Surgical Management of Recurrent Herniated Lumbar Disc at TU Teaching Hospital

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Over the duration of eight and half years, we had performed over 158 cases of hernitated lumbar disc surgeries at Tribhuvan University Teaching Hospital. Among them, there were altogether 6 cases with recurrent herniated disc at the same or the adjacent level. The demographic profile, clinical pictures, surgical management and the outcome are presented. Our limited experience and technical recommendation for the surgical mangement of such recurrent lumbar disc pathologies are also discussed in detail.

Key: Recurrent herniated lumbar disc, Surgical outcome.

Introduction

Lumbar discectomy is one of the commonest surgey performed by Neurosurgeons and Orthopedic surgeons alike. Going back to the history of spinal surgery, sciatica has been mentioned in literature since antiquity. With the tendency towards ever-increasing momentum in the arena of lumbar disc surgeries for sciatica and radiculopathy due to disc herniation, complications with such spine surgeries are also encountered. Recurrent herniated disc at the same level or at the adjacent level is an uncommon complication.

As part of our further study of surgical outcome of lumbar disc herniation[1], here, we have made an attempt to present our over eight and half year experience in the surgical management of recurrent herniated disc.

Material and Method

All the patients with lumbar disc herniation who were managed surgically at TU Teaching Hospital in a period of eight and half year, starting from Feruary 1995 to July 2003 were retrospectively reviewed. Those surgically-managed patients who had recurrent lumbar disc herniation were taken in as the subject of this study. Patients with recurrent herniated lumbar disc treated conservatively and those with spondylotic myelopathy or with those strictly having spinal canal stenosis as major pathology were excluded from the study.

Results

Our clinical series consisted of 158 consecutive patients with lumbar disc herniation who were surgically managed. Among them, there were altogether six cases with recurrent disc herniation. The demographic profiles were as follows. The patients' age ranged from 35 to 42 years with mean age of 36.8 years; and the male-to-female ratio was 3:3. All of the six patients were between 30 to 40 years of age.

In respect to time interval from the previous lumbar surgical, it varied from 2 months to 27 months (mean 8.3 months) while duration of symptoms before the repeat surgery ranged from 1/4 of month to 12 months (mean 5.9 months). On probing the possible causes for recurrence from the clinical history, it was found that two cases were directly related to inadequate surgical decompression with technical flaws while two cases had direct relation to heavy lifting before the recurrence of symptoms. One case had history of severe chronic coughing and in one remaining case, no causative factor could be elicited from the history except that she had concomitant lateral rotatory subluxation of C1 on C2, which got spontaneously relieved with conservative management.

As to see where the previous surgeries were done, the past history of all the patients, as well as their previous discharge summaries were thoroughly reviewed. It was found that four cases had their previous surgeries at TUTH; whereas the remaining two were operated elsewhere within the capital, one at Norvic Hospital and another at Birendra Police Hospital. The sumary is given below:

Case	Age/Sex	Time Interval (months)			Hospital Stay (days)	Cause	Level Involved		Surgery	Institute Hospital
		Surg	Symptom	F/U			Previous	Present		
I	42M	2	0.25	98	4	Coughing	L4/5,L	L4/5,B	Hemilami	TUTH
II	35M	3	3	28	9	Surgery	L3/4/5,L	L3/4/5,B	Lami	Police
III	35F	22	8	37	7	Heavy working	L3/4/5,R	L3/4/5,L	Lami	TUTH
IV	37F	12	12	17	7	Surgery	L4/5,L	L4/5,R	Hemilami	Norvic
V	27M	23	1	24	5	Heavy lifting	L4/5,L	L4/5,L	Hemilami	TUTH
VI	40F	11	1	41	6	Not known	L5/S1,L	L5,S1,B	Lami	TUTH

Preoperative radiographic evaluation was based on MRI of lumbar spine with and/or with contrast in five cases; and only postmyelographic CT-scan of the lumbar spine was performed in one case. The summary of the preoperative radiographic evaluation is given below:

Radiological Evaluation		**Cases**
MRI		5
Without contrast	3	
With contrast	2	
Postmyelographic CT		1

On classifying the recurrent herniated discs based on the extent of protrusion, we divided it into three groups: herniated, exruded and sequestrated. There were threee cases of herniation and two cases with extrusion and one case with sequestration.

