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Microdiscectomy for Lumbar Intervertebral Disc Prolapse: Is Fixation Required?

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Abstract

Introduction Microdiscectomy, as of now, is considered the gold standard for the treatment of herniated lumbar disc. It preserves motion at the spinal segment and does not alter the local spinal anatomy significantly, resulting in a "functional and mobile" spine. Development of increasingly better-quality implants has seen their indiscriminate use in cases without any demonstrable instability. We see an increasing number of patients of lumbar disc prolapse being treated by fixation and fusion procedures, without any clear indication or evidence supporting such practice. This adds to the operating time, blood loss, cost of surgery and leads to loss of motion at the spinal segment resulting in a "stiff and immobile spine." Our 10-year experience of treating lumbar disc herniation by micro-discectomy makes a strong case for preserving the spinal motion segment wherever possible and to use fixation very judiciously only in cases of proven instability.

Materials and Methods A total of 295 cases of lumbar disc prolapse operated by the first author from January 2013 to April 2022 were analyzed. All the patients had unilateral or bilateral radicular pain. Preoperatively instability was ruled out by dynamic X-rays. All the patients were operated in prone position on Wilson's frame. Microdiscectomy was done through the inter-laminar space. Patient outcomes and complications were analyzed.

Results There was no mortality in our series. All the patients had significant relief of lower limb pain with improved visual analog scale scores postoperatively. The patients were followed up for 6 months. There were complications in 17 patients, all of which were treated successfully with a good outcome. None of the complications were attributable to failure of doing fixation.

Conclusion Lumbar disc prolapse can be treated effectively by microdiscectomy. Fixation should be reserved for only those cases with demonstrable preoperative instability.

Keywords
- microlumbar discectomy
- lumbar disc prolapse
- fusion

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Introduction

Microlumbar discectomy (MLD) was pioneered by Yasargil,[1] and Casper[2] in 1977 to 1978. Over the years, it has undergone certain modifications and refinements, but the basic approach through the interlaminar window has remained the same.

The last few decades have seen an increasing number of patients with lumbar disc prolapse being subjected to fixation and fusion procedures, often without any clear justification or evidence to support this practice.[3] This not only adds to the operating time, blood loss, loss of mobility of spinal motion segment and postoperative back pain but also increases the cost of surgery, making it unaffordable to a sizeable population of a developing country like India.

We present our 10-year experience of MLD.

We discuss the basic technique of interlaminar approach, its modifications, and compare it with the transforaminal approach. We also discuss the demerits of unindicated fixation and fusion procedures.

Materials and Methods

A total of 295 cases were operated in the last 10 years by the first author. The inclusion criteria for surgery were as follows:

1. Unilateral or bilateral lower limb pain for more than 1 month and not relieved by conservative management with magnetic resonance imaging (MRI) showing lumbar disc prolapse (►**Fig. 1A**).
2. Severe, excruciating unbearable pain in the limbs with a large lumbar disc herniation on MRI. (►**Fig. 1B**).
3. Severe pain in the lower limb with presence of neurodeficit.
4. No spinal instability/pars lysis on preoperative flexion–extension X-rays/MRI (defined as excessive translation/rotation of one spinal segment relative to its inferior spinal segment).

Patients with lumbar canal stenosis and spondylolisthesis with pars lysis were not included in the study (►**Tables 1–3**).

Table 1 Age and sex distribution of patients

Sex distribution	No. of patients
Male	180
Female	115
Age distribution	**No. of patients**
11–20	12
21–30	34
31–40	70
41–50	67
51–60	55
61–70	42
71–80	11
>80	4

