

Treatment of Far Lateral Lumbar disc Herniation Via a Minimally invasive Approach

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Abstract

Back Ground Data: Far lateral lumbar disc herniation is a unique entity. It needs special care in designing the best surgical approach. Many limited approached have been advocated. We report a case series treated by a minimally invasive approach.

Purpose: to evaluate the efficacy and safety of minimally invasive approach in treatment of far lateral lumbar disc herniation.

Study Design: Prospective analytic study.

Methods: 25 patients suffering from far lateral disc herniation (extra-foraminal) were operated according to this technique. Through a small skin incision (1.5 cm), the paraspinal muscles are spread by dilators, until a working channel of 11 mm inner diameter and 14 mm outer diameter can be placed. All further steps are performed through this channel under illumination and control of the operating microscope. The mean follow up period was one year, and patients were evaluated by using the Visual Analogue Scale (VAS) and the Oswestry Disability Index (ODI).

Results: The average surgical time was 49.2 minutes. The ODI improved from 29.96 (pre-operative) to 12.12 (post-operative). The VAS of back pain improved from 6.24 (pre-operative) to 3.4 (post-operative). The VAS of leg pain improved from 7.2 (pre-operative) to 2.6 (post-operative). No intra-operative or early postoperative complications occurred. However, only one recurrence happened and could be treated by the same technique.

Conclusion: The results from this small series seem to promise that this minimal invasive microscope assisted technique is a practical and valuable alternative to conventional techniques for the treatment of far lateral lumbar disc herniation. The main advantages include: minimal surgical trauma, no effect on the stability of the spine, rapid rehabilitation, short hospital stay and excellent cosmetic outcome. (2012ESJ018)

Key Words: Far lateral lumbar disc herniation, Extraforaminal lumbar disc herniation, Minimally invasive approach, Microscopic discectomy.

Introduction

In 1974, Abdullah et al¹ was the first to describe the clinical syndrome of extreme LLDH. Since then, several definitions have been used to describe the anatomic site of this pathology. Intraforaminal, extraforaminal, far-lateral, and extreme lateral are terms that have been used to describe the disc herniation as either into or lateral to the

limits of the intervertebral foramen or lateral interpeduncular compartment. This is the space bordered superiorly and inferiorly by the pedicles of the respective vertebrae, and ventrally by the posterolateral portion of the vertebral body and disc space. Both CT and MRI are fairly accurate in showing the pathology^{7,15,20,21}. Some investigators believe that MRI has not been as useful in identifying

these laterally herniated discs. Discography with or without CT has been helpful in equivocal cases^{16,17}.

The common approach used by most surgeons until the early 1980s to remove a LLDH was an upward and lateral enlargement of the interlaminar fenestration^{1,16,20}. In the process, the base of the inferior articular process was removed to reach the medial margin of the herniated disc and decompress the root. Such facetectomy in conjunction with discectomy can lead to persistent severe back pain, with some of these patients eventually requiring lumbar fusion. However, contrary to previous belief, the risk of spinal instability does not appear to be as high as estimated, with only up to 2% of patients requiring fusion according to some of the larger series^{7,9,14,17}.

When a minimally invasive variant of the paraspinal approach is used to introduce a working channel and by the help of the operating microscope, removal of the laterally herniated disc will be available. The aim of this approach is to minimize the surgical trauma and to maintain the stability of the spine as the paraspinal muscles, the bony structures, and the ligaments are left relatively undamaged.

Methods

The material of this study consisted of 25 patients with far lateral lumbar disc herniations (FLLDH). The mean age was 58.64 years. Fifty six of patients were males. Seventeen patients complained only of pain (mainly leg and to less extent back pain) and the other 8 patients suffered from neurological deficits in addition to pain. The neurological deficits were in the form of paraesthesia at the distribution of the compressed nerve root and weakness of its myotome. The diagnosis was made sure by lumbar MRI (Figure 1). The level mainly affected was L3/4 (12 patients) L4/5 (10 patients), L2/3 (2 patients), and L5/S1 (one patient). The indication for surgery was failure of conservative treatment of pain over a period of 6 weeks and/or neurological deficits. The patients were assessed pre-operatively and post-operatively using the Oswestry disability Index (ODI)⁸ and the Visual Analogue Scale (VAS) for back and leg pain². The follow up period ranged from 2-24 months with a mean of 10.92 months. The results of the scoring systems will be analyzed statistically using t-test.