Concomitant pathologies included neuroforaminal stenosis in four cases (in the same level in two cases and in the adjacent level in one case), and canal stenosis due to hypertrophied ligamantum flava in four cases. Fibrosis was noted in all six cases with severe fibrosis in only two cases. The details are given below:

Disc Pathologies		**Cases**
Herniated		3
Extruded		2
Sequestrated		1
Concomitant Pathologies		**Cases**
Foraminal stenosis		4
Same level	3	
Adjacent level	1	
Canal stenosis		4
Fibrosis		6
Mild	4	
Severe	2	

On the basis of the laterality of the lesion, three cases had unilateral pathology of which one was on the same side while two were on the opposite side. There were also three cases with bilateral involvement of which two cases had only single level involvement while one case had two-level pathology. Categorizing on the bases of number of disc level involved, it was found that four cases had single level recurrence while in remaining 2 cases had two-level disc involvement. The summary of the laterality and involved spinal levels are given below.

Laterality		**Cases**
Unilateral		3
Same side	1	
Opposite side	2	
Bilateral		3
One level	2	
Two levels	1	
Involved Levels		**Cases**
I. Multiple levels		
L3-4 & L4-5		2
II. Single Level		
L4-5		3
Unilateral	2	
Bilateral	1	
L5-S1		1

From above, it was found that the commonest level with recurrent disc was L4-5 disc level.

On analyzing clinical manifestations, two patients presented with repeated sciatica in the same leg while one case had sciatica in the opposite leg. The remaining two cases had bilateral asymmetrical sciatica. Apart from this, one case presented with symptoms of cauda equina syndrome, namely urinary incontinence. The details of the clinical presentation are given below:

Case	Previous History	Present	History				
	Sciatica	Sciatica	Dysuria	SLR	Motor	Sensory	Reflex
I	Left	Bilateral L>R	No	R 40° L 30°	5/5	Intact	Intact
II	Left	Bilateral L>R	No	R 30° L 20°	4/5	Intact	Intact
III	Right	Left	Yes	R 90° L 20°	4/5	Intact	Intact
IV	Left	Right	No	R 50° L 90°	4/5	¬	Intact
V	Left	Left	No	R 80° L 60°	4+/5EHL	¬	AJ(-)
VI	Left	Bilateral L>R	No	R 80° L 10°	4/5	¬	Intact

In respect to the neurosurgical management, all the patients underwent laminectomy, followed by foraminotomy prior to removal of the recurrent disc and further decompression. Three patients underwent only partial laminectomy of the adjacent lamina alss termed as hemilaminectomy in our study while the remaining three had standard laminectomy, complete removal of lamina on either side. Three patients had placement of romovac drainage, which was removed within 24 to 48 hours of surgery. The details are summarized as below:

Surgical Approach		Cases
Laminectomy		6
Partial	3	
Standard	3	
Foraminotomy		6
Drainage		3

In respect to the surgical outcome for recurrent herniatd lumbar spine, there was no mortality or obvious complications. The hospital stay ranged from 4 to 9 days (mean 6.3 days). The recurrent rate of lumbar disc surgery at TUTH was calculated to be 2.5% (4/158) with a follow-up ranging from 17 months to 98 months (mean follow-up of 40.8 months).