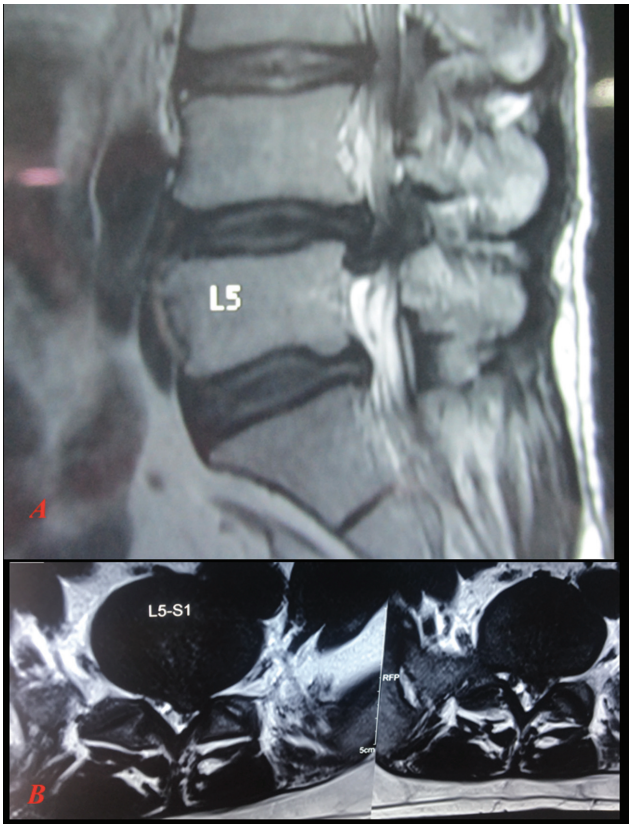

Fig. 1 (**A**) Magnetic resonance imaging (MRI) of lumbar spine sagittal section showing L4 to L5 disc prolapse. (**B**) MRI of lumbar spine axial sections showing L5 to S1 left-sided disc prolapse with inferior migration of the disc fragment.

Operative Technique[4,5] (►Videos 1 and 2)

Video 1

Microlumbar discectomy with a conventional hook retractor. Online content including video sequences viewable at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0042-1759617.

Video 2

Microlumbar discectomy using a tubular retractor system. Online content including video sequences viewable at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0042-1759617.

All the patients were operated in prone position under general anesthesia on a Wilson's frame (►**Fig. 2**). Wilson's frame helps to open up the interlaminar spaces by making the lumbar spine kyphotic. The level was marked preoperatively by C-arm image intensifier, and approximately 3 cm long midline incision (►**Fig. 3**) was

Table 2 Side of disc herniation and levels operated

Side of disc prolapse	No. of patients	No. of levels	No. of patients	Level operated	No. of patients
Right	150	Single level	291	L1–L2	4
Left	128	Two levels	3	L2–L3	6
Central	15	Three levels	1	L3–L4	10
Far lateral	2			L4–L5	177
				L5–S1	103

Table 3 Preoperative neurologic status

Neurologic status	No. of patients
Normal without any neurodeficit	271
Cauda equina syndrome	8
Muscle weakness (foot drop/EHL weakness)	16

Fig. 3 The length of incision for microdiscectomy.

made centered on the disc space. The paraspinal muscles were cut from the spinous process, mobilized by subperiosteal dissection, and retracted by hook and blade retractor (►**Fig. 4A**). When using the tubular retractor, the muscles were split bluntly by dilators and the tubular retractor (►**Fig. 4B**) was inserted. The interlaminar space was identified. The microscope was brought in at this stage.

The ligamentum flavum is cut sharply by no 11 knife along the upper border of lower lamina, and dissected of with a microdissector, opening up the interlaminar space. The

Fig. 2 Wilsons frame used for lumbar microdiscectomy.

exiting root is identified. The root is gently retracted to visualize the bulging disc. The disc is removed with disc forceps. The disc almost always should be removed from the "shoulder" after retracting the root and not from the "axilla."[6] The disc usually can be removed without cutting the annulus with a knife. Up and down curved disc forceps are used to clear the disc space of any fragments. Curreting of the disc space is best avoided as it leads to severe back pain in postoperative period. After confirming that the root is free any compression, injection gentamicin is infiltrated in the disc space, to decrease the chances of postoperative discitis.

Incision is closed in layers, and dressing applied. Central disc herniations were treated by unilateral or bilateral interlaminar approach depending on the pathology.

Patients are mobilized the same or the next day, and discharged over the next 2 to 4 days. Stitches are removed on the 8th postoperative day.

Results

All the patients had good relief from lower limb radicular pain. Visual analog scale scores improved significantly in the postoperative period. All the patients were able to walk the same day. Back pain lasted for 3 to 4 days but was mild and the patient could walk with the pain. The patients were followed up for 6 months (►**Table 4**).

Postoperative discitis was treated medically by rest, intravenous antibiotics (vancomycin, linezolid), and serial monitoring of erythrocyte sedimentation rate, C-reactive

