 0.6 cc for the injection as this volume is typically well below the volume of disc injection at which extravasation into the epidural space is noted on fluoroscopy during discography (1–1.5 cc in degenerated discs), and as such minimizes the likelihood of the anaesthetic effect being due to an epidural effect.