



Endoscopic Discectomy and Decompression

Scientific Update

Endoscopic discectomy is an ultra-minimally invasive technique for removing a variety of disc herniations. A transforaminal, or paraspinous, approach provides the ability to reach far-lateral disc herniations. Meanwhile, an interlaminar approach provides minimally invasive access to posterior herniations in the lower lumbar spine that may be difficult to reach through a transforaminal approach. These endoscopic approaches result in less tissue and muscle disruption, resulting in less postoperative pain.¹⁻³ Additionally, patients have shown faster recovery times and a quicker return to activity than with traditional open procedures.^{4,5}

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Komp M,
Godolias G

Interlaminar Approach

[A new full-endoscopic technique for the interlaminar operation of lumbar disc herniations using 6 mm endoscopes: prospective 2-year results of 331 patients.](#) *Minim Invasive Neurosurg.* 2006;49(2):80-87. doi:10.1055/s-2006-932172

- Examined the technical possibility of full-endoscopic interlaminar access to reach the spinal canal
- 331 patients were followed for 2 years post-op
- 82% reported no longer having leg pain, while 13% had only occasional pain
- Traumatization of both the access pathway and the spinal canal was reduced compared to conventional procedures

Takeaway

This study found that the full endoscopic interlaminar approach for lumbar disc herniations is a viable alternative to open or microscopic approaches, with a low 2-year recurrence rate (2.4%), no documented complications in 331 patients, and less approach trauma.

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Chen R,
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[Endoscopic and microscopic interlaminar discectomy for the treatment of far-migrated lumbar disc herniation: a retrospective study with a 24-month follow-up.](#) *J Pain Res.* 2021;14:1593-1600. doi:10.2147/JPR.S302717

- Retrospective study of 53 consecutive patients with symptomatic far-migrated lumbar disc herniations treated with interlaminar endoscopic discectomy or interlaminar microscopic discectomy (endoscopic = 33 patients, MIS = 20 patients)
- Patients reported 78.95% excellent or good pain ratings at 2-year postoperative follow-up after microscopic lumbar discectomy
- Patients reported 90.32% excellent or good pain ratings at 2-year postoperative follow-up after endoscopic interlaminar discectomy for a lumbar herniated disc

Takeaway

As compared to the microscopic interlaminar approach, interlaminar endoscopic lumbar discectomy for far-migrated lumbar disc herniations had a higher rate of excellent results (90.31% vs 78.95%), resulted in better Visual Analog Scale (VAS) scores for lower back pain, lower 24-month Oswestry Disability Index (ODI) scores, and statistically similar complication rates.

Lee CH,
Choi M,
Ryu DS,
Choi I,
Kim CH,
Kim HS,
Sohn MJ

[Efficacy and safety of full-endoscopic decompression via interlaminar approach for central or lateral recess spinal stenosis of the lumbar spine: a meta-analysis](#) [published correction appears in *Spine (Phila Pa 1976)*. 2019;44(4):E258]. *Spine (Phila Pa 1976)*. 2018;43(24):1756-1764.

- Considered studies concerning full-endoscopic decompression via the interlaminar approach for lumbar spinal stenosis. Changes in ODI and VAS scores for back and leg pain were compared with the minimally clinically important difference (MCID) for each.
- Five studies involving 156 patients at 6- and 12-month follow-ups
- ODI improved by 41.71 (95% CI, 39.80-43.62) after surgery
- VAS leg and back pain scores improved by 5.95 (95% CI, 5.70-6.21) and 4.22 (95% CI, 3.88-4.56), respectively

Takeaway

Successful clinical outcomes can be achieved with full-endoscopic decompression via the interlaminar approach for lumbar central spinal stenosis in patients with defined indications.

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Hahn P,
Oezdemir S,
Giannakopoulos A,
Heikenfeld R,
Kasch R,
Merk H,
Godolias G,
Ruetten S

[Bilateral spinal decompression of lumbar central stenosis with the full-endoscopic interlaminar versus microsurgical laminotomy technique: a prospective, randomized, controlled study](#). *Pain Physician*. 2015;18(1):61-70.

- 135 patients treated with full-endoscopic or microsurgical decompression were followed for 2 years post-op
- Postoperatively, 72% of patients no longer had leg pain or the pain was almost completely reduced and 21.2% experienced occasional pain
- Clinical results were similar in both groups, but complications and revisions were significantly reduced in the endoscopic surgery group. There were also measurable advantages in operative time, traumatization, and post-op rehabilitation.

Takeaway

In this prospective randomized controlled clinical trial, as compared to microscopic bilateral laminotomy for lumbar central stenosis, full-endoscopic unilateral laminectomy for bilateral decompression (ULBD) yielded lower rates of complications, fewer revisions, shorter operative times, less need for postoperative medications, shorter hospital stays, and similar long-term outcomes.