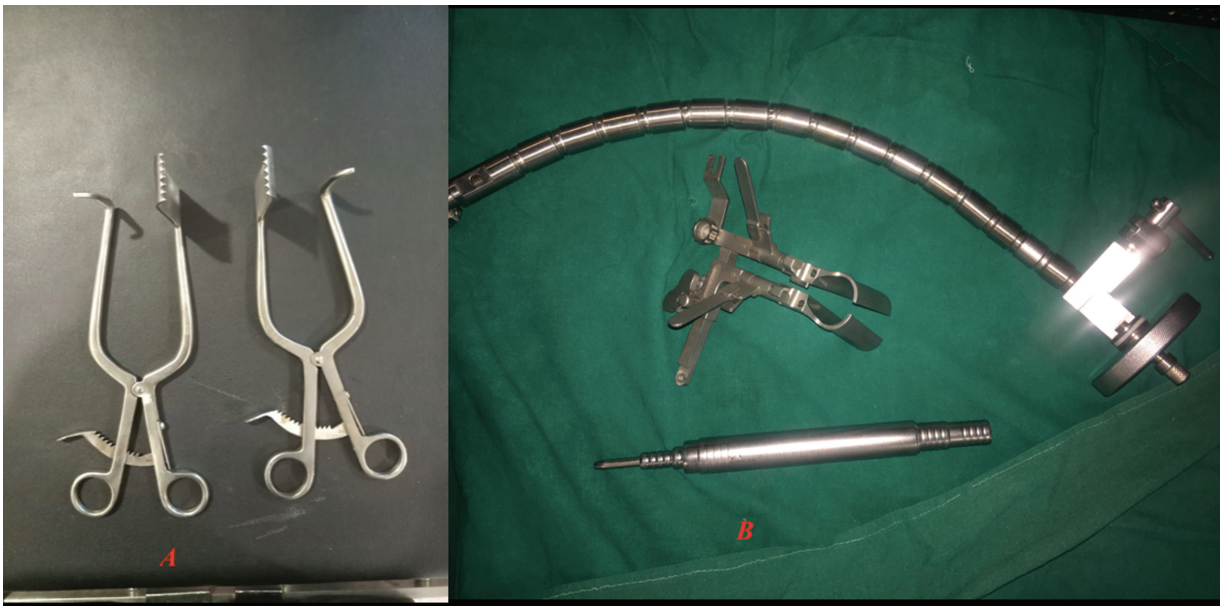

Fig. 4 (A) Hook and blade retractor used for lumbar microdiscectomy. (B) Tubular dilator system used for lumbar microdiscectomy.

Table 4 Complications

Complication	No. of patients
Postoperative discitis	5
Intraoperative dural tear	3
Neurologic worsening	3
Wound infection	2
Postoperative cerebrospinal fluid leak	0
Postoperative instability	0
Postoperative instability requiring fixation	0
Recurrent disc herniation at same level within 3 months	4

protein, and total blood count. All the patients responded well to treatment, though it required 6 to 8 months for them to return to their normal activities.

Intraoperative dural tear was repaired by putting a fat graft. None of the patients developed cerebrospinal fluid leak from the wound postoperatively. Four patients developed foot drop in the postoperative period, due to overstretching of the nerve root, all of which recovered in 3 months with physiotherapy and stimulation.

Two patients developed recurrent disc herniation at the same level within 6 months of the surgery and were successfully treated by repeat surgery.

It is worthwhile to note that none of the patients developed postoperative instability over a 6 months follow-up (►**Fig. 5A, B**) and none of the complications can be ascribed to failure to do fixation.

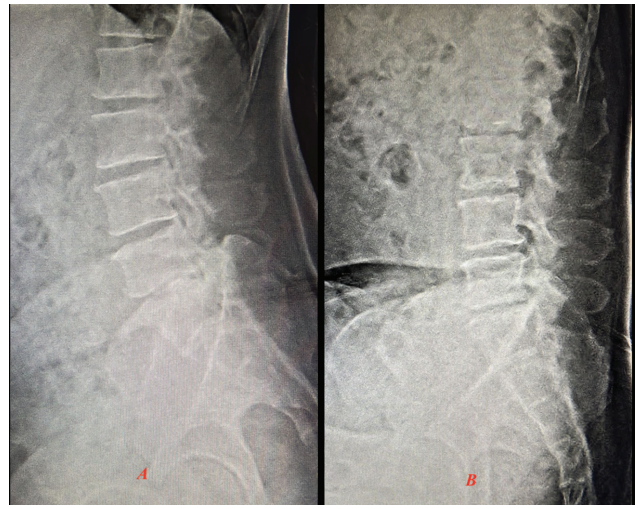

Fig. 5 (A) Postoperative X-ray of lumbar spine in flexion of patient (operated in ►**Video 1**) 2 years after surgery showing no instability. (B) Postoperative X-ray lumbar spine in extension of patient (operated in ►**Video 1**) 2 years after surgery showing no instability.