Surgical technique:

The operation is done under general anesthesia and in prone position. After skin disinfection and draping, we determine the position of the upper transverse process at the level of the herniated disc by spinal needle and image intensifier (anteroposterior view) (Figure 2,a). Skin incision of 1.5 cm length and about 4-5 cm lateral to the midline is made then two soft tissue dilators are applied in sequence (Figure 2,b), in order to achieve gentle spreading of the soft tissues and the fibers of the paraspinal muscles. After this, the working channel is inserted (Figure 2,c). These working channels (Figure 2,d) are made of Titanium with 11 mm inner and 14 mm outer diameter. There are 3 different lengths (45, 55, 65 mm). The handle of the working channel allows us to move it in a suitable direction with good access. A smooth insertion and secure positioning of the working channel are achieved through the outer threads. An important anatomical landmark is the angle between the lower border of the transverse process and the lateral part of the isthmus region. The working channel should be inclined 10 degrees toward the midline. After correct positioning of the working channel, the next steps are done using illumination and vision of the operating microscope. By dissectors and probes, we search for the nerve root in the extraforaminal region (lateral to the pars interarticularis)²³. Usually the nerve root will be found under the lower border of the transverse process and sometimes, resection of a small part of the inter-transverse ligament may be necessary. The herniated disc can be found and removed after cranial mobilization of the nerve root and the accompanying branch of the segmental lumbar artery. In case of partial intraforaminal disc herniation, trimming of the ligamentum flavum will be necessary.

After removal of the herniated part of the disc, the nerve root is freed all around by using ball-pointed hooks of different lengths. In case there is neural foramen stenosis as a result of facet joint hypertrophy, careful undercutting can be done from this lateral position without damaging the facet joints. A difficulty may be met with this technique at the level of L5/S1 due to high iliac bone. However, in our single patient with L5/S1 level, we did not encounter any problems.

After making sure that the nerve root is free

all around, washing with saline and removal of the working channel is carried on. Closure of the fascia and the subcutaneous layer is done by one suture and the edges of the skin are approximated using steri strips and sterile dressing.

Post-operatively, there is no need for lumbar support and mobilization of the patient can be started after 4 hours. The post-operative hospital stay ranges from 1-4 days. There is no restriction of daily activity or duration of sitting.

Results

The average operation time was 49.2 minutes. The post-operative ODI and VAS for the patients are shown in (Table 1). The ODI improved from 29.96 (pre-operative) to 12.12 (post-operative) and this was statistically significant ($P < 0.01$). Also, the VAS showed post-operative improvement of both back and leg pain when compared with the pre-operative findings. The VAS of back pain improved from

6.24 (pre-operative) to 3.4 (post-operative). The VAS of leg pain improved from 7.2 (pre-operative) to 2.6 (post-operative). Both were statistically significant ($P < 0.01$). In general, both back and leg pain improved immediately post-operative. The neurological deficits (8 patients) had also been improved with disappearance of paraesthesia and return of muscle power back to normal. The patients who had been employed before the operation (12 from 25) returned back to work within 4 to 8 weeks post-operatively.

There were no reported intra-operative or post-operative complications. One patient (No. 14) remained symptom free for 2 months after the operation, and then he started to complain once again. MRI proved recurrence of the disc herniation which was treated by the same technique. Intra-operatively, there was minimal scar tissue around the nerve root. The calculated rate of re-operation would be 4% (one patient out of 25).

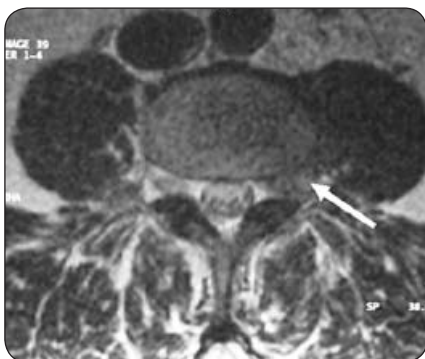


Figure 1: MRI axial cut at the level of L4/L5 showing left lateral disc herniation.



Figure 2,a. Intraoperative antero-posterior view (by C-arm) showing the position of the spinal needle in relation to left L4 transverse process.



Figure 2,b. The position of the second dilator at L4/L5 level (left side) in relation to the midline and the iliac bone.

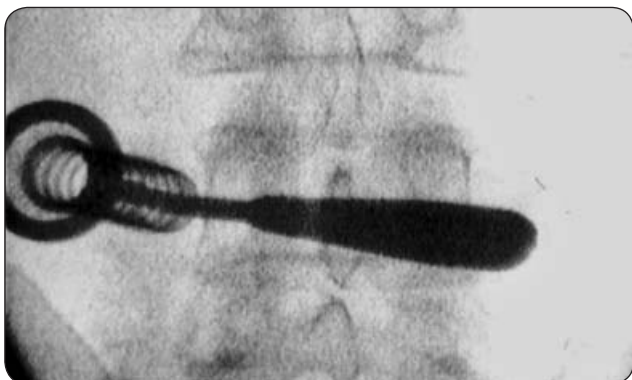


Figure 2,c. Intra-operative X-ray (by C-arm) showing the inserted working channel at L4/L5 level (left side).



Figure 2,d. Working channels in different lengths.

Table 1: The clinical data of the patients.