Our Surgical Experience and Technical Recommendation

1. Our surgical experience and recommendation for lumbar disc surgeries in general had been concluded in our recently published article[1]. The technical consideration and recommendation is analogous to the previous recommendation except for the following few additional points.
2. In cases of recurrent herniated disc with history of previous surgery, the previous incision should be extended caudad and cephalad and the scarred incisional margins may be excised.
3. Adequate skin incision and generous longitudinal fascial release on either ends by retracting the skin with a Army-Navy retractor, provide atraumatic retraction, without contusing the muscle and allowing adequate posterolateral exposure.
4. Fascia must be incised and muscle is sharply dissected using Bovie electrocautery starting from the virgin level adjacent to the previous operated levels.
5. Almost all requires sharp dissection except stripping off the scar tissue from the bone. It is always recommended to start dissection from a fresh area where the demarcation is clear to avoid dural tear and injury to the cord or nerve roots. One must carefully identify the remaining cephalad and caudad portion of laminae as bony landmarks to avoid inadvertently penetrating the spinal canal during dissection. One must inspect meticulously by inserting a small Kerrison punch or curved currette at the lateral, superior and inferior margins of the previous laminotomy defect.
6. We prefer partial laminectomy, and standard laminectomy when required, followed by foraminotomy prior to fibrosis dissection and identification of the nerve root and removal of herniated or extruded disc material.
7. We recommend beginning dissection from the superior and inferior and then gradually extend the bony decompression laterally, find the pedicle and then identify the neural foramen.
8. Operating microscope or loupes have proved to be invaluable in facilitating surgery in recurrent disc more so than in virgin disc due to the need for dissection of fibrous tissue and identification of nerve root.
9. Accepted principle in lumbar surgery remains adequate and generous bony removal above, below and lateral to the lesion to allow a posterolateral approach with minimal traction on surgical compression of removed elements. As nerve roots are less flexible due to the epidural fibrosis, it is advised to use no retraction or minimal retraction of hte nerve roots in the case of recurrent discs, particularly with severe fibrosis.
10. In cases of recurrent herniated disc and in cases concomitant with canal stenosis requiring laminectomy whether it is partial or standard, we use curved Weitlander retractor or Scoville retractor.
11. Judicious extensive laminectomy provides adequate decompression and avoids postoperative complications unwanted narrowing of canal and neural edema. Foraminotomy should be performed for additional decompression prior to discectomy.
12. Access to fragments (extruded or herniated) extruding superior or inferior to the disc space requires extensive

bony removal and wide neuroforaminal exposure before attempting to remove the sequestrated or extruded fragments in piecemeal. There is no need for removal of every bit of herniated disc fragments and radical removal of disc material is not thought to reduce the recurrence of disc herniation.

13. Bleeding can be very troublesome. Apart from the epidural sinusoid plexus veins, the peridural fibrosis may also cause profuse bleeding which may need to be meticulously coagulated with bipolar cautery.
14. One should not attempt to remove all adherent fibrous tissue from the dura to minimize the possibilities of dural tear. In addition, fibrous tissue adherent to the dura can be used to retract medially the thecal sac by transfixing with 4-0 silk suture for better exposure of the lateral gutter.
15. One of the most difficult step of the operation during recurrent disc is finding the nerve root and then protecting it. The distorted anatomical landmarks and epidural fibrosis from the previous surgery inevitably makes this step of identifying nerve roots very difficult and hazardous. Once it is identified, there is no need to dissect the nerve root completely to minimize the chance of neural injury.

Discussion

On reviewing the literature, the recurrence rate after herniated lumbar disc surgery has been quoted as ranging from 3~19%, with higher rates in the long-term follow-up studies[2]. In this study, out of 158 operated cases, there were only four cases of recurrent disc previously operated at our institute. Thus, the recurrence rate was calculated to be 2.5% (4/158) for TUTH experience.

In another ten-year mean follow up study, Davis estimated a recurrence rate of herniated disc to be 4% (same level, either side), one third of which occurred during hte first year of operation (mean 4.3 years)[3]. In our study, the follow-up period ranged from 17 months to 98 months (mean 40.8 months). The time interval from the first surgery to the second varied from 2 months to 23 months (mean 12.2 months). The duration of symptoms before the second surgery ranged from 1/4 of month to 12 months (mean 5.9 months).

