

The Extraforaminal Approach for the Management of Far Lateral Lumbar Disc Herniation

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Abstract

Background Data: Far lateral lumbar disc herniation accounts for 1-12% of all lumbar disc herniations. Every aspect of management of this unique type of lumbar disc herniation is challenging for spine surgeons, and no consensus has been reached for the best surgical approach and technique to use.

Purpose: The purpose of this study is to evaluate the extraforaminal approach, which is a less invasive approach, for the treatment of far lateral lumbar disc herniation.

Study Design: A prospective case series.

Patients and Methods: Of 501 lumbar disc prolapse patients treated surgically in our department between September 2013 and August 2015, 15 patients presented with far lateral lumbar disc herniation. These 15 patients (11 males and 4 females, mean age 46.80 ± 8.08 years) were treated surgically using the extraforaminal approach and were prospectively followed for 1 year. The study was approved by the Institution Ethical Committee, and all patients signed an informed consent form. Clinical and functional outcomes were assessed using VAS and ODI scores and MacNab's criteria. Follow-up MRI was performed at 1 year.

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Results: Far lateral lumbar disc herniation accounted for 3% of all lumbar disc herniation patients treated surgically in our department. The mean back pain VAS score improved from 6.46 preoperatively to 1.06 at the 1-year follow-up evaluation (P=0.001). The mean leg pain VAS score improved from 7.40 preoperatively to 1.06 at the 1-year follow-up evaluation (P=0.001). The mean ODI score improved from 30.20 preoperatively to 2.80 at the 1-year follow-up evaluation (P=0.001). According to MacNab's criteria, 12 patients (80%) had excellent outcomes, 3 (20%) had good outcomes, and no patients showed fair or poor outcomes at the final follow-up evaluation at 1 year.

Conclusion: The extraforaminal approach seems to be a safe, less traumatic and less destabilizing approach for managing far lateral lumbar disc herniation and can lead to a better outcome than traditional approaches. (2017ESJ129)

Keywords: far lateral lumbar disc, extraforaminal approach, paramedian approach

Introduction

Lumbar disc herniation is considered one of the most common medical and surgical problems worldwide. Most lumbosacral radiculopathies are caused by para-central herniations.² Prior to the 1970s, however, it was known that a lumbar intervertebral disc may protrude outside the anatomical boundaries of the vertebral canal.⁸ Abdullah et al,¹ was the first to realize the clinical importance of these herniations situated far laterally beyond the foramen and introduced the term "extreme lateral" for these protrusions outside the vertebral canal.

With the advent of improved imaging techniques such as high-resolution CT scans and MRI, this type of disc herniation, which was previously considered very rare, became increasingly identified.⁷ Despite increased awareness about its existence, the optimal treatment for this disease remains controversial. Many surgical techniques have been developed over the past several years to allow safe and easy access to these disc herniations, from maximally invasive full facetectomy through a midline approach to endoscopic discectomy via paramedian approaches.^{5,15}

Wiltse et al,¹⁸ popularized the paraspinous sacrospinalis-splitting approach to the lumbar spine. Since then, many refinements have

been applied to the Wiltse approach, including sacrospinalis muscle splitting along the natural cleavage plane between the multifidus and the longissimus parts of the sacrospinalis muscle.^{3,16,19}

The aim of this study was to evaluate the usefulness and safety of using the extraforaminal approach for the treatment of far lateral lumbar disc herniation.

Patients and Methods

This is a single-centre, prospective, case series study of all patients with confirmed far lateral lumbar disc herniation treated from September 2013 to August 2015 at the Orthopaedic and Trauma Surgery Department – Faculty of Medicine – Assiut University. The study was approved by the Institution Ethical Committee, and all patients signed an informed consent form.