Discussion

Discectomy through the interlaminar window is known by different names depending on the instruments used, like MLD, microendoscopic discectomy, tubular discectomy, and Destandau technique.[7] In MLD, a conventional hook-blade retractor is used, microendoscopic discectomy, and tubular discectomy employ various tubular dilator–retractor systems and the Destandau technique uses Destandau system. All these different modifications aim to decrease the length of the incision and minimize the trauma to the paraspinal muscles. This in turn leads to less back pain in the postoperative period and faster return to normal activities. We have used the hook retractor as well as the tubular dilator system. Though its claimed that tubular dilator system causes less back pain than the conventional hook retractor,[8] we have not found any significant difference between the two with respect to back pain. The patients can be mobilized the same day in both the systems. We find

Table 5 Comparison between MLD and PELD

MLD	PELD
Shorter learning curve	Longer learning curve
Calcified and migrated disc can be easily removed	Difficult to remove calcified and migrated disc.
Can be done with the routine available cheap instruments	Requires an entire new set of instruments
All lumbar levels and all various locations can be managed	Difficult to manage L5–S1 pathology
Less chances of root damage	More chances of damaging the exiting root during the learning curve and in those with short pedicles and facet osteophytes
Comparatively more invasive with a larger incision	Less invasive with very small incision
Familiar anatomy	Entirely different anatomy and orientation

Abbreviations: MLD, microlumbar discectomy; PELD, percutaneous endoscopic lumbar discectomy.

the hook retractor more convenient as the muscles do not obstruct the view and do not need to be cauterized, as is the case with tubular dilator systems (►**Videos 1** and **2**).

We find microscope more convenient than endoscope as it gives three-dimensional image, allows working with both hands, is faster, and does not involve any additional cost.[9] We have attempted using endoscope for discectomy (through tubular dilator and via Destandau system). Our experience was that it significantly increases the operating time as compared with microscope as it gives a two-dimensional image and blood sticking to endoscope requires frequent cleaning.

Percutaneous transforaminal lumbar discectomy through the transforaminal window is being used increasingly for discectomy.[10–12] We find the MLD much more simpler and convenient due to the reasons given in ►**Table 5**.[13]

There is no evidence in the literature to support fixation in cases of lumbar disc prolapse without any preoperative instability.[14–16]Fixation leads to more postoperative back pain as more dissection is needed. It also increases the rate of degeneration at the adjacent levels because of loss of one motion segment.[17] Thus, it not only adds to the cost, operating time, and postoperative back pain, but may be detrimental to the patients in the long run. The proponents of fixation put great emphasis on maintenance of disc height as one of the benefits of fixation. However, it is important to know that gradual loss of disc height with disc degeneration is a normal phenomenon of the aging process and it cannot be called pathological.[18]

Addition of fixation increases the cost of surgery by minimum 40,000 to 60, 000 INR (~1000 USD) per surgery. This makes the spine surgery extremely costly and unaffordable for a sizeable population in a developing country.

In the United States, the rate of spinal fixation and fusion procedures from 1998 to 2008 showed an increase of 137%, more than that of any other procedure involving implants.[19,20] This is also evident from the number of publications in the recent times.[21,22]Though it is difficult to get such a data from developing countries like India, unwarranted spinal fixations are definitely on the rise. The reasons for this are as follows:

1. Many spine surgeons from developing countries go to United States and other developed countries for fellowships and workshops. Hence, they tend to propagate the same concepts in their native country leading to fixation and fusion being performed for doubtful indications like nonspecific back pain, lumbar disc herniations, and stable canal stenosis.
2. A fixation and fusion procedure commands higher charges as compared with MLD,[23,24] especially when the cost is borne by the insurance company or industry.
3. Many spine surgeons in developing countries are not adequately trained to work with an operating microscope or do not have funds to get a microscope in their hospital facility.
4. Fear of litigation also is responsible for surgeons to use fixation procedure. This is because many spine surgeons fear that the complication may be ascribed to failure to do fixation.
5. Inability to read an MRI perfectly and to precisely locate the pain producing disc often leads to two or three level discectomy and addition of fixation to prevent instability. As can be seen, in our series only one patient required two-level discectomy. Multilevel disc prolapse is not very common. It is important to differentiate a normal age-related degenerative disc from a pathologic disc protrusion causing symptoms.
6. A more worrying point is that majority of the cases where fixation is done without any definite indications are rarely ever reported, presented, or published. Hence, the actual number of unwarranted spinal fixation procedures is much more than what is being reported, particularly in a developing country like India where there is no national database or registry.

The authors have no bias toward instrumentation as they are doing fixation and fusion procedures wherever indicated in presence of instability and deformity.

We believe that our results of lumbar microdiscectomy will encourage the upcoming spine surgeons to perform the "motion sparing" micro/endoscopic procedures for lumbar disc herniation and to use the fixation and fusion procedures only in the presence of well-defined indications.

Conclusion

Lumbar disc prolapse is best treated by microdiscectomy that preserves motion at the spinal motion segment, does not disturb the regional spinal anatomy significantly, leads to less postoperative back pain, and is cheaper.

Implants for spine fixation, though a very useful tool for treating spinal disorders, should be used judiciously only for definitive indications, keeping in mind the long-term consequences of loss of spinal motion segment, and the financial burden to the patient in a developing country like India.

Conflict of Interest
None.

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