

## Reperforming Minimally Invasive Microdiscectomy Approaches for Recurrent Lumbar Intervertebral Disc Prolapse

Wael Ossama Hamouda, MD.

Department of Neurosurgery, Cairo University Medical School and Teaching Hospitals, Egypt

### Abstract

**Background Data:** Reperforming minimally invasive discectomy (MID) approaches are typically challenging and demanding for patients with recurrent lumbar disc herniation (rLDH).

**Purpose:** The aim of this study to assess the safety and efficacy of reperforming Minimally invasive discectomy in recurrent lumbar disc herniation surgery.

**Study Design:** Retrospective clinical case study.

**Patients and Methods:** The author reviewed the medical records all patients re-operated after MID during the period from June 2010 to April 2016 via minimally invasive approaches for recurrent lumbar disc herniation. Age, gender, presenting symptoms, disc herniation level and side, type of MID approach used in first surgery, period between 1<sup>st</sup> and 2<sup>nd</sup> surgeries, redo surgery duration, intra or post-operative complications, visual analogue scale VAS for pain at 1, 30, and 90 days postoperatively were recorded.

**Results:** We could track 18 patients (12 males, 6 females), with mean age 43.2±6.3 years. The most operated level was L4/5 in 12 patients. Disc herniation on the left side was presented in 11 patients. Mean duration between the two surgeries was 44±19 weeks. Main clinical presentations were recurrent leg pain in 16 patients and new onset of partial foot drop in 2 patients. Duration of redo surgery was 97±37 minutes. Intraoperative minor dural tears were reported in 2 with no serious sequels. VAS for leg pain improved from 7.3±1.2 preoperatively to 2.1±1.1, 1.4±0.5 and 1.2±0.4 at 1, 30 and 90 postoperative days respectively.

**Conclusion:** MID approach for rLDH following initial MID surgery sounds feasible option with better perioperative and short-term outcome. Clinical outcome in the present study showed favourable outcome regarding operative time and incidence of dural tears with CSF leak comparing to open approaches. (2017ESJ151)

**Keywords:** recurrent Lumbar disc; minimally invasive; microdiscectomy

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## Introduction

Lumbar disc herniation (LDH) presenting with sciatica is the most common indication of lumbar spine surgery. Surgery is usually mandated after failure of conservative management.<sup>12,15,15</sup>. Although numerous factors might be the cause of disc surgery failure, recurrent LDH (rLDH) remains the most common cause with a reported incidence of 3-24%.<sup>1,8</sup>

Different surgical approaches can be applied for lumbar discectomy. Though the results of conventional open discectomy are equally good, microdiscectomy introduced by Yasargil and Caspar (1977) is now considered the gold standard.<sup>6</sup> Also, microendoscopic discectomy introduced by Foley et al,<sup>7</sup> in 1997 combines standard lumbar microsurgical techniques with an endoscope. In general, minimally invasive discectomy techniques (MID) in treating de novo LDH showed equal or favorable outcomes compared to open approaches,<sup>11</sup> with added benefit of smaller incision and less tissue trauma.

Surgery for rLDH is relatively more challenging due to the distorted anatomy and epidural fibrosis after the first surgery.<sup>4</sup> Incidental dural tears and/or nerve root injuries are other challenges. The aim of the study was to investigate the safety and efficacy of performing a second MID approach for patients with recurrent lumbar disc herniation.

## Patients and Methods

In this study we retrospectively reviewed our hospital medical records of patients who were re-operated using second MID approach for symptomatic rLDH in the period from July 2010 to April 2016 were reviewed. All patients involved in the study had recurrent disc herniation at the same level and side of the previous MID. All included patients had a definite pain-free period of at least three months from first surgery. Clinical presentation included refractory recurrent sciatica not responding to conservative measures for at least 8 weeks and/or progressive new onset of motor/sensory deficit. Recurrent disc herniation was confirmed radiologically in all cases using contrast-enhanced Magnetic Resonance Imaging (MRI), and

correlated to the radiculopathy pattern presented by the patients. (Figure 1) Exclusion criteria included initial open discectomy, clinical or radiological signs of segmental instability at the index level, cauda equina syndrome, concomitant spinal pathology necessitating additional surgery, and failure to follow up for at least three months postoperatively.