All patients presenting with extraforaminal lumbar disc herniation were enrolled in this study if they fulfilled the following inclusion criteria: (i) pure extraforaminal disc herniation, (ii) single-level disc herniation, (iii) failed conservative treatment or a neurological deficit, (iv) unilateral radicular symptoms, and (v) no previous disc surgery at the same level. The exclusion criteria were (i) recurrent disc herniation at the same level, (ii) multilevel disc

herniation, (iii) associated vertebral instability, (iv) the presence of a severe medical disease, and (v) biradicular symptoms.

All patients in this study were clinically assessed preoperatively through a comprehensive examination using the visual analogue scale (VAS) for their back and leg pain and the Oswestry disability index (ODI) and underwent surgical intervention using the extraforaminal approach. Table 1 summarizes the demographic data of the patients.

Surgery was conducted under general anaesthesia following the technique described by several authors,^{13,18} with special emphasis on the longitudinal incision of the erector spinae aponeurosis and blunt dissection along the cleavage plane between the multifidus and the longissimus muscle. The medial third of the transverse processes, the lower half of the upper transverse process and the upper half of the lower transverse process were exposed with the intervening membrane and cleared of all soft tissues. Intraoperative lateral radiographic verification is essential to confirm the operative level. Elevation of the intertransverse membrane was then initiated at the point at which it inserts into the inferior margin of the cephalad transverse process, proceeding medially and distally along the pars to safely expose the nerve root, which was gently mobilized, usually in the superior direction, to reveal the lateral portion of the intervertebral disc and the herniation, which was excised.

All patients were discharged 24-48 hours postoperatively and were followed clinically at 2, 6, 12, and 24 weeks and finally at 1 year postoperatively. The final results are expressed according to MacNab's criteria.⁹ In addition; follow-up MRI images were obtained at 1 year (Figure 1).

Results

Of the 501 patients who were surgically treated for lumbar disc herniation in our department from September 2013 to August 2015, 15 (3%) patients (11 males and 4 females) had far lateral lumbar disc herniation. The mean age was 46.80 ± 8.08 years. The most frequently affected site was the L4-5 level (46.7%), followed by the L3-4 level (33.3%), the L2-3 (13.3%) level, and the L5-S1 (6.7%) level.

All patients showed significant improvement of their back and leg pain as reflected by their VAS scores. The mean back pain VAS score improved from 6.46 preoperatively to 2.46 at the 6-week follow-up evaluation (Table 2) and was 1.06 at the 1-year follow-up evaluation ($P = 0.001$). The mean preoperative leg pain VAS score improved from 7.40 to 1.73 at the 6-week follow-up evaluation (Table 2) and was 1.06 at the 1-year follow-up evaluation ($P=0.001$).

Likewise, all patients showed significant improvement of their ODI scores. The mean ODI score improved from 30.20 preoperatively to 7.80 at the 6-week follow-up evaluation (Table 3) and was 2.80 at the 1-year follow-up evaluation ($P=0.001$).

After integration of the above data into MacNab's outcome criteria,⁹ twelve patients (80%) exhibited excellent results, three patients (20%) exhibited good results, and none of our patients were in the fair or poor results category (Table 4).

At the short-term follow-up evaluation, only two patients complained of slight dysesthesia, which had improved with medical treatment by the final follow-up evaluation. None of our patients had a recurrence of his symptoms during the follow-up period, and none developed instability.

