



Evaluation of lumbar discography as a modality to diagnose disc as a cause of low back pain

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ABSTRACT Purpose to study the role of provocative discography along with disc morphology as a diagnostic modality to diagnose disc as a cause of low back pain.

Methods : Prospective observational study was conducted involving 34 patients who underwent procedure of discography as a diagnostic modality for chronic low backache. Study was conducted between 2012 and 2014.

Results : In our study 25 patients had abnormal disc shape and 9 patients had normal shaped disc (p value < 0.0001). Of the 25 abnormal discs irregular shaped disc (38.23%), fissured disc (26.47%), and ruptured disc (8.82%). 25 patients showed positive provocative discography and 9 patients showed negative provocative discography (p value < 0.01). On an average 4ml dye was used.

Conclusions : Discography is still a viable option as a diagnostic modality to diagnose disc as a cause of low backache. When multiple level discs are involved, it helps to determine which level is the cause of pain.

KEYWORDS : Low back pain ; lumbar discography ; annular tear.

Introduction

Provocative discography is an imaging-guided procedure in which a contrast agent is injected into the nucleus pulposus of the intervertebral disc. It provides both anatomical and functional information about a disc suspected to be diseased. Following intradiscal contrast injection, disc morphology is usually assessed on radiographs or computed tomography (CT), or both. The functional evaluation consists of pain provocation and careful assessment of the patient's response to pain.

Low back pain is a very common clinical problem. Work has become less physical and sedentary due to technological advancement [1]. Sedentary lifestyle and lack of exercise are responsible to increase low back pain problem in the society. Low back pain can be caused by structure-specific etiologies including zygapophyseal joint abnormality, disc pathology, and sacroiliac joint arthropathy; and intervertebral disc disease. Currently, magnetic resonance (MR) imaging is widely regarded as the imaging modality of choice for investigating patients with suspected disc lesions. However, it is well known that many asymptomatic discs appear abnormal on MR imaging [2,3,4,5,6,7,8]. Discs that appear normal on MR imaging have also been shown to be abnormal on discography [9, 10].

In early days of discography, it was performed to demonstrate disc morphology and to diagnose disc herniation in low back pain. However, this technique is no longer used for diagnosing disc herniation and result do not correlate well with morphology of intradiscal degeneration. Instead, provocation discography often referred as "disc stimulation". It is currently used to stimulate individual "painful discs" to determine whether they are sources of patients' spinal pain. In modern provocation discography, slow increase of intradiscal pressure by injecting contrast media into the nucleus pulposus can produce patient's accustomed pain if the disc is painful, while stimulation of normal disc does not produce any pain. Provocation discography has been recognized to be a very specific diagnostic test for discogenic pain.

In this study we intend to study the role of provocative discography along with disc morphology as a diagnostic modality to diagnose disc as a cause of low back pain.

Materials and methods

1. Method

This is prospective observational study involving 34 patients who

underwent procedure of discography as a diagnostic modality for chronic low backache. Study was conducted between 2012 and 2014. Analysis of the data is done using p value and chi square test and the result will be expressed in terms of numbers and percentages.

2. Inclusion and exclusion criteria

An inclusion criterion was any patient between 20 years to 60 years age group, presenting with low backache with or without radiculopathy treated conservatively for 3 weeks and not relieved with the same. Exclusion criteria were 1) Patients with a known bleeding disorder and those on anticoagulation therapy 2) Pregnancy 3) Systemic infection or skin infection over the puncture site 4) allergy to the contrast agent 5) Previously operated disc 5) Solid bone fusion that does not allow access to the disc 6) Severe spinal cord compromise at disc level to be investigated.

All the patients with chronic low back pain were initially attended in OPD and given a trial of conservative treatment for 3 weeks or more. Patients who did not respond to conservative management were given option of discography and all those patients who met the inclusion criteria and were willing to get enrolled in the study were selected after taking a written and informed consent.

3. Surgical technique

All the procedures of discography were carried out as day care procedures. All the patients were evaluated for allergic reactions by injecting 0.1ml of Dye and 2% Lignocaine intradermally prior to the procedure. Patient is placed prone on regular table. On the basis of clinical examination the level to be injected is marked using metallic object under the image intensifier. Parts are scrubbed and painted. Local anesthesia is given using Lignocaine 2% at the desired level. Omnipaque dye is pre-filled in 10cc disposable syringe and diluted with distilled water. Depending on patient size either no. 20 or 21 spinal needle is selected. Using paraspinous approach needle is inserted through the anesthetized site. Under image intensifier the position of the needle is checked in both AP and Lateral views. After confirming the position of the needle slowly the dye is injected into the disc and pain response of the patient is recorded (concordant or discordant). After injecting the dye into the disc, it is visualized under the image intensifier in both AP and Lateral positions, and disc morphology is noted down. If another level is to be studied same procedure is repeated.

