

Minimally invasive tubular microdiscectomy

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Minimally invasive tubular microdiscectomy, also known as microdiscectomy or microdecompression, is a surgical procedure used to treat herniated or bulging discs in the spine, typically in the lumbar (lower back) region. This procedure is considered minimally invasive because it involves smaller incisions and less disruption to the surrounding tissues compared to traditional open surgery.

Key aspects

Indications: This procedure is commonly performed when a patient experiences symptoms like lower back pain, leg pain (sciatica), numbness, or weakness due to pressure on spinal nerves caused by a herniated or bulging disc.

Preparation: Before the surgery, the patient may undergo diagnostic tests, such as imaging scans (MRI or CT scan), to precisely locate the affected disc and assess its condition. The surgeon will also evaluate the patient's overall health to ensure they are a suitable candidate for the procedure.

Anesthesia: Typically, the surgery is performed under general anesthesia, which means the patient is unconscious during the procedure. In some cases, local anesthesia with sedation may be used.

Incision: Instead of a large incision, the surgeon makes a small (usually less than an inch long) incision over the affected area of the spine. This incision is used to create a pathway for the surgical instruments.

Tubular retractor: A tubular retractor, a small tube-like device, is inserted through the incision and positioned over the affected disc. The retractor gently pushes aside the muscles and soft tissues to provide access to the spine without cutting or damaging them.

Microsurgical instruments: Microsurgical instruments, including a microscope or endoscope for visualization and small surgical tools, are inserted through the tubular retractor to perform the surgery.

Disc removal: The surgeon carefully removes the portion of the herniated or bulging disc that is

compressing the spinal nerves. This alleviates pressure on the nerves and relieves symptoms.

Closure: After the disc material is removed, the tubular retractor is removed, and the incision is closed with a few stitches or surgical glue.

Recovery: Minimally invasive tubular microdiscectomy usually results in a shorter hospital stay and quicker recovery compared to open surgery. Patients may be encouraged to start moving and walking shortly after the procedure to prevent complications and aid in healing.

Postoperative care: Patients are typically advised to avoid heavy lifting, bending, or twisting of the spine for several weeks after the surgery. Physical therapy and rehabilitation may be recommended to help strengthen the back and improve mobility.

Minimally invasive tubular [microdiscectomy](#) in the lumbar spine results in a small, but statistically significant, advantage in [length of stay](#) compared to conventional open microdiscectomy. While small on an individual basis, this difference may translate to substantial economic savings over time when one considers how many discectomies are performed in aggregate ¹⁾

The clinical outcome of [minimally invasive tubular microdiscectomy](#) is comparable to the reported success rates of other minimally invasive techniques. The dural tear rate is not associated to higher morbidity or worse outcome. The technique is an equally effective and safe treatment option for recurrent LDH ²⁾.

The traditional MI [transpedicular thoracic discectomy approach](#) can be further refined and enhanced by [stereotactic navigation](#) to expand the limitations of the MIS technique allowing for an increased number and types of patients eligible for minimally invasive surgery. Therefore, [Minimally invasive tubular microdiscectomy](#) with stereotactic navigation is a novel, safe, and effective improvement in feasibility from the traditional minimally invasive transpedicular thoracic discectomy technique ³⁾.

Advantages

This minimally invasive approach can offer several advantages over traditional open surgery, including less postoperative pain, reduced scarring, faster recovery, and a lower risk of complications. However, not all patients are suitable candidates for this procedure, and the choice of surgical approach depends on the individual's specific condition and the surgeon's assessment. It's essential to discuss all available treatment options with your healthcare provider to determine the best course of action for your spine condition.

Recurrence and Complications

Recurrence of disc herniation is a potential concern following microdiscectomy, and studies have reported recurrence rates ranging from a few percent to around ten percent. Factors such as patient

selection, surgical technique, and postoperative care may influence the risk of recurrence.

Complications associated with minimally invasive tubular microdiscectomy may include dural tears, neurological deficits, wound infections, and postoperative instability. However, the overall complication rate tends to be low, and most patients experience successful outcomes.

Case series

9 patients with RLDH at the same level and same side was included in the study. Clinical outcomes were assessed using the visual analog score (VAS) for leg pain before and three months after surgery.