Table 1. Patient Demographic Data

Patient	Gender	Age	Diagnosis	Signs	PreOp Back VAS	PreOp Leg VAS	PreOp ODI
1	Male	26	L4-5 (Rt.)	SLR +ve	7	8	27
2	Female	52	L3-4 (Lt.)	FST +ve	8	9	42
3	Male	40	L4-5 (Lt.)	SLR + FST +ve	6	8	34
4	Female	50	L4-5 (Lt.)	SLR +ve	8	7	36
5	Male	49	L3-4 (Lt.)	FST +ve	6	8	29
6	Male	45	L4-5 (Lt.)	SLR + FST +ve	5	7	20
7	Male	58	L4-5 (Rt.)	FST +ve	6	9	31
8	Male	47	L3-4 (Lt.)	SLR + FST +ve	6	6	25
9	Male	54	L2-3 (Lt.)	FST +ve	8	8	33
10	Female	42	L4-5 (Rt.)	SLR +ve	5	7	24
11	Male	50	L2-3 (Lt.)	FST +ve	5	7	30
12	Female	38	L5-S1 (Rt.)	SLR +ve	6	8	32
13	Male	52	L3-4 (Lt.)	FST +ve	7	6	31
14	Male	44	L4-5 (Rt.)	FST +ve	6	6	29
15	Male	55	L3-4 (Lt.)	FST +ve	8	7	30

SLR: Straight Leg Raising Test, FST: Femoral Stretch Test

Table 2. Comparison between Preoperative Back Pain and Leg Pain VAS Scores and Those Recorded At the 6-Week and 1-Year Follow-Up Evaluations.

Patients	Back Pain			Leg Pain		
	PreOp	6 ws	1 y	PreOp	6 ws	1 y
1	7	2	0	8	1	0
2	8	4	2	9	2	1
3	6	2	2	8	2	1
4	8	2	1	7	1	0
5	6	2	0	8	1	0
6	5	3	2	7	2	2
7	6	3	2	9	1	1
8	6	2	1	6	1	1
9	8	5	3	8	3	2
10	5	1	0	7	1	0
11	5	1	0	7	2	1
12	6	2	0	8	1	1
13	7	3	3	6	3	2
14	6	2	0	6	3	2
15	8	3	0	7	2	2
Mean	6.46	2.46	1.06	7.40	1.73	1.06

Table 3. Comparison between Preoperative ODI Scores and Those Recorded At the 6-Week and 1-Year Follow-Up Evaluations.

Patients	PreOp	6 Wks	1 y
1	27	5	0
2	42	20	10
3	34	15	7
4	36	19	5
5	29	16	3
6	20	7	1
7	31	7	0
8	25	10	1
9	33	10	0
10	24	12	5
11	30	7	0
12	32	10	0
13	31	15	10
14	29	16	0
15	30	8	0
Mean	30.20	7.80	2.80

Table 4. Final Follow-Up Results at 12 Months Postoperatively According To Macnab's Outcome Criteria⁹

Item	Criteria	Far lateral lumbar disc herniation (N=15)
Excellent	no pain; no restriction of activity	12 (80%)
Good	occasional back or leg pain of sufficient severity to impair a patient's ability to perform normal work	3 (20%)
Fair	improved functional capacity but handicapped by intermittent pain of sufficient severity to curtail or modify work or leisure activities	0
Poor	no improvement or insufficient improvement to enable participation in activities; further operative intervention required	0