### **Surgical Technique:**

A 25mm skin incision was performed utilizing the previous surgical scar. All patients were operated with MID approach via a subperiosteal muscle dissection and lateral retraction using Aesculap® lumbar microdiscectomy retractor system. Surgical microscope was typically used in all cases. Usually 3-4 mm of the caudal edge of the proximal lamina was drilled to expose a “virgin” zone to start operating from. In that “virgin” zone where no adhesions have developed, a dissection plane is easily developed between the ventral aspect of the theca/nerve root and the posterior longitudinal ligament in the lateral canal recess. A rigid blunt hook is then introduced in this plane and carefully moved caudally to redevelop this plane in the zone of previous surgery. Most of the adhesive fibrous bands can be easily released using this technique. Very tight fibrous bands, after confirming that it is devoid of any dural sleeve, can be transected using a 1mm Kerrison rongeur. The dissected nerve root is then medially displaced and protected, before retrieving the offending fragment and reopening the disc space.

Data collected were age, gender, level and side of the rLDH, type of the primary MID technique (microscopic or endoscopic), duration between first and second surgeries, presenting symptoms and signs, duration of the redo surgery, and intraoperative or postoperative complications. All microscopic discectomy patients were routinely admitted at the operation day morning and are discharged next day morning. Visual Analogue Scale (VAS) preoperatively and at days 1, 30 and 90 postoperatively was recorded to measure sciatica improvement.

Data were analysed using the SPSS ver. 13.0 statistical software package (SPSS Inc., Chicago, IL, USA). The continuous variables are presented as mean  $\pm$  standard deviation.

## Results

A summary of all the data of Patients reported in this Study is depicted in table 1. A total of 18 patients were identified, twelve males and six females, with mean age  $43.2 \pm 6.3$  (Range, 33-57) years. Most operated level was L4/5 (12 patients, 66.6%) followed by L5/S1 (5 patients) and L3/4 (one patient). Most operated side was the left side (11 (61%) patients were lefts and 7 patients were right side).

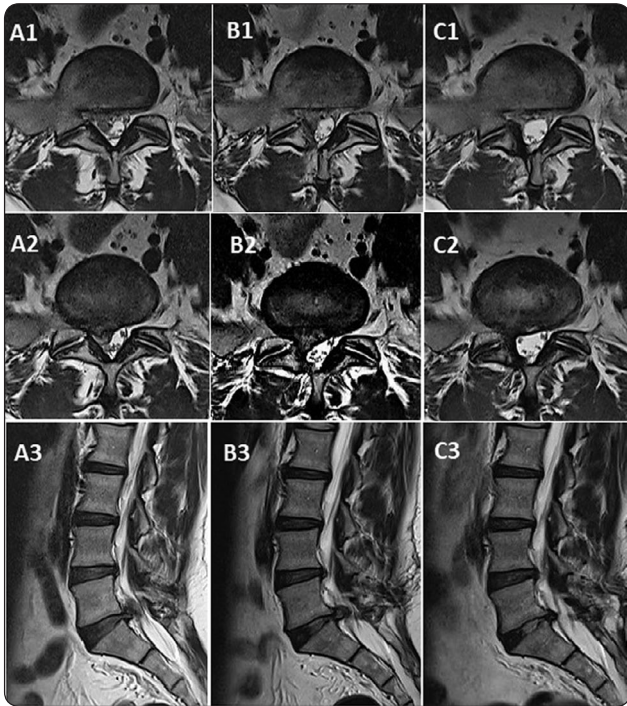
Nine patients were previously operated via MID using Casper-like retractors / microscopic visualization, five patients using tubular retractors / microscopic visualization, and four patients using tubular retractors / endoscopic visualization techniques. Mean duration between the two surgeries was  $44 \pm 19$  (Range, 15-92) weeks. Recurrent sciatica refractory to conservative treatment was the main presentation in sixteen patients (88.8%), while two patients presented by new onset foot weakness (both had partial foot drop, motor power grade 4/5), and both improved to full motor power after surgery and physiotherapy rehabilitation.

Mean duration of the second surgery was  $97 \pm 37$  (Range, 52-158) minutes. Intraoperative small dural tears occurred in two patients, one with intact arachnoid (no cerebrospinal fluid CSF leak) and the other with frank CSF leak. As primary suturing was inaccessible due to the small surgical field, both tears were reinforced with a muscle patch, augmented with DuraSeal® in the second patient, with no intra or postoperative sequels.

None of the patients developed new postoperative neurological deficits or surgical site infection. The mean preoperative VAS for sciatica was  $7.3 \pm 1.2$ , while it was  $2.1 \pm 1.1$ ,  $1.4 \pm 0.5$  and  $1.2 \pm 0.4$  at the 1<sup>st</sup>, 30<sup>th</sup> and 90<sup>th</sup> postoperative day respectively.

