I believe that discogenic pain is a treatable disease and that discography is a useful test. Of course, in this era, when tests and treatments are presumed worthless unless there is compelling evidence to the contrary, belief is not enough. The best evidence for any diagnostic test is that it leads to better outcomes for patients. The effect of discography on outcomes could be determined by conducting what is known as a diagnostic randomized controlled trial (diagnostic RCT). The essence of a diagnostic RCT is that patients are randomized to a treatment independent of the results from a diagnostic test. In the case of discography, this means that patients would have to agree to undergo an invasive test that would not affect their treatment, while the surgeon would have to agree to operate regardless of the discography results. Given the inherent problems in conducting a diagnostic RCT of discography, it is not surprising that none exists (although I understand one is underway). With little evidence that discography improves outcomes, the next best thing would be evidence that it can correctly diagnose discogenic pain, from what is known as an accuracy study. The essence of an accuracy study is that an independent reference standard for the disease in question is applied to all patients who undergo the test, in turn allowing the familiar measures of accuracy (e.g., sensitivity, specificity, and likelihood ratio) to be calculated. Unfortunately, as Derby et al. point out, there is no reference standard for discogenic pain and therefore no way to determine accuracy.

While we need evidence from RCTs and accuracy studies, what we have instead are studies on asymptomatic subjects, such as the one by Derby et al. The only value of such studies is that they permit what in the field of diagnostic research is called a preliminary accuracy study [1]. In a preliminary accuracy study, the frequency of a positive test in subjects who definitely do not have a disease is compared with the frequency of a positive test in subjects who definitely do have it. If the rates of positive tests are similar in these two groups, then it is highly likely that the test is worthless and probably not worth studying further. Comparing the frequency of positive discography in subjects who do not have chronic low-back pain (CLBP), and therefore could not possibly have discogenic pain, with the rates of positive discography in people who have CLBP approximates a preliminary accuracy study (ideally, we would compare subjects who do not have CLBP with those who have discogenic pain, but that gets us back to the reference standard problem).

Walsh et al. conducted a landmark study of discography that constituted a preliminary accuracy study [2]. Walsh studied 10 asymptomatic subjects and seven patients with CLBP. By simply considering a painful disc as positive, the frequency of positive discs in the asymptomatic group was around 20% and in the CLBP group, around 60%. However, by making the criteria for a positive disc pain at an intensity of 3/5 and two abnormal pain behaviors, the frequencies changed to 0% and roughly 50%, respectively, which is quite encouraging. The problem with this is that the asymptomatic subjects studied by Walsh et al., healthy Iowans, bear little resemblance to CLBP patients. Carragee et al. corrected this deficiency by providing data on several groups of subjects who did not have CLBP but did have nonspinal chronic pain (NSCP) [3–6]. They found considerably higher rates of positive discography in these individuals, as high as 83% in those with somatization disorders. A preliminary accuracy study using data from the Walsh and Carragee studies, as well as from subjects with CLBP, was recently carried out [7]. Figure 1 illustrates the frequency of positive discography, with confidence intervals,
in three groups of subjects: those without chronic pain, those with NSCP, and those with CLBP. The definition of positive discography is the same as that used in all of the Carragee studies—a patient with one or more discs having pain of at least 6/10 and a “negative control,” designated as a disc with pain of less than 6/10. As illustrated by the overlapping confidence intervals, there is no significant difference between the frequency of positive discs in the CLBP subjects and the NSCP subjects. If that were true, it is very likely that discography would be worthless. However, the validity of the criteria used in the Carragee studies to define a positive discogram is suspect on several grounds. First, because we fuse discs, not patients, the unit of analysis should be discs, not patients. Second, to be reasonably confident that a patient does not have an elevated pain sensitivity, the control disc should be painless, not just 5/10 or less. Finally, there should be an upper limit for pressure, as even normal discs can hurt if enough pressure is applied. Recent evidence suggests that a disc that is painful at more than 50 psi distending pressure is false positive [8]. If the definition of a positive discogram is altered to a disc with pain of at least 6/10 at a distending pressure of less than 50 psi and a painless control disc, there is a significant difference between the frequency of positive discograms in the CLBP group and the other two groups, as shown in Figure 2. The conclusion that can be made from this preliminary accuracy study is that there is no evidence that discography is a worthless test, if one accepts the modification of Carragee’s criteria for a positive test.

Derby et al. state that the purpose of their study was to “resolve persisting controversy concerning lumbar discography.” Only a diagnostic RCT or accuracy study could do so. The data produced by Derby et al. on subjects without CLBP could potentially be useful if they were compared with the established data from NSBP and CLBP subjects. Unfortunately, because of the nature of the subjects they elected to study and flaws in their methods, valid comparisons with other studies are not possible. With respect to the study subjects, based on what the authors have presented at scientific meetings, the majority of them were not only physicians but also members of the International Spinal Injection Society and included several of the authors. In the best case, this introduces the possibility of considerable subject expectancy and, in the worst case, outright bias. There are a number of problems with the study methods including the failure to calculate confidence intervals, which is important, given the small number of subjects, and the misuse of receiver operating characteristic methodology. However, the most important problem related to the methods is that, contrary to previous studies, the authors used dynamic pressures for calculating intradiscal pressures. During pressure-controlled discography, contrast medium is injected from a syringe with an integrated pressure transducer into a needle that has been placed into the disc. The pressure measured in the syringe during contrast injection is the dynamic pressure, while the pressure measured after contrast is injected is termed the static pressure. The dynamic pressure is affected by factors such as the rate of flow and local resistance at the tip of the needle in the disc and is always higher than the static pressure. Previous studies on pressure-controlled discography in asymptomatic subjects have used static pressure, as this is more likely to reflect the distending pressure in the disc produced by the injection of contrast medium. If the authors had used a static pressure of 100 psi above opening as the end point to injection, their results may have been considerably different.

Almost 30 years after Massie and Stevens first reported the results from discography in asymptomatic subjects, we have learned as much as we can from such studies. Based on these studies, I am confident that there is no evidence that discography is worthless. What I and my fellow believers need now is evidence proving that at least some patients with CLBP are going to be better off having discography than not. Producing this evidence is going to be difficult, but it is the only option we have if we want to ensure our
ability to continue using this test on behalf of our patients.

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References