Original Article

Lumbar Canal Stenosis Decompression Using Bilateral Interlaminar Versus Classic Laminectomy Technique

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ABSTRACT

Objective: The study compared the postoperative back pain VAS score in bilateral interlaminar and classic laminectomy techniques in patients with lumbar canal stenosis.

Material and Methods: This randomized controlled experiment was carried out at Ayub Teaching Hospital's Neurosurgery Department. 30 patients were in the bilateral interlaminar (BIL) group (A) and 30 were in the traditional laminectomy group (B). The bilateral interlaminar decompression technique was carried out utilizing the operating microscope. Both groups employed facet joint undercutting to reduce the 61-facet joint excision. All patients had postoperative CT scans to assess how well the decompression went. Postoperative VAS score was stratified to age, gender, duration of complaints, and duration of the procedure.

Results: In group A, the mean age of patients was 51.10 years while in group B, the mean age was 54.500 years. There was a male dominance of male patients in both groups. The baseline mean VAS score was 7.9 in group A and group B both. The duration of the procedure was 71.2 minutes in group A, and 104.7 minutes in group B. Mean postoperative VAS score was 5.4 in group A and 3.3 in group B. There existed a significant difference in mean postoperative VAS scores between groups concerning gender, the duration of complaints, and procedures.

Conclusion: In patients with lumbar canal stenosis, bilateral interlaminar allows for safe and adequate spinal canal decompression.

Keywords: Lumbar canal stenosis (LCS), Bilateral Interlaminar (BIL), Classic Laminectomy, Visual Analog Scale (VAS).

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INTRODUCTION

Lumbar canal stenosis is a common cause of lower back and leg discomfort. It refers to a constriction in the vertebra, specifically in the central canal, lateral recess, or neural foramen. Symptoms of lumbar radiculopathy may appear when the lateral recess and neural foramen are stenosed. Spinal stenosis is a disorder in which the nerve roots get compressed as a result of a

variety of pathologic conditions, resulting in symptoms such as pain, numbness, and weakness.[1] The upper neck (cervical) and lower back (lumbar) are the most commonly afflicted locations, while the thoracic spine can also be squeezed by a disk herniation.[2] Each form of compression might cause distinct symptoms depending on the level of the spine affected, necessitating a different treatment technique.[3] Trauma, degenerative changes, iatrogenic causes, and systemic processes are the most common causes of acquired stenosis.[4] Trauma often causes immediate mechanical stress to alter the spinal canal. Degenerative alterations occur when the central canal and lateral recess narrow due to posterior disk herniation, ligamentum flavum hypertrophy, or spondylolisthesis.[5,6]

Lumbar canal stenosis (LCS) is a common cause of lower back and leg discomfort. It refers to a constriction in the vertebra, specifically in the central canal, lateral recess, or neural foramen. Symptoms of lumbar radiculopathy may appear when the lateral recess and neural foramen are stenosed.[7-8] Minimally invasive techniques are becoming more common as technology develops. Bilateral interlaminar