**Table 1.** Summary of Data of 18 Patients Reported in this Study

Parameters		Value
Age/years		$43.2 \pm 6.3$
Gender	Male	12 patients
	Female	6 patients
Level	L3/4	1 patient (5.5%)
	L4/5	12 patients (66.6%)
	L5/S1	5 patients (27.7%)
Duration between two surgeries/weeks		$44 \pm 19$
Type of first MID surgery	Casper-like retractors / Microscopic visualization	9 patients
	Tubular retractors / Microscopic visualization	5 patients
	Tubular retractors / Endoscopic visualization	4 patients
Presentation	Sciatica	16 patients (88.8%)
	Partial foot drop	2 patients (11.2%)
Operative Time/min		$97 \pm 37$
VAS for Sciatica	Preoperative	$7.3 \pm 1.2$
	Day 1 postoperative	$2.1 \pm 1.1$
	Day 30 postoperative	$1.4 \pm 0.5$
	Day 90 postoperative	$1.2 \pm 0.4$



**Figure 1.** An illustrative case of 32 years old male patient presenting with a 3 months duration recurrent right sciatica after a previous successful L5-S1 right microdiscectomy operation 7 months earlier. (A1) & (A2) & (A3) Axial & sagittal MRI T2 images before the initial first surgery. (B1) & (B2) & (B3) Axial & sagittal MRI T2 images before the second surgery, 7 months after the first surgery, showing recurrent disc prolapse which was found intraoperatively to be a cartilaginous endplate fragment. (C1) & (C2) & (C3) Axial & sagittal MRI T2 images 90 days after the second surgery, with patient reporting complete resolution of his sciatica.

## Discussion

Surgery for rLDH is classically accompanied with higher incidence rate of surgical morbidity if compared to first surgery.<sup>14</sup> This is particularly related to the loss of smooth tissue planes, distorted anatomy and epidural scar tissue which increases the risk of incidental dural tear and nerve root injury.<sup>10</sup>

MID techniques for lumbar discectomy are variable but share common principals: small skin inlet, targeted surgical corridor, and utilization of visual magnification tools. Generally, there are either microscopic or endoscopic techniques, or a combination of both. The surgical trajectory may differ according the targeted pathology and available equipments between median or paramedian, as well as either interlaminar or transforaminal. MID techniques proved comparable long term clinical outcomes to open approaches<sup>5</sup> arguing that there may be less injury to the paraspinal muscles, decreased postoperative pain, and a faster recovery time. However, a recently published large randomized controlled trial (RCT. However, MID showed favorable secondary outcomes as reduced soft tissues trauma, less postoperative pain, shorter hospital stay and better cosmesis.<sup>2</sup>a comprehensive

search was performed in PubMed, EMBASE, Web of Science, Cochrane Library and the Chinese Biological Medicine Database. Only randomised controlled trials (RCT These secondary outcomes directly and indirectly reflect on length of postoperative sick leaves, and how fast the patients return to their work and time needed for rehabilitation, which indeed has a marked economic and social impact.

Still the majority of surgeons prefer the use of standard open discectomy approach to treat rLDH,<sup>4</sup> performing relatively extensive tissue dissection aiming for a wider exposure to provide better recognition of anatomical landmarks and safer tissue manipulation.

The rational of this study was the assumption that if a MID technique had been used in the primary discectomy surgery, the postoperative surgical corridor with distorted anatomy/epidural fibrosis would be to its minimum, thus requiring less time for dissection and exposure than after open techniques. Add to it that reaching a “virgin” operative start-point is closer to the target pathology and readily accessible. Not to mention that surgical microscopes or endoscopes with their unparalleled magnification abilities are basic standard tools in MID techniques, allowing precise safer visualization, and hence less incidence of



incidental iatrogenic injuries. Re-operating utilizing the MID techniques help to grant the patient the same favorable secondary outcomes (reduction in soft tissues trauma, postoperative pain, length of hospital stays, and size of surgical wound scar), he had been privileged in his first surgery.

In this study, the mean operative time was  $97\pm 37$  minutes, longer than the reported averages for primary discectomy surgeries either open ( $44-45\text{min}$ )<sup>1,6</sup> or MID ( $49\text{min}$ )<sup>5</sup> arguing that there may be less injury to the paraspinal muscles, decreased postoperative pain, and a faster recovery time. However, a recently published large randomized controlled trial (RCT, but similar to those reported for rLDH surgeries utilizing MID ( $90\pm 35-98.5$ )<sup>10,2</sup> and slightly shorter than those reported for rLDH open surgeries ( $125.3-141\text{min}$ )<sup>1,4</sup>

One patient developed dural tear (5.5%), with incidence close to those reported in literature for primary surgeries, as in Khan et al,<sup>17</sup> who reported incidence of (7.6%) in their reviewed 2,024 patients of primary discectomy, and as in Kamper et al,<sup>16</sup> who reported an incidence of (1.9%) from their meta-analysis pooled data, and as in Nosseir<sup>19</sup> who reported 2.3% (10/423) of incidental durotomy during lumbar discectomy. But lesser than those reported for rLDH surgeries in other series like by Shazli et al,<sup>19</sup> who reported 4 patients (26.7%) with dural tear out of 15 patients operated by MID for rLDH, and Fu et al,<sup>18</sup> who reported (15.6%) durotomy incidence in their 20 patient series for recurrent discectomy without posterolateral fusion.