A second recurrence at same site occurred in 1% in another series with mean follow up of 4.5 years. It recurred at the same level in 74% and in 26% at the adjacent level. Recurrent disc herniation occurred at L4-5 more than twice as frequent as L5-S1[2]. In this study, the recurrence rate was 2.5% with a mean follow-up of 40.8 months. Three cases had unilateral pathology (1 same and 2 opposite side). Another three cases had bilateral involvement (2 single and 1 two-levels). Four cases had single level recurrence while 2 cases had two-level disc involvement. The most commonly involved disc level was found to be L4-5 (50%, 4/8).

Recurrent disc herniation is not necessarily a surgical complication[4]. Theoretically speaking, the only way to absolutely eliminate the possibility of recurrence of disc herniation is to remove the disc material completely and also to perform a fusion to avoid spinal instability. However, this is neither possible nor necessary in the majority of cases with herniated lumbar disc. One should scrupulously remove all loose fragments from the disc space to reduce the risk of recurrence; however, any aggressive attempts to remove disc material that may subsequently fragment and herniate or extrude are not indicated and can be hazardous.

On understanding the pathophyiology of recurrent disc herniation, it is said to be due to the ongoing intradiscal fragmentation and subsequent protrusion of the loose fragments through the annular disruption into the neural canal. The annulus disruption produced by the disc herniation does not heal with the biomechanical integrity of the original annulus[5]. In this study, the possible cause for recurrence has been attributed to inadequate surgical decompression in two cases, heavy lifting or working in two cases and severe coughing in one case.

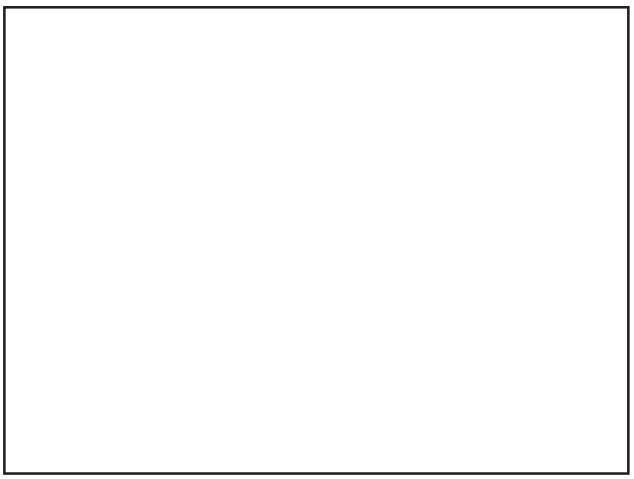
The possibility of recurrence of disc herniation exists. However, there is no evidence to support the belief that an early resumption of normal physical activities increases the risk of recurrence. On the contrary, postoperative ambulation and physical activities should begin as early as possible in case of repeated surgery for recurrent disc, analogous to any spinal surgeries, Our recommendation has been to start ambulation as soon as the first postoperative day.

On the basis of radiographic or gross histopathological findings, peridural fibrosis is an inevitable sequela of any lumbar disc surgery. Even patients who are relieved of their radicular pain following discectomy develop some scar tissue after surgery [6]. If a patient has recurrent radicular pain following lumbar discectomy, there is a 70% chance that extensive peridural scar will be found on MRI[7]. Therefore, it is very important to differentiate prior to the second surgery whether repeated radicular pain is due to the fibrosis or there is a recurrent disc for which preoperative radiological imaging is mandatory. Here, it must also be emphasized no less that appropriate patient selection for repeat surgery is also very important.

In respect to the radiological evaluation for recurrent herniated lumbar disc MRI with and without contrast is the investigation of choice. On plain MRI, intensity signal from recurrent herniated disc becomes more intense as the sequence varies from T1W to T2W, whereas the peridural fibrosis becomes less intense. The recurrent disc and fibrosis may be distinguished based on mass effect and the location to some extent. In case of recurrent disc, the nerve

root is displaced away from the disc material, whereas it may be retracted toward scar tissue by adhesions in case with severe epidural fibrosis. On the other hand, disc material tends to be in contiguity with the disc interspace, best-viewed on sagittal MRI while fibrosis is more spread out and is not just limited to the vicinity of disc space.

