

Availability of Discographic Computed Tomography in Automated Percutaneous Lumbar Discectomy

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Automated percutaneous lumbar discectomy (APLD) has been developed since 1984 when Gary Onik first attempted it. This procedure has many advantages and has been used widely in the treatment of protruded disc diseases. The success rate of APLD by authors from March 1988 to February 1993 when the discographic computed tomography (CT) had not been performed was 74%. In evaluating lumbar disc diseases, we have used discographic CT. According to the patterns of dye distribution in the disc, two different types of protrusion can be distinguished: broad dye base protrusion and narrow dye base protrusion. From April 1993 to July 1994, 52 patients with protruded disc diseases were performed discographic CT. 23 Patients had narrow dye base protrusion and 29 patients had broad dye base protrusion. 29 patients with a broad dye base on discographic CT were treated with APLD and evaluated. The success rate in these patients was 93% by Macnab's criteria. Thus, we suggest that it is mandatory to apply discographic CT to increase the success rate of APLD in patients with protruded disc diseases.

Key Words: Hemiated lumbar disc, Automated percutaneous lumbar discectomy, Discographic computed tomography

INTRODUCTION

In the operative treatment of lumbar disc diseases, there has been much debate about success rates, recurrence rates and complications. Despite the many debates, microdiscectomy is regarded as the treatment of choice for extruded or sequestered disc diseases. But, in protruded disc diseases with sustained symptoms, there are three modes of treatment; conservative treatment, chemonucleolysis, and auto-

mated percutaneous lumbar discectomy (APLD).

Since the first attempt at chemonucleolysis by Dr. Smith in 1964, this procedure has been widely used (Smith, 1975). However, the frequency of use of chemonucleolysis has decreased due to some adverse effects, e.g., anaphylactic reaction to the drug, transverse myelitis and chemical discitis.

Since 1975 when Hijikata et al. first tried percutaneous nucleotomy, Kambin and Gellman(1983), Schreiber and Suezawa(1986), and Hoppenfelt (1989) have attempted similar procedures with various disc rongeurs or other instruments. APLD has also been used widely since Onik's first trial in 1984. The reported success rate is 70 to 85% (Goldstein et al., 1989; Maroon et al., 1989; Park and Cho, 1989; Suk et al., 1990; Lee et al., 1994).

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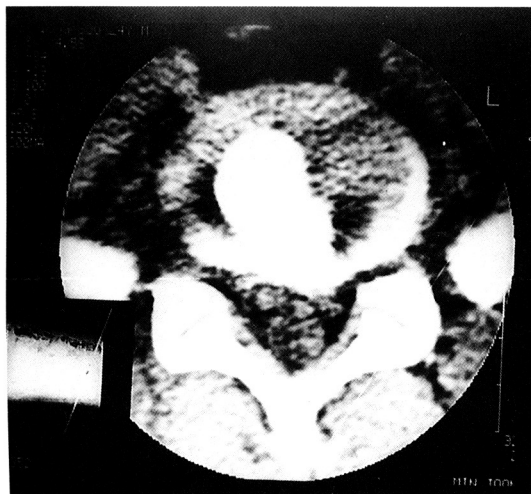


Fig. 1. Discographic CT finding of a broad dye base disc protrusion.

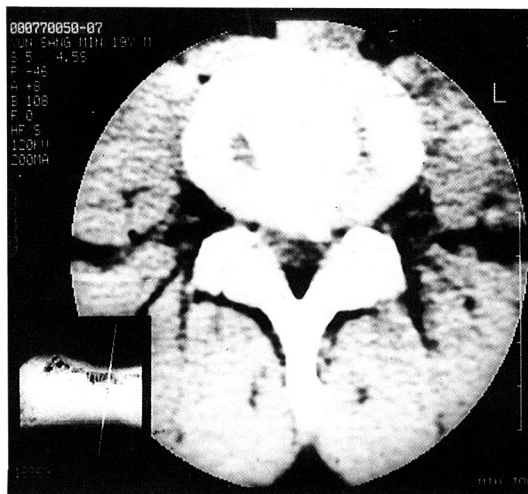


Fig. 2. Discographic finding of a narrow dye base disc protrusion.