A significant improvement was observed between the preoperative and postoperative VASs [mean (SD): 9.2 (1) vs. 1.5 (1)] for all patients. We did not report any incidental durotomy, neurological deficits or mortality in this study. One patient had superficial wound infection. The study is limited by small population, short follow-up and not reporting stability or spondylolisthesis.

A modified tubular discectomy technique with safe scar dissection is effective for RLDH treatment. Technically, the only scar needed to be dissected is the scar lateral to the exposed normal dura and the scar extended caudally till the level of the superior end plate of the targeted disc space where the scar can be entered ventrally and the disc fragment retrieved. Adherence to the step-by-step procedure described in our study will help surgeons operate with more confidence and minimize complications of recurrent lumbar disc herniation ⁴⁾.

2017

A retrospective study was conducted using prospectively collected data from a consecutive cohort of all 1241 patients operated for single-level lumbar disc herniation with tubular microdiscectomy by a single surgeon who already had extensive experience with this technique. They collected demographic and perioperative data and consequently tracked all complications, recurrent herniations, and other reoperations. Additionally, 495 patients (40%) provided complete outcome scores on a numeric rating scale for back and leg pain and the Oswestry Disability Index at baseline, 6 weeks and 12 months postoperatively.

A decrease in surgical time ($p < 0.001$) and recurrent herniations were observed ($p = 0.012$) over time. Increased leg pain at six weeks was independently associated with recurrent herniation ($p = 0.01$). Fifty-six patients (4.5%) experienced ipsilateral recurrent herniation.

Relevant improvements in clinical results were seen even after surgeons had already accumulated extensive experience. Any future studies should unambiguously report the level of experience of the participating surgeons, possibly including the number of cases previously treated using a particular technique ⁵⁾.

Minimally invasive tubular microdiscectomy (MITD) has been reported as an equivalent treatment to traditional approaches and may have better utility for revision surgery. A retrospective review of MITDs performed by the senior surgeon (F.A.S.) on 42 patients with single-level, recurrent disk herniation was analyzed. Surgical technique, preoperative and postoperative visual analogue score,

modified Macnab criteria, and complication rate were compared with similar patient series in the literature. One case is reviewed and the technique is described in detail. There were no significant differences across age (49.5 ± 14.1), sex, or obesity status. Visual analogue scores improved significantly from 7.24 ± 1.75 to 2.45 ± 2.12 ($P < 0.001$). Successful clinical outcome (excellent or good Macnab score) was reported in 83.3% of patients. There were no postoperative complications, including dural tears or wound infections: fewer than any reported series of this size to date. MITD can be safely performed for revision discectomies with low morbidity. A paramedian approach helps to decrease the exposure to preexisting scar tissue and may offer a significant advantage over the traditional midline approach to treat recurrent disk herniation ⁶⁾.

2016

Thirty consecutive patients who underwent minimally invasive tubular microdiscectomy for recurrent LDH were included in the study. The preoperative and postoperative [visual analog scale](#) (VAS) scores for pain, the clinical outcome according to modified [Macnab criteria](#), and complications were analyzed retrospectively. The minimum follow-up was 1.5 years. Student t-test with paired samples was used for the statistical comparison of pre- and postoperative VAS scores. A p value < 0.05 was considered to be statistically significant.

The mean operating time was 90 ± 35 minutes. The VAS score for leg pain was significantly reduced from 5.9 ± 2.1 preoperatively to 1.7 ± 1.3 postoperatively ($p < 0.001$). The overall success rate (excellent or good outcome according to Macnab criteria) was 90%. Incidental durotomy occurred in 5 patients (16.7%) without neurological consequences, CSF fistula, or negative influence to the clinical outcome.

Instability occurred in 2 patients (6.7%).

The clinical outcome of minimally invasive tubular microdiscectomy is comparable to the reported success rates of other minimally invasive techniques. The [dural tear](#) rate is not associated to higher morbidity or worse outcome. The technique is an equally effective and safe treatment option for recurrent LDH ⁷⁾.