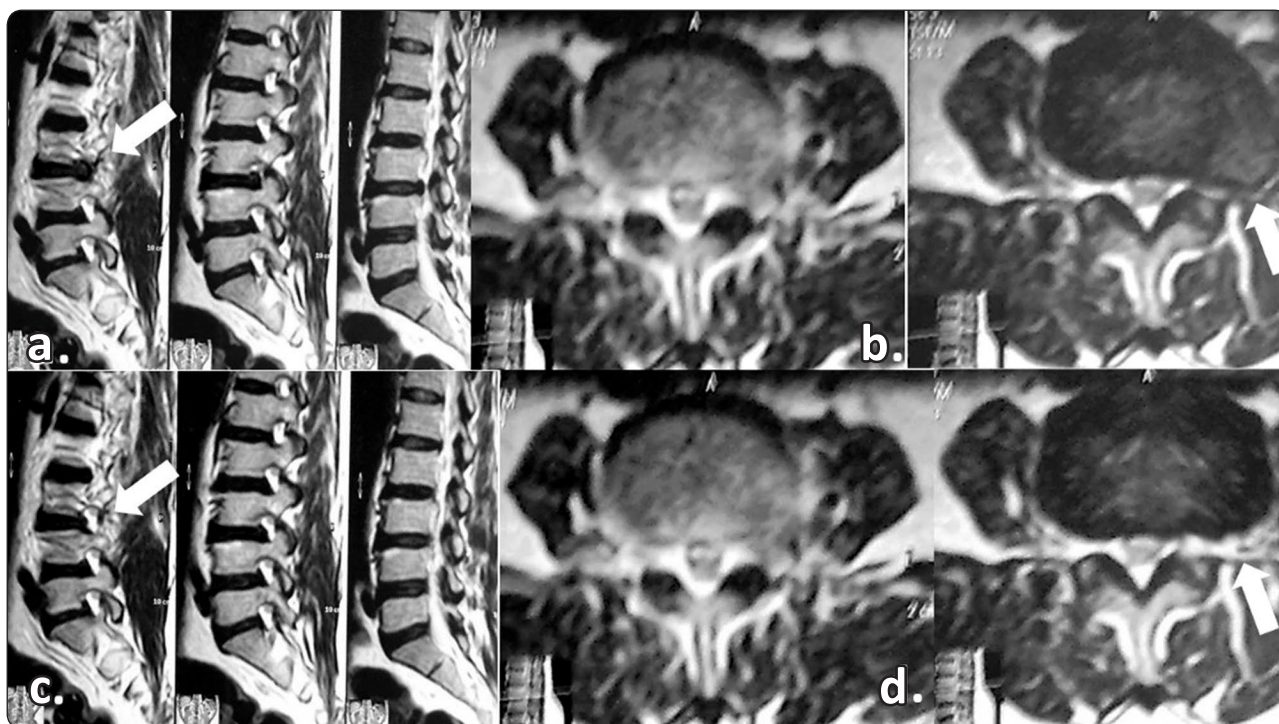


Figure 1. A 55-year-old female patient presented with left-side L3-4 far lateral lumbar disc herniation. (a,b): Preoperative MRI. The white arrows indicate the extraforaminal disc. (c,d): One-year follow-up MRI. The extraforaminal disc was completely removed.

Discussion

Extraforaminal (far lateral) lumbar disc herniation has been a surgical challenge since its initial diagnosis in 1974 by Abdullah et al,¹ and should be considered in the differential diagnosis of upper lumbar disc herniation in elderly patients,¹³ as diagnosis failure may account for the poor results of classic

laminectomy and discectomy for the herniated discs identified in earlier studies.⁹

Most surgeons use a midline interlaminar approach,¹ but full exposure of the nerve root requires total resection of the facet joint, which may compromise the subsequent stability of the spine.¹² This has led to the development of the extraforaminal approach to expose the nerve root within the intertransverse space via muscle

splitting, usually with a paramedian incision. Although it requires minimal or no resection of bone, this technique carries a risk of injuring the dorsal root ganglion.¹⁷

This study revealed that the overall incidence of far lateral lumbar disc herniation among all lumbar disc herniations subjected to surgery in our department is 3%, which is consistent with the findings of other studies reporting an incidence of 1-12%,¹ confirming the rarity of this problem.

The patient outcomes in this study were classified as excellent or good in all cases (80% and 20%, respectively), and neither long-term complications nor recurrence were detected at the 1-year follow-up evaluation. Comparisons of the results of many studies in the literature that evaluate the extraforaminal approach for the management of far lateral lumbar disc herniation^{4,6,10,12-14} are restricted by the different lengths and various modalities of follow-up. The significant and long-term improvement of back and leg pain scores and the significant improvement of ODI scores observed in the current study compare favourably with similar reports^{4,6,10,14} and seem to be better than the results reported for the treatment of far lateral lumbar disc herniation through the traditional midline exposure.¹⁴ Most of these studies, however, are retrospective,^{12,13} and some have only short-term follow-up periods.^{6,10}