Number	Sex	Age	Level	Operation time (Minutes)	ODI preoperative	ODI postoperative	VAS back preoperative	VAS leg preoperative	VAS back postoperative	VAS leg postoperative	Follow up (Months)
1	f	76	L4/5	45	42	27	8	9	5	6	24
2	m	46	L3/4	65	20	10	6	8	2	6	19
3	m	37	L3/4	60	29	20	8	7	8	2	18
4	f	60	L4/5	40	34	19	6	5	3	2	15
5	m	72	L3/4	40	31	3	6	6	2	2	15
6	f	54	L4/5	50	36	20	8	6	8	1	12
7	f	74	L4/5	50	32	25	7	7	7	4	12
8	m	71	L2/3	20	25	0	5	8	1	1	10
9	f	69	L3/4	25	29	20	9	8	8	6	10
10	m	70	L4/5	60	33	16	6	6	2	3	10
11	f	65	L4/5	30	24	13	7	7	4	3	9
12	f	57	L2/3	60	31	27	7	8	5	4	7
13	m	26	L5/S1	20	27	7	5	8	2	3	5
14	m	75	L3/4	40	36	1	7	7	1	1	2
15	f	52	L3/4	40	30	7	6	6	5	2	3
16	m	53	L3/4	65	25	8	5	6	2	2	12
17	m	49	L4/5	70	30	13	6	7	2	3	12
18	m	55	L3/4	50	32	11	5	8	2	1	12
19	f	48	L4/5	45	28	4	6	8	3	2	11
20	m	62	L3/4	60	27	9	6	7	2	2	10
21	m	70	L3/4	45	34	6	5	8	2	1	10
22	f	65	L4/5	50	24	8	6	7	3	4	10
23	f	56	L3/4	55	31	12	6	6	1	1	9
24	m	49	L4/5	70	27	7	5	9	3	2	8
25	m	55	L3/4	75	32	10	5	8	2	1	8

Discussion

Although lateral disc herniation constitute only 2.6 to 11.7% of all lumbar disc herniation^{3,17}, but they (through compression of the nerve root) can be a source of back pain, leg pain and neurological deficits as well. While central (intraspinal) disc herniation are common at the age of 30-50 years²², we found that far lateral (extraforaminal) disc herniation predominated older age groups (60 years)^{6,13}. This coincides with our findings as the

mean age in our group is 58.64 years. A possible explanation for this is the disc degeneration which occurs in elderly patients results in loss of disc height and narrowing of the intervertebral foramen. Under these circumstances, minimal extraforaminal disc herniation can produce symptoms. On the other hand, normal disc height found in young patients will maintain the height of the intervertebral foramen and hence, considerable disc herniation must take place to be symptomatic.

This minimally invasive technique via the paraspinal approach is designed to avoid the hazards of open surgery, specially the post-operative instability. According to Panjabi¹⁹, the posterior elements are mainly responsible for the stability of the spine. So, operative techniques damaging the paraspinal muscles, facet joints, and the ligaments, have a potential to destabilize the spine.

Casper⁴ was the first to introduce the microscopic surgery in the treatment of lumbar disc herniation through midline posterior approach. On the other hand, the advent of endoscopic techniques was by Foley¹⁰ and Destandeu⁵, and they both helped in minimizing the surgical trauma when treating disc herniation. However, a very important disadvantage of the endoscopic technique is that it only allows 2 dimension visualization and vision is often blurred by bleeding. In comparison, this new minimally invasive technique has the advantage of the 3 dimension vision of the operating microscope. This technique is also simple and minimizes the surgical trauma without restricting the indications of lateral disc herniation surgery.

The average operative time is 49 minutes. However, we could not find similar reports in the literature to compare with. Goffin¹² reported that the operative time of microscopic nucleotomy by midline posterior approach ranges from 40-60 minutes. When comparing the pre-operative and post-operative clinical results, we found that patients improved significantly as regards pain and the quality of life and these findings are similar to those of other authors^{11,18}. The effect of this minimally invasive technique on the late follow up results needs further examination and assessment.

An important advantage of this technique is rapid mobilization of the patients (after 4 hours post-operatively) which is important in this old age and in this way we can avoid a lot of complications resulting from delayed mobilization of the patients.

Conclusion

The results from this small series seem to promise that this minimal invasive microscope assisted technique is a practical and valuable alternative to conventional techniques for the treatment of far lateral lumbar disc herniation. The main advantages include: minimal surgical trauma, no effect on the stability of the spine, rapid rehabilitation, short

hospital stay and excellent cosmetic outcome.

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الملخص العربي

طريقة جديدة قليلة الإختراق لمعالجة الإنزلاق الغضروفي خارج الفتحة العصبية بالفقرات القطنية. المادة العلمية: ٢٥ مريض يعانون من اعراض الإنزلاق الغضروفي خارج الفتحة العصبية قد تم معالجتهم جراحيا بواسطة هذه الطريقة .
الطريقة: من خلال فتحة صغيرة بالجلد (١.٥ سم) يتم توسيع العضلات جانب العمود الفقري ثم يتم تركيب القناة العمل التي لها قطر خارجي (١٤ مم) . يتم اجراء العملية بمساعدة الميكروسكوب الجراحي ومن خلال قناة العمل .
النتائج: وقت العملية كان حوالي ٤٩.٢ دقيقة اظهر المريض تحسن في الم الظهر وكذلك الم الساق عند المقارنة بقبل العملية. لم يتم رصد اي مضاعفات اثناء العملية .
الإستنتاج: هذه الطريقة تجمع مزايا الرؤيا ثلاثية الابعاد للميكروسكوب الجراحي مع قلة اختراق الانسجة.