Comparison of Delta Spinal Endoscopy and Bilateral Laminotomy for Short-term Patient Outcomes in Degenerative Lumbar Spinal Stenosis

Dongze Wu, Tianzuo Chen and Rujie Qin

Department of Orthopedics, Clinical Medicine School of Lianyungang of Nanjing Medical University, Jiangsu, China

ABSTRACT

This prospective randomised controlled trial aimed to compare the clinical efficacy of Delta spinal endoscopy with bilateral laminotomy for degenerative lumbar spinal stenosis (DLSS). Eighty patients with DLSS were randomly assigned to two groups: 40 treatments by Delta spinal endoscopy named (A) and 40 treatments by bilateral laminotomy named (A). Patients were followed up for one year. The incision length, intraoperative bleeding, and hospitalisation time were lower in group A than in B ($p < 0.01$); however, the operation time in group B was lower than in A ($p < 0.05$). The VAS and ODI in both groups improved significantly after surgery, compared with the results before the surgery. The VAS and ODI in group A after surgery were lower than in B, but only for one week after the surgery, ($p < 0.05$). The excellent rate of modified MacNab criteria was not statistically significant between groups A and B ($p > 0.05$). Overall, Delta spinal endoscopy can effectively manage DLSS with faster patient recovery.

Key Words: *Delta spinal endoscopy, Spinal stenosis, Minimally invasive, Bilateral laminotomy*.

How to cite this article: Wu D, Chen T, Qin R. Comparison of Delta Spinal Endoscopy and Bilateral Laminotomy for Short-term Patient Outcomes in Degenerative Lumbar Spinal Stenosis. *J Coll Physicians Surg Pak* 2023; **33(09)**:1074-1076.

Degenerative lumbar spinal stenosis (DLSS) is a condition that affects the elderly, causing a reduction in the space for neural and vascular elements in the lumbar spine. The symptoms include lower extremity pain and fatigue which may be relieved by forward flexion, sitting, or recumbency. The patients with DLSS should first consider conservative treatment. Failure of conservative treatment for 3-6 months, or severe lower back pain and walking disorders should be treated surgically. The effect of surgical treatment is better than non-surgical treatment.[1] The classic treatment for DLSS is traditional laminectomy, and fusion is only considered in cases of spinal instability. Nevertheless, the traditional open surgery is more invasive and often leaves intractable lower back pain, secondary to spinal instability, epidural scarring, and adjacent segmental degeneration after surgery.[2] In the recent years, percutaneous spinal endoscopic techniques have emerged with the Delta system including a wider diameter and shorter length of working cannula, which have greatly improved in terms of visualisation, working space, safety, and efficiency. On this basis, endoscopic unilateral laminotomy for bilateral decompression (Endo-ULBD), which incorporates the concepts of targeting, precision, and minimally invasive, has been applied in the treatment of DLSS with good results.[3]

Correspondence to: Dr. Rujie Qin, Department of Orthopedics, Clinical Medicine School of Lianyungang of Nanjing Medical University, Jiangsu, China
E-mail: w862729286@163.com

Received: September 29, 2022; Revised: February 24, 2023; Accepted: March 27, 2023
DOI: https://doi.org/10.29271/jcpsp.2023.09.1074

However, very few studies directly compare and describe the clinical efficacy of the Delta system with open surgery for DLSS. Therefore, this randomised controlled trial was designed to prospectively compare the short-term outcomes of Delta spinal endoscopy and bilateral laminotomy in patients with DLSS.

This prospective randomised controlled trial was carried out at Lianyungang Clinical School of Nanjing Medical University, China, from September 2020 to October 2021, including 80 patients. The study was conducted after approval from the Hospital Ethical Committee. Inclusion criteria was Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) confirmed lumbar spinal stenosis and patients whose symptoms did not improve significantly after 3 months of non-surgical treatment. Exclusion criteria was lumbar spine slippage; lumbar infection, tumour, and other diseases, patients with previous history of lumbar surgery; patients with systemic conditions that cannot tolerate surgery patients with mental disorders; patients with severe posterior longitudinal ligament ossification.

According to the random number table method, 80 DLSS patients were randomly divided into Group A (n=40) that was treated with the Delta endoscopic and Group B (n=40) that was treated with bilateral laminotomy. The incision length, operation time, intraoperative bleeding, hospital stay, and postoperative complications were recorded and compared in both groups; the visual analog scale (VAS) assessed the patient's pain level before surgery, 1 week, 3 months, 6 months, and 12 months after surgery, and the Oswestry Disability Index (ODI) questionnaire was used to assess the patient's body function; the modified MacNab criteria evaluated excellent and good rate at 12 months after surgery.

Table I: Comparison of perioperative data between the two groups.