2011

From 2005 to 2010, Lee et al. analyzed 109 patients who underwent elective, single-level lumbar discectomy for central or paracentral disc herniations. A retrospective analysis of medical records was performed for perioperative complications. Tubular discectomy was not associated with increased rates of [durotomy](#), nerve root injury, wound complications, or recurrent disc herniations requiring additional surgery. Minimally invasive tubular discectomy in the lumbar spine results in a small, but statistically significant, advantage in length of stay compared to conventional open microdiscectomy. While small on an individual basis, this difference may translate to substantial economic savings over time when one considers how many discectomies are performed in aggregate ⁸⁾.

2010

Under general anaesthesia and fluoroscopic guidance, a guidewire was placed over the inferior aspect

of the superior lamina. A 2.5-3 cm midline skin incision was made, followed by paramedian lumbar fascia incision. Then, dilators were sequentially introduced (muscle-splitting approach). Finally, a tubular retractor was fixed directly over the interlaminar space. Further stages of the procedure were performed using an operating microscope and standard microdiscectomy equipment. The first 13 consecutive patients operated on using this method were analysed. Twelve patients were operated on at one level and 1 at two levels. Disc herniation was centro-lateral in 10 cases, lateral in 2 and central (broad-based) in 2 patients.

Regression of radicular pain was noted in all patients. No postoperative complications were observed except for prolongation of wound healing in 2 patients. According to modified MacNab criteria, excellent late outcome was achieved in 8 patients and good in 4 patients. There were no cases of recurrent radicular pain or need for surgical revision for herniation recurrence. One patient was reoperated on because of low back pain (implantation of an interspinous spacer).

Microscopically assisted lumbar discectomy using the METRx X-Tube system seems to be safe and effective. This method combines the advantages of modern minimally invasive techniques while avoiding the limitations of endoscopy ⁹.

Moliterno et al. retrospectively reviewed the cases of 217 patients who underwent tLMD for single-level LDH performed identically by 2 surgeons (J.B., R.H.) between 2004 and 2008. Evaluation for LDH recurrence included detailed medical chart review and telephone interview. Recurrent LDH was defined as the return of preoperative signs and symptoms after an interval of postoperative resolution, in conjunction with radiographic demonstration of ipsilateral disc herniation at the same level and pathological confirmation of disc material. A cohort of patients without recurrence was used for comparison to identify possible risk factors for recurrent LDH.

Of the 147 patients for whom the authors were able to definitively assess symptomatic recurrence status, 14 patients (9.5%) experienced LDH recurrence following single-level tLMD. The most common level involved was L5-S1 (42.9%) and the mean length of time to recurrence was 12 weeks (range 1.5-52 weeks). Sixty-four percent of the patients were male. In a comparison with patients without recurrence, the authors found that relatively lower body mass index was significantly associated with recurrence ($p = 0.005$), such that LDH in nonobese patients was more likely to recur.

Recurrence rates following tLMD for LDH compare favorably with those in patients who have undergone open discectomy, lending further support for its effectiveness in treating single-level LDH. Nonobese patients with a relatively lower body mass index, in particular, appear to be at greater risk for recurrence ¹⁰.

2002

One hundred thirty-five patients underwent surgery in which the METRx-MD system was used; most procedures were performed on an outpatient basis, and general anesthesia was induced in all cases. All patients were followed prospectively. Outcomes were measured using a visual analog scale (VAS), the Oswestry Disability Index (ODI), and the Short Form-36 (SF-36) questionnaires. Follow-up data were collected by an outside company, which also tabulated the data. Data were collected in 129 of 135 patients. Improvement was seen on the VAS (Scores 7-2), ODI (Scores 57-16), and SF-36 scales (bodily pain Scores 20-60). Patient satisfaction with results was 94% and with office services 88%. Thirty-six percent of patients returned to work at 0 to 2 weeks, 38% at 3 to 5 weeks, and 25% at 5 to

26 weeks. Hospital charges decreased by \$2395 (18%). The mean operative time was 66 minutes, and the mean blood loss was 22 ml. Complications included one superficial wound infection, one discitis, three durotomies, and three cases of excessive bleeding (> 100 ml). There were five reoperations: four for recurrent disc herniations, (two ipsilateral and two contralateral to the index site) and one for spinal stenosis contralateral to the index site.

Minimally invasive surgery in which the METRx-MD system is used is clinically effective and cost effective. Patient satisfaction was high. A mean per case cost savings of \$2395 was realized. Complications rates were comparable with those associated with traditional microdiscectomy procedures ¹¹⁾.

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