Authors (1994) reported that the success rate was correlated with the age of patients, the level of disc protrusion and the amount of aspiration in this procedure.

Ninoyama and Muro (1992) reported that discographic CT was a very useful tool to identify the extent and the size of herniation. Maejawa and Muro (1992) reported that pain being induced by discographic CT was not correlated with degenerative changes of the spine but disc herniation. Castro et al.(1992) suggested two types of disc protrusion in discographic CT: broad dye base and narrow dye base (Fig.1, Fig. 2).

The authors performed this study to evaluate the usefulness of discographic CT by comparing the clinical results of APLD without discographic CT (Group I) to those with discographic CT (Group II).

MATERIALS AND METHODS

From March 1988 to February 1992, we treated 148 patients with protruded discs with APLD. One-hundred and eighteen patients among the 148 patients were followed up more than 6 months. The male to female ratio was 1.6 : 1 (Table 1). The majority of the patients were in their 3rd and 4th decades. All patients were examined by physical examination, myelogram (n=101), CT (n=108) and/or MRI

(n= 42).

The original selection criteria for APLD were ; 1) A typical radicular pain pattern, 2) Classical findings at physical examination, e.g. Lasegue's sign, 3) Classic protrusion findings by CT and/or MRI, in accordance with the radicular syndrome, 4) Failure of conservative treatment over a period of at least 4 weeks. Patients were excluded if ; 1) Their radiologic examination showed signs of spinal stenosis, 2) They had previously undergone surgery or chemonucleolysis.

However authors were disappointed somewhat in the success rate of APLD. According to Dallas Discogram Description (Sachs et al., 1987) and the proposal of Castro et al.(1992), new criteria was applied by adding the broad dye base protrusion in discographic CT.

Table 1. Age and sex distribution of Group I.

Age	Male	Female
10-19	5	3
20-29	28	15
30-39	25	13
40-49	10	6
50-59	3	6
60-69	1	2
70-	1	
Total	73	45

From April 1993 to July 1994, we performed discographic CT in 52 patients who fulfilled the original criteria. Among them, 29 patients fulfilled the new criteria i.e., broad dye base protrusion, as opposed to narrow dye base protrusion. We treated and evaluated these 29 patients. The male to female ratio was 1.6 : 1. The majority of patients were in their 3rd and 4th decades (Table 2).

Discographic CT procedure

The patient is placed in the lateral decubitus position. Using fluoroscopy, a lateral view of the patient's spine is obtained on the identified L4-L5 disc interspace. An entry point for the needle is selected on the skin about 7 to 10 cm from the midline as identified by the spinous process.

Under local anesthesia with 1% lidocaine, the usual double needle technique is performed by using fluoroscopic guidance to insert the needle into the center of the disc. Then, contrast material is injected. During the procedure, the physician verbally checks for the aggravation of the low back pain or sciatica.

One or two hours after discography, CT is performed at the affected level to detect the pattern of disc protrusion.

APLD procedure

The point of needle insertion is similar to the discographic CT procedure but different only in that the patient is placed with the painful side facing up. A straight cannula is used at L4-L5 or higher level and a curved cannula is used at L5-S1 disc lesion. This procedure is carried out in the same manner as described by Gary Onik (Maroon et al., 1989; Onik et al., 1989).