Ruetten S,
Komp M,
Merk H,
Godolias G

[Surgical treatment for lumbar lateral recess stenosis with the full-endoscopic interlaminar approach versus conventional microsurgical technique: a prospective, randomized, controlled study.](#) *J Neurosurg Spine.* 2009;10(5):476-485. doi:10.3171/2008.7.17634

- 161 patients treated with interlaminar full-endoscopic or microsurgical decompression underwent follow-up for 2 years. VAS, ODI, and the German version of the NASS instrument were used to analyze patient-reported outcomes.
- 74.5% of patients reported no longer having leg pain and 20.5% reported only occasional pain
- Clinical results were comparable in both groups, but rates of complications and revisions were significantly reduced in the interlaminar endoscopic group

Takeaway

The clinical results of both groups were comparable but endoscopic surgery showed advantages related to operative time, rates of complications and revisions, traumatization, and rehabilitation.

Transforaminal Approach

[Awake, transforaminal endoscopic lumbar spine surgery in octogenarians: case series.](#) *Pain Physician.* 2022;25(2):E255-E262.

- Retrospectively reviewed 52 consecutive patients who underwent awake transforaminal lumbar endoscopic decompression performed by a single surgeon at a single institution between 2014-2019
- Transforaminal surgeries performed included discectomies (21), foraminotomies (7), post-laminectomy redo foraminotomies (5), fusion explorations (13), facet cyst resections (3), spondylolisthesis decompressions (2), and a decompression for metastatic disease (1)
- 13.5% (7/52 patients) required repeat surgery at the treated level during the one-year follow-up
- For the remaining 45 patients, VAS for leg pain improved from 6.9 +/- 1.4 to 1.8 +/- 1.4
- For the remaining 45 patients, ODI improved from 40.5% +/- 11.5% to 12.0% +/- 10.8%
- The only complication was a single durotomy (2%)

Takeaway

Endoscopic spine surgery offers octogenarians a safe and effective option for treatment of lumbar degenerative spine disease and may represent a valuable treatment strategy in a growing patient population.

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Sastry R,
Oyelese A,
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Camara-Quintana JQ,
Niu T,
Sampath P,
Lewandrowski KU,
Mueller K,
Gokaslan ZL



[Return to work and recovery time analysis after outpatient endoscopic lumbar transforaminal decompression surgery. *J Spine Surg.* 2020;6\(Suppl 1\):S100-S115. doi:10.21037/jss.2019.10.01](#)

- Retrospective study of 442 patients with symptomatic, contained lumbar herniated discs treated with transforaminal endoscopic surgery
- Mean follow-up of 33.5 months (24-85 months)
- Mean patient age of 40.9 years (30-85 years)
- Excellent and good results were obtained in 83.7% (370/442) of patients
- Patients performing heavy and medium work had lower return to work (RTW) rates than patients who perform light work, at 87.5%, 86%, and 95.7%, respectively
- Mean RTW was 22.27 days for heavy, 13.97 days for medium, and 7.58 days for light work
- Following endoscopic lumbar spine surgery, 83.7% of patients showed significantly improved function and were able to return to work in 10 days or less

Takeaway

RTW and recovery time with narcotic independence following endoscopic transforaminal lumbar decompression for symptomatic contained lumbar disc herniations is on the order of 10 days or less in the vast majority of patients, with an average RTW rate of 92.5%.

Other Studies

[A postoperative phenomenon of percutaneous endoscopic lumbar discectomy: rebound pain. *Orthop Surg.* 2021;13\(8\):2196-2205. doi:10.1111/os.13088](#)

- Retrospective study of 144 patients treated with single-segment percutaneous endoscopic lumbar discectomy (PELD) from May 2017 to June 2020
- Successful outcomes, according to the modified MacNab criteria, reached 94.4%
- Fifteen patients (10.4%) experienced rebound pain that usually began within 1 month of procedure and lasted for less than 1 month. Symptoms were relieved with conservative treatment.
- One year after undergoing endoscopic discectomy, approximately 94% of patients had significantly improved function and were able to restore strength and motion through exercise

Takeaway

Postoperative rebound pain (radiculitis) can occur in up to 10% of PELD procedures without recurrence or instability but normally resolves within a month and does not influence long-term outcomes. Great care must be taken to avoid inadvertent pressure on the dorsal root ganglion with this approach.

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Williams JR,
Feroze AH,
Eaton J,
Pan ZJ,
Boop S,
McGrath LB,
Harmon K,
Hofstetter CP

[Endoscopic spine surgery in athletes: case series and review of literature.](#) *World Neurosurg.* 2021;145:702-707. doi:10.1016/j.wneu.2020.08.211

- The best evidence available cites a return to play of 81% at 5.2-8.7 months after traditional open and minimally invasive surgery. Endoscopic surgery shows an average 88% return-to-play rate at 3 months
- Patients who undergo endoscopic lumbar spine surgery may be able to return to sports and activities such as golf, soccer, tennis, pickleball, yoga, and other recreational activities in just 6 to 8 weeks
- More than 85% of patients who undergo endoscopic lumbar spine procedures return to athletics

Takeaway

This review study suggests that endoscopic spine surgery in athletes may offer both a quicker and higher rate of return to play than traditional minimally invasive approaches, but direct comparison and data volume is lacking.