On early (<10 minutes) T1W sequence of enhanced MRI, the scar tissue enhances in homogeneously, whereas disc show no enhancement. On the other hand, on late (>30 minutes) images, the scar tissue enhance homogeneously while disc has variable to enhancement.



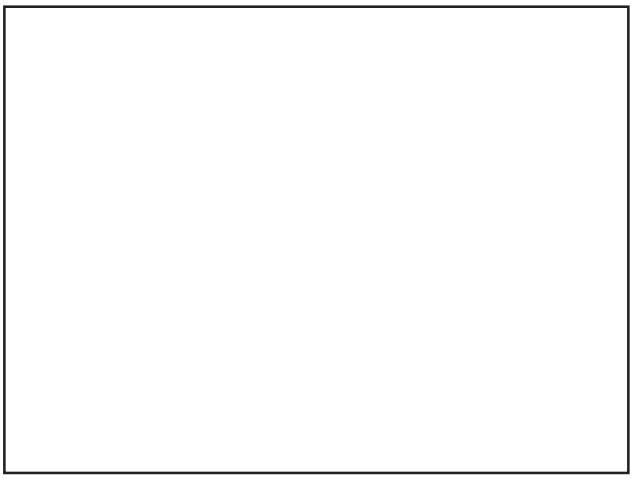
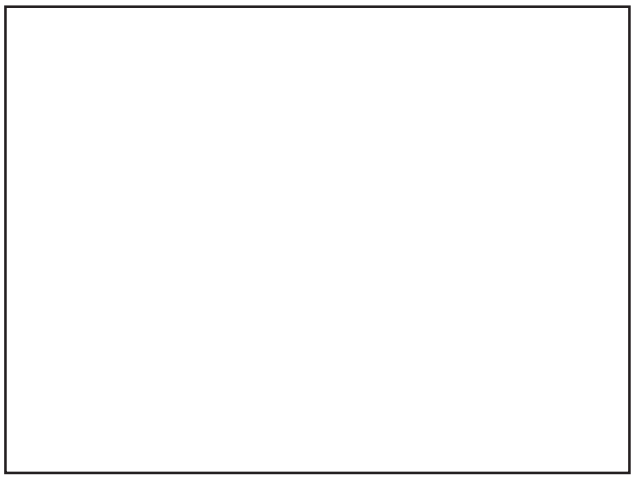


Fig. I: MRI-scan of lumbar spine of a 35-year-old female with history of laminotomy and microdiscectomy one year ago, presently having recurrence of sciatica and urinary incontinence, showeing large centrally located herniated disc at L4-5 level with sequestration and herniated disc at L3-4 as well. A) Sagittal T2-weighted sequence B) Axial T1-weighted sequence. There is also evidence of previous surgery from right side.

Post-myelographic CT, by itself is unreliable for distinguishing disc material from scar but it is very capable of demonstrating arachnoiditis [8,9]. In this study, five patients with recurrent disc were radiographically evaluated with MRI with and without contrast and only one case had post-myelographic CT scan because of unavailability of MRI at that time.

Initial recommended management strategy is analogous to that of first time surgery of so-called "virgin disc" herniated lumber disc. Non-surgical management should be utilized to the fullest extent in absence of progressive neurologic deficits, cauda equina syndrome or intractable pain prior to consideration of repeat surgical intervention.