RESULTS

According to Macnab's criteria (1971), the clinical result is determined at 3 months after the operative procedure. By convention, if the result was excellent or good, the treatment was considered to be successful and if the result was fair or poor, the treatment was considered to be unsuccessful. Macnab's criteria are as follows:

Excellent: No pain, no restriction of activity

Good: Occasional back or leg pain of sufficient severity to interfere with the patient's ability to

do his normal work or his capacity to enjoy himself in his leisure hours

Fair: Improved functional capacity, but handicapped by intermittent pain of sufficient severity to curtail or modify work or leisure activities

Poor: No improvement or insufficient improvement to enable increase in activities, further operative intervention required

In the beginning of our study (i.e., the first 118 patients), the success rate was 74% (Table 4). The level of disc protrusion, the age of patient and the aspiration amount influenced the outcome of clinical result (Lee et al., 1994). The distribution of the affected segments is shown in Table 3. Of 52 patients who fulfilled the original criteria, 29 patients fulfilled the new criteria. The success rate was 93.1% (Table 4). Only two patients were unsuccessful but they did not want to undergo open discectomy. The distribution of the affected segment is shown in Table 3.

Table 2. Age and sex distribution of Group II.

Age	Male	Female
10-19	1	1
20-29	9	3
30-39	6	4
40-49	1	5
50-59	1	
Total	18	11

Table 3. Level of Treatment.

Site	Group I	Group II
L4-5	85	19
L5-S1	21	6
L3-4	4	
L3-4 & L4-5	2	1
L4-5 & L5-S1	6	3
Total	118	29

Table 4. Clinical results by Macnab's criteria.

Result	Group I(%)	Group II(%)
Excellent	19(16)	8(28)
Good	68(58)	19(65)
Fair	26(22)	2(7)
Poor	5(4)	
Total	118(100)	29(100)

DISCUSSION

In the treatment of patients with herniated lumbar disc, microdiscectomy has been regarded as the standard mode of treatment (Ejeskar et al., 1983). But in protruded disc diseases with sustained symptoms, the need for microdiscectomy is somewhat controversial.

In the place of microdiscectomy, chemonucleolysis or APLD have been performed widely. However, the success rate of chemonucleolysis and APLD is somewhat disappointing in spite of the careful selection of patients.

The potential advantages of APLD are very similar to those of chemonucleolysis. In both procedure postoperative wound pain is subtle because of no lumbar incision, muscle stripping and bone removal. (Friedman, 1983). But chemonucleolysis showed not only the anaphylactic reaction to chymopapain as a major complication (McCulloch, 1980) but also other common complications, such as postoperative back pain (50%) and paraspinal muscle spasm (25%) due to chemical discitis (Friedman, 1983).

The aim of percutaneous nucleotomy is to decompress the affected nerve root without damaging the surrounding structures thus decreasing postoperative complications. Since the mid-1970s, several authors have published methods directed toward obtaining this goal. The proposed several percutaneous nucleotomy methods have similar disadvantages. First, the large diameter of the instruments used in percutaneous approaches may endanger surrounding structures, e.g., the nerve root. Second, there is the possibility of damage to great vessels or viscera as a result of passing of the instruments through the annulus fibrosus. Third, there is difficulty in approaching to the L5-S1 level because of the firmness of the instruments.

APLD is designed to overcome these problems. The diameter of the nucleotome probe is only 2 to 3 mm and the tip of the probe is round to prevent perforation of the annulus fibrosus (Onik et al., 1985). In L5-S1 lesion, a curved cannula can be used to overcome the obstacle of iliac crest interference (Onik et al., 1989).

According to the Dallas Discogram Description edited by Sachs et al.(1987), discographic CT is considered as the procedure of choice when an equivocal or negative correlation exists between clinical information and imaging studies. Patrick (1973:

1975) and Angtuaco et al.(1984) reported that CT discography provided useful information in the clinical situation with an extreme lateral or posterolateral rupture of the lumbar disc which was not detected by myelography or by routine CT scanning. Castro et al.(1992) modified the Dallas Discogram Description and suggested that there are two types of disc protrusion: broad dye base and narrow dye base in discographic CT.

We have applied these strict new criteria by adding broad dye based disc protrusion in discographic CT since April, 1993. Among 52 patients who fit the original criteria, 29 patients fit the new criteria. With the patients, the success rate was 93%. We suggest that if the indication is more restricted based on the finding of broad dye base disc protrusion, the success rate will be much higher.

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