Ruetten S,
Komp M,
Merk H,
Godolias G

[Full-endoscopic interlaminar and transforaminal lumbar discectomy versus conventional microsurgical technique: a prospective, randomized, controlled study.](#) *Spine (Phila Pa 1976).* 2008;33(9):931-939. doi:10.1097/BRS.0b013e31816c8af7

- 178 patients treated with full-endoscopic or microsurgical discectomy underwent follow-up for 2 years
- Postoperatively, 82% of patients no longer had leg pain and 14% had occasional pain
- Clinical results were the same in both groups
- Minimal blood loss and less tissue disruption as compared to conventional microsurgical techniques
- A transforaminal endoscopic approach can help relieve nerve compression while minimizing incision size and disruption to surrounding soft tissue and muscle anatomy

Takeaway

In this prospective RCT comparing full-endoscopic discectomy to conventional microsurgical discectomy, two-year outcomes and recurrence rates were similar but the full-endoscopic group had quicker operative times, fewer complications, quicker return to work, less post operative pain, and required less postoperative pain medication.



Comparison of clinical outcomes following minimally invasive or lumbar endoscopic unilateral laminotomy for bilateral decompression. *J Neurosurg Spine*. Published online January 11, 2019. doi:10.3171/2018.9.SPINE18689

- Retrospective analysis of 95 consecutive patients undergoing either MIS (n = 45) or endoscopic (n = 50) unilateral laminotomies for bilateral decompression to treat lumbar spinal stenosis
- Surgical time for endoscopic technique was significantly longer per level (161.8 +/- 6.8 minutes) than minimally invasive tubular surgery (99.3 +/- 4.6 minutes)
- Hospital stay for MIS patients was an average of 2.4 +/- 0.5 days compared to 0.7 +/- 0.1 days for endoscopic patients
- At 1-year follow-up, endoscopic patients had a significantly lower VAS score for leg pain (1.3 +/- 0.3) compared to MIS patients (3.0 +/- 0.5)
- At 1-year follow-up, endoscopic patients had a significantly lower ODI for back pain (20.7 +/- 3.4) compared to MIS patients (35.9 +/- 4.1)
- Two patients in the MIS group and 1 patient in the endoscopic group required a return to the OR acutely after surgery

Takeaway

Lumbar endoscopic unilateral laminotomy for bilateral decompression is a safe and effective surgical procedure with a favorable complication profile and positive patient outcomes. The endoscopic group had better clinical outcomes and shorter length of hospital stay, fewer complications, and fewer revisions.



[Current techniques of endoscopic decompression in spine surgery.](#) *Ann Transl Med.* 2019;7(Suppl 5):S169. doi:10.21037/atm.2019.07.98

- The main objective of endoscopic spine surgery is to reduce tissue trauma and maintain proper segmental stability and mobility
- Definitive benefits of endoscopic spine surgery over conventional open surgery can be summarized by research:
 - Minimized tissue damage through the use of a small skin incision, reduced need for extensive laminar or facet resection, dural sac retraction, and reduced blood loss
 - Feasibility of outpatient surgery, with the aid of local anesthesia combined with conscious sedation, leading to reduced operative time and shorter length of hospital stay
 - An earlier recovery, potentially obtainable due to less postoperative medication, fewer wound complications, and a quicker return to work
- There are studied limitations and risks to endoscopic spine surgery, including:
 - Rate of perioperative complications such as hematoma, dural tear, and surgical site infection can be relatively low. However, adverse events such as nerve root injury, tissue damage, and increased radiation exposure are still present.
 - The learning curve is relatively challenging to ensure clinical success without complications. Systematic training in endoscopic techniques is almost required before performing in a real situation.
 - Standard indications are still widely undetermined and therefore limited. Appropriate patient selection is essential to success. A calcified disc, severe stenosis, painless weakness, or severe fibrotic tissue adhesion may be contraindications for endoscopic spinal surgery.

Takeaway

Endoscopic transforaminal lumbar discectomy has been proven through randomized trials and meta-analyses as an alternative surgical option to traditional open surgery. However, the current level of evidence is limited for other techniques, and, therefore, further high-quality research is required to confirm clinical relevance and efficacy.

Interlaminar vs Transforaminal Approach

[Transforaminal versus interlaminar endoscopic lumbar discectomy for lumbar disc herniation: a systematic review and meta-analysis.](#) *Global Spine J.* 2023;13(2):575-587. doi:10.1177/21925682221120530

- 1948 patients from 18 studies were included, consisting of 1006 (51.6%) treated with transforaminal endoscopic lumbar discectomy (TELD) and 942 (48.4%) treated with interlaminar endoscopic lumbar discectomy (IELD)
- TELD had better improvement of post-op ODI, post-op VAS for back pain, and less follow-up VAS for back pain
- IELD had shorter operative and fluoroscopic time, especially in L5-S1 operations
- Bed rest time was significantly longer following IELD, with no difference in VAS for leg pain, hospital stay length, or complications

Takeaway

Both interlaminar and transforaminal approaches to endoscopic discectomy have been studied with comparable clinical outcomes when it comes to pain measurement levels, patient satisfaction, hospital stay, and complication risk.

References

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