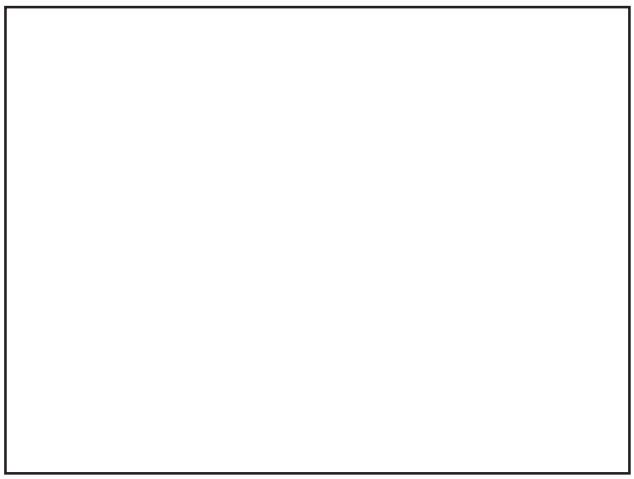


Fig. II: MRI of L-spine of a 27-year-old male with history of microdiscectomy via laminotomy and foraminotomy, depicting left centrolateral herniated disc with compression of the thecal sac and left lateral recess with evidence of epidural fibrosis and postoperative changes on the left side. A) Sagital T2-weighted image and B) Axial T2-weighted image. There is a small herniated disc at L5-S1 as well.

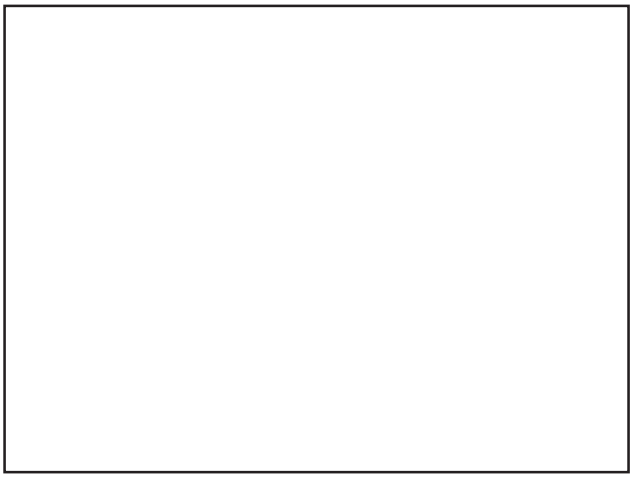


Fig. III: MRI of L-spine of a 37-year-old female with history of microdiscectomy via laminotomy at L4-5 on left, presenting right sided sciatica, showing centrolateral herniated disc with epidural fibrosis.

In respect to surgical management for recurrent disc without spinal instability, 1992 survey showed opinion divided primarily between simple repeat discectomy (57%) vs repeat discectomy with fusion (40%). Apart from the cardinal objective of adequately decompressing the nerve roots and cauda equina in lumbar disc surgeries, in case of recurrent disc herniation, the emphasis should be first on avoiding the neural and dural injury while maintaining the spinal stability and preventing further unwanted compliations. We do not perform fusion following laminectomy for recurrent herniated disc.

Surgical procedure for a recurrent disc herniation can be performed in a very similar fashion to the original surgery, with some minor modifications that allow for scar tissue as aforementioned.

It is often possible for small herniated fragments to cause symptoms in recurrent herniation than in a virgin disc is due to the fact that the nerve roots are often fixated by the scar tissue and has little ability to deviate away from fragment [10]. In our study, we found that all six patients with recurrent lumbar disc herniation had epidural fibrosis to some extent; but among them, two had severe fibrosis, making the surgical decompression of the nerve root extremely difficult and hazardous.

Analogous to the first virgin disc, the outcome from surgery in recurrent disc is worse in workers's compensatin and in patients under litigations. Only nearly 40% of these patients actually benefit from surgical decompression [2].

Patients with less than 6 months of relief after their first operation and cases without significant epidural fibrosis found at operation is said to have poorer prognosis. In this study, among the six cases, three had less than 6 months of relief after the first operation.

Conclusion

Recurrent lumbar disc herniation is a relatively uncommon complication of disc surgery. We present our over eight and half year experience with six cases of recurrent herniated lumbar disc and their surgical management and recommendation.

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