	Group A (n=40)	Group B (n=40)	t	p-value
Incision length (cm)	1.00±0.12	3.75±0.57	-2.41	<0.001**
Surgery time (min)	90.41±11.93	67.56 ± 12.51	8.36	<0.001**
Bleeding quantity (ml)	65.18±8.25	145.72 ±12.36	-34.28	<0.001**
Length of stay (d)	5.19±1.54	7.55±0.83	-8.53	<0.001**

*Group A, Delta system; Group B, Bilateral laminotomy; N: number; *p<0.05; **p<0.01*

The data were analysed statistically using SPSS 25.0 (IBM Corp.) software. The measurement data was expressed as mean ± standard deviation (m ± SD), and the count data were expressed as n (%). The patients' general information, perioperative data, modified Macnab criteria, and postoperative complications were compared by chi-square test or independent samples t-test, and the functional scores were compared by repeated measures analysis of variance (ANOVA). The difference was considered statistically significant at p <0.05.

The general information of the two groups' patients was not significantly different (p >0.05) and was comparable. The incision length, intraoperative bleeding, and hospital stay in Group A were all lower than in B (p <0.01). The operation time in Group B was lower than in A (p <0.01, Table I). The VAS and ODI in both groups improved significantly after the surgery in comparison to what it was before the surgery. The VAS and ODI in Group A patients after surgery and 1 week after surgery (p<0.05) were lower than those in Group B. The excellent rate of modified MacNab criteria was not statistically significant between Group A (92.50%) and B (87.50%), (p = 0.70). The incidence of post-operative complications was 5% (2/40) and 12.5% (5/40) in Group A and B, respectively, (p = 0.43).

There were no significant differences between the two groups in terms of demographic characteristics. Although comorbidities were common in this study, they were well--controlled at the start of the study, and surgical options for these patients were not affected. In this study, the incision length and intraoperative bleeding in Group A were lower than in B, however, the operation time in Group B was lower than in A (p <0.01). This is similar to the previous research.[4] Since smaller incisions are a natural advantage of endoscopic techniques, the smaller incisions in Group A allow for minimal soft tissue trauma, while the clear endoscopic view reduces the risk of small vessel injury, thereby reducing intraoperative bleeding. But intraoperative fluoroscopy, the establishment of working access, and the initial operator's lack of experience prolonged the surgery time. In addition, the hospitalisation time was shorter in Group A. This suggests that the Delta system can minimise trauma and facilitate the patient's postoperative recovery. The VAS and ODI in both groups improved significantly after surgery compared with the pre-operation. Only when 1 week after surgery, the VAS and ODI in Group A patients were lower than those in B (p <0.05). This is consistent with the previous studies.[4] This may be because prolonged traction in the bilateral Laminotomy group may lead to denervation and ischemia of the muscles beside the spine, resulting in muscle atrophy and pain in the bilateral laminotomy group after surgery. There were no statistically significant differences in excellent rates and postoperative complication rates between the two groups, similar to the previous studies,[4] which suggests that the short-term efficacy of delta spinal endoscopy and bilateral laminotomy is similar.

In this study, the unilateral laminotomy bilateral decompression spinal endoscopy was found to be comparable to bilateral laminotomy in the treatment of DLSS but demonstrated precise and limited decompression and faster recovery. Therefore, unilateral laminotomy with bilateral decompression spinal endoscopy is an alternative option for the treatment of DLSS. However, to further validate these results, additional prospective randomised controlled trials with large samples, multi-centre, and long-term follow-ups are necessary. Additionally, the study only included patients with single-segment stenosis and significant difference in the duration of symptoms, so caution should be exercised in generalising the results to patients with multi-segment stenosis and longer duration of symptoms.

FUNDING:
Sixth "521 Project" Scientific Research Project Funding Plan of Lianyungang City (LYG065212202215). Lianyungang Health Science and Technology Project (202110).

ETHICAL APPROVAL:
The study was conducted after approval from the Hospital Ethical Committee.

COMPETING INTEREST:
The authors declared no competing interest.

AUTHORS' CONTRIBUTION:
RQ: Research design and implementation.
DW: Article writing and revision, data receipt, and analysis.
TC: Article writing and revision.
All the authors have approved the final version of the manuscript to be published.

REFERENCES

1. Jensen RK, Harhangi BS, Huygen F, Koes B. Lumbar spinal stenosis. *BMJ* 2021; **373**:n1581. doi: 10.1136/bmj.n1581.
2. Bussieres A, Cancelliere C, Ammendolia C, Comer CM, Al Zoubi F, Châtillon CE, *et al*. Non-surgical interventions for

lumbar spinal stenosis leading to neurogenic claudication: A clinical practice guideline. *J Pain* 2021; **22(9)**:1015-39. doi: 10.1016/j.jpain.2021.03.147.

3. Han S, Zeng X, Zhu K, Wu X, Shen Y, Han J, *et al*. Clinical application of large channel endoscopic systems with full endoscopic visualisation technique in lumbar central spinal stenosis: A retrospective cohort study. *Pain Ther* 2022; **11(4)**:1309-26. doi: 10.1007/s40122-022-00428-3.
4. Wu B, Xiong C, Tan L, Zhao D, Xu F, Kang H. Clinical outcomes of MED and iLESSYS (R) Delta for the treatment of lumbar central spinal stenosis and lateral recess stenosis: A comparison study. *Exp Ther Med* 2020; **20(6)**:252. doi: 10.3892/etm.2020.9382.