VAS improved by  $5.9\pm 0.7$  over the first thirty days postoperatively, correlating with similar improvement reported in other series investigating either open or MID surgeries for rLDH.<sup>16,18,19</sup> Alkoshia et al,<sup>2</sup> reported similar results for their series of recurrent lumbar discectomy patients, with a mean preoperative sciatica VAS of ( $8.97\pm 1.03$ ) which improved to ( $2.55\pm 1.64$ ) at 90 days postoperatively. Dasenbroke et al,<sup>6</sup> also reported a mean preoperative sciatica VAS score of almost 7 which improved at long-term follow-up (1–2 years postoperatively) to a mean of 1.6 in both the MID and OD groups.

The study has some inheriting limitations of retrospective studies. Also, the number of patients were relatively small, which can be attributed to

the fact that some of the operated cases during the study period were initially excluded due to noncompliance with the follow up visits inclusion criteria. Additionally, would be there any difference in outcome in redo surgery whether the approach utilized during the first surgery has been either microscopic or endoscopic, median or paramedian, is still to be investigated when a larger number of patients for each approach is available.

## Conclusion

MID approach for rLDH following initial MID surgery sounds feasible option with better perioperative and short-term outcome. Clinical outcome in the present study showed favourable outcome regarding operative time and incidence of dural tears with CSF leak comparing to open approaches.

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Address reprint  
request to:

**Wael Ossama Hamouda, MD.**

Department of Neurosurgery, Cairo University Medical School and Teaching Hospitals, Egypt - Email: wohamouda@outlook.com

## الملخص العربي

### إعادة أداء مقاربات استئصال الغضروف الميكروسكوبي محدود التدخل للغضروف القطني المنزلق المرتجع

**البيانات الخلفية:** مقاربات استئصال الغضروف الميكروسكوبي محدود التدخل غير محبذة بحكم العادة بجراحات الغضروف القطني المنزلق المرتجع.

**الغرض:** دراسة فاعلية وسلامة إعادة أداء مقاربات استئصال الغضروف الميكروسكوبي محدود التدخل بجراحات الغضروف القطني المنزلق المرتجع

**تصميم الدراسة:** دراسة بأثر رجعي

**المرضي والطرق:** المرضى الذين أجروا جراحات استئصال الغضروف الميكروسكوبي محدود التدخل للغضروف القطني المنزلق المرتجع ما بين يونيو 2010 وابريل 2016 الذين تلقوا جراحة مثيلة لجراحتهم الأولى، تم مراجعة ملفاتهم. تم تسجيل السن، الجنس، الاعراض، المستوى الفقري والجانب المتأثر، نوع مقاربة استئصال الغضروف الميكروسكوبي محدود التدخل بالجراحة الأولى، المدة بين الجراحتين، مدة الجراحة الثانية، المضاعفات أثناء أو بعد الجراحة، مقياس الألم البصري، عند 1 و30 و90 يوم بعد الجراحة.

**النتائج:** 18 مريض (12 ذكر). متوسط السن  $43.2 \pm 6.3$  سنوات. المستوى الأكثر جراحة L4/L5 ب 12 حالة. الجانب الأيسر ب 11 حالة. المدة بين الجراحتين  $44 \pm 19$  أسبوع. الاعراض الرئيسية آلام عرق النسا المتكررة العنيدة ب 16 حالة، سقوط جزئي جديد بالقدم ب 2 حالة. مدة الجراحة الثانية  $97 \pm 37$  دقيقة. قطع صغير بالألم الجافية بحالتين بلا مضاعفات. مقياس الألم تحسن من  $7.3 \pm 1.2$  قبل الجراحة الى  $2.1 \pm 1.1$  و  $1.4 \pm 0.5$  و  $1.2 \pm 0.4$  عند 1 و 30 و 90 يوم بعد الجراحة.

**الاستنتاج:** إعادة الجراحة باستخدام مقاربات استئصال الغضروف الميكروسكوبي محدود التدخل بجراحات الغضروف القطني المنزلق المرتجع بعد جراحة مثيلة أولية لها مميزات نظرية سليمة. النتائج الإكلينيكية لتلك الدراسة متقاربة إذ لم تكن أفضل بهامش بسيط للمقاربات المفتوحة.