The primary limitation of this study is the small number of patients included. However, given the rarity of the problem (3%) and the prospective nature of this study, this number is comparable with other reports.¹⁰⁻¹¹

Conclusion

Treating extraforaminal disc herniation with an extraforaminal (far lateral) approach using the paramedian (intermuscular) technique is

a safe and minimally traumatizing procedure that yields satisfactory results and is a better alternative to the midline approach. It requires minimal soft tissue and bone resection, and the herniated disc is directly visualized. Moreover, it involves minimal manipulation of the neurovascular structures and avoids significant muscle retraction and potential spinal instability due to excessive bone resection.

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الملخص العربي

التدخل الجراحي باستعمال المدخل الخارج عن قناة العصب لاستئصال الانزلاق الغضروفي القطني البعيد الوحشي

البيانات الخلفية: يعد الإنزلاق الغضروفي القطني المركزي او للجانب الخلفى الوحشى من أكثر الإنزلاقات الغضروفية حدوثاً فى العمود الفقرى. لكن هناك نوعاً آخر من إنزلاقات الغضروف القطنى وهو الإنزلاق فى الجانب البعيد الوحشى من قناة العصب وهو نادر الحدوث ونسبة حدوث هذا النوع من الانزلاقات تتراوح ما بين ١-١٢٪ من اجمالى الانزلاقات الغضروفية القطنية. وقد مثل تشخيص وعلاج مثل هذا النوع من الانزلاقات الغضروفية تحدياً كبيراً علي مر السنوات لجراحي العظام المتخصصين فى جراحات العمود الفقرى لإيجاد المدخل الجراحي المناسب لعلاج مثل هذه الانزلاقات.

الغرض: تقييم استخدام المدخل الجراحي الخارج عن قناة العصب فى إستئصال الانزلاق الغضروفي القطني فى الجانب البعيد الوحشى من قناة العصب.

تصميم الدراسة: هذه الدراسة هي دراسة مستقبلية لعدد (١٥) مريض يعانون من إنزلاق غضروفي قطني في الجانب البعيد الوحشى.

المرضي و الطرق: خلال الفترة من سبتمبر ٢٠١٣ الي اغسطس ٢٠١٥ تم علاج عدد ٥٠١ حالة تعاني من انزلاق غضروفي قطني من بينهم ١٥ حالة تعاني من انزلاق غضروفي قطني بعيد وحشي حيث تم استخدام المدخل الجراحي الخارج عن قناة العصب في علاج الحالات التي تعاني من انزلاق غضروفي قطني في الجانب البعيد الوحشى. وكانت متابعة المرضى خلال عام بعد إجراء الجراحة لمقارنة نسبة التحسن في الأعراض المرضية قبل وبعد إجراء الجراحة من خلال إستخدام استبيان مؤشر العجز أوسويستري (ODI) ومقياس الألم التماثلي المرئي (VAS) وتقييم النتائج النهائية بعد عام من المتابعة باستخدام مقياس خصائص ماكناب.

النتائج: أظهرت المؤشرات الإحصائية لهذا الدراسة أن نسبة حدوث حالات الانزلاق الغضروفي القطني في الجانب البعيد الوحشى الذين سيخضعون للتدخل الجراحي من بين جميع حالات الانزلاق الغضروفي القطني تقدر بحوالي ٣٪. وأن نسبة تحسن الأعراض المرضية بعد إجراء الجراحة وفي نهاية عام من المتابعة باستخدام مقياس خصائص ماكناب هي ٨٠٪ ممتازة (١٢ مريض) و ٢٠٪ جيدة (٣ مرضي).

الاستنتاج: لذا طبقاً لمؤشرات هذه الدراسة ننصح باستخدام المدخل الجراحي الخارج عن قناة العصب في علاج الحالات التي تعاني من انزلاق غضروفي قطني في الجانب البعيد الوحشى.