4. Discography interpretation

The amount of contrast agent injected into the nucleus pulposus and resistance encountered during injection should be carefully recorded. The normal lumbar disc usually takes up to 1.5 ml of contrast agent. A degenerated lumbar disc will typically have a volume of more than 2 ml. The two major aspects to consider in the interpretation of discography are disc morphology and pain provocation.

Disc morphology was determined by evaluating the anteroposterior (AP) and lateral radiographs obtained after intradiscal contrast injection. A normal disc maintained a normal height on both AP and lateral radiographs. Injected contrast agent remained in the nucleus pulposus, and may be unilocular (“cottonball” or rectangular) or bilocular (“hamburger bun”) in shape.

In degenerated discs, discography showed a reduced disc height, and complex or multiple irregular fissures in the annulus fibrosis, with or without contrast leakage through annular tears. On discography, a single annular fissure was often seen. The nuclear material may migrate superiorly or inferiorly (giving a “candle drip” appearance). (Figure 1) . A sequestered disc was seen when extruded disc material was separated from the parent disc, with the detached disc being located in the extradural space.

Pain provocation was the most useful and important aspect of discography. During injection, the location and character of the pain was noted and recorded. It was useful to observe the patient's facial expression or body movement for signs of pain response.

The pain response was classified into the following categories: 1.No or insignificant pain reproduction. 2. Pain different from the usual painful symptoms (discordant). 3. Pain similar to some of the usual painful symptoms (partially concordant). 4. Pain identical to the usual painful symptoms (concordant).

When taking the disc morphology and pain provocation aspects together, the categories of a discography study were: Normal study, Abnormal but asymptomatic disc(s), abnormal disc(s) with discordant symptoms and abnormal disc(s) with concordant (partially or fully) symptoms.

Walker J et al [11] described discographic contrast imaging findings & corresponding interpretations. (Table 1)

Results

All the patients were included as per the inclusion and exclusion criteria. In this study, out of 34 patients, an eighteen were females (52.94%) and sixteen were males (47.05%). The mean of the patient was 41.17 years (range 20-60 years).10 patients (29.41%) presented with low back pain only and 24 patients (70.58%) presented with low back pain associated with radiculopathy. Out of 34 patients, twenty five patients (73.52%) had positive provocative discography and nine patients (26.47%) had negative provocative discography (p value < 0.01).The average amount of dye used in our study was 4ml. A total of 43 discs were examined. The most common level injected in our series was L4-L5, followed by L5-S1. Nine patients (26.47%) had normal shaped disc and twenty five patients (73.52%) had abnormal shaped disc. The most common type of disc in our series was Irregular shaped 13 patients (38.23%), followed by 9 patients having Normal (26.47%) and Fissured (26.47%) discs, and 3 patients (8.82%) had Ruptured disc (p value < 0.01). (Figure 2) . In our study we did not encounter any complications.

Discussion

The diagnosis and treatment of chronic low back pain is a very difficult clinical problem. Intractable low back pain that has lasted for 6 months and unresponsive to non-operative interventions has a low probability of spontaneous resolution. The current study reported the clinical outcome in a group of patients with chronic discogenic low back pain proved by discography who showed no response to various non-operative treatments were treated with an intradiscal omniopaque injection. The preliminary results indicated that the result of intradiscal omniopaque injection for the diagnosis of discogenic low back pain was relatively encouraging.

1. Dye used comparison

The average amount of dye used in our study was 4ml. Derby et al [12] in their study of 86 patients used 3.5ml or less dye for discography. The

grade of annular disruption was rated using CT discography and fluoroscopic imaging as follows: 0 (no disruption); 1 (extension into the inner third of the annulus); 2 (extension into the middle third of the annulus); 3 (extension into the outer third of the annulus); 4 (circumferential extension with a >30 degrees arc at the disk center); and 5 (contrast media leakage into the outer space)

2. Disc shape comparison

Derby et al [12] in their series found the numbers of disks at each annular disruption grade were 19 (6.8%) at grade 0, 29 (10.4%) at grade 1, 35 (12.5%) at grade 2, 42 (15.1%) at grade 3, 69 (24.7%) at grade 4, and 85 (30.5%) at grade 5. A total of 93 disks met the criteria for a symptomatic disk. Of 93 symptomatic disks, 88 (94.6%) showed annular disruption of grade 3 or greater.

In our study we encountered 13 irregular discs (grade 3, 38.23%) (Figure 3), 9 patients had normal disc (grade 0, 26.47%), 9 patients had fissured discs (grade4, 26.47%), and 3 patients had ruptured disc (grade 5, 8.82%)

In our series of 43 discs evaluated 34 discs (79.06%) were symptomatic and grade 3 or above. 9 discs (20.93%) were grade 0. No grade1 or 2 discs were found in our study (p value < 0.01).

3. Provocative discography response comparison

Sheng et al [13] in their study evaluated 34 patients and thirty four patients with 38 discs who showed positive response to i.e. displayed pain reproduction on contrast injection during discography. They concluded that though MRI and electrophysiological studies play an important role in diagnosing annular tears, lumbar discography appears to be the decisive method for the diagnosis and potential interventions.

Chen et al [14] in 2011 concluded that Concordant pain significantly correlated with type IV-V discs on discography, Grade IV-V disc degeneration on MR image, the presence of HIZ, and endplate abnormalities. Disc degeneration grades on MRI showed an association with discogenic grades.

Shin et al [15] in 2006 studied 21 patients with clinically suspected discogenic low back pain who underwent pressure controlled discography. They concluded that pressure controlled discography was useful to diagnose discogenic pain and an excellent guide in decision making for spinal operations.

In our study we had 25 patients(73.52%) who showed positive response or concordant pain and 9 patients(26.47%) negative response or discordant pain i.e. 25 patients with 34 discs had positive response (p value < 0.01).

4. Complication comparison

Shreck et al [16] reports a nucleus pulposus pulmonary embolism in a single case study. Poynton et al [17] in a recent case series of five patients presented with acute lumbar herniation that occurred after provocative discography. No complications were encountered in our study.

There were several limitations in our study. This is observational study which has no control group. Study was conducted in single medical centre.

Conclusions

Discography is still a viable option as a diagnostic modality to diagnose disc as a cause of low backache. When performed by experienced surgeon it is a safe procedure with minimal complication rate. When multiple level discs are involved, it helps to determine which level is the cause of pain. No complications were encountered in our series.

Table 1- Discographic contrast imaging findings & corresponding interpretations.

Imaging Finding	Significance
Cotton ball	No degeneration, soft amorphous nucleus
Lobular	Mature disc with nucleus starting to coalesce into fibrous lumps
Irregular	Degenerated disc with fissures & rents in the nucleus & inner annulus

Fissured	Degenerated disc with radial fissures leading to the outer edge of the annulus
Ruptured	Disc has complete radial fissure that allows injected fluid to escape. This can be any stage of degeneration
End plate fracture	Disruption of end plate

Figures:



Figure 1- candle drip appearance- arrow showing some leakage of dye upwards suggestive of annular tear.

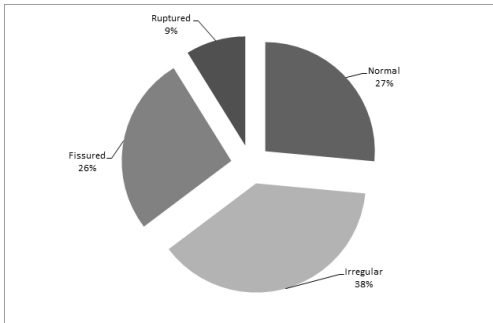


Figure 2- Pie chart of Disc shape percentages found in patients.

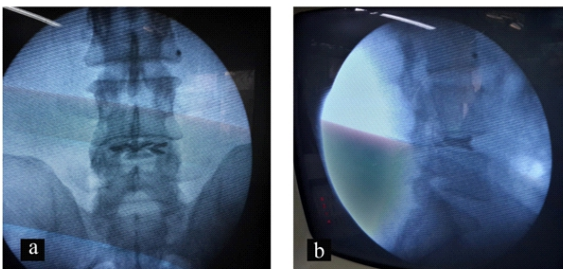


Figure 3 - Discogram showed irregular shaped disc. a) AP view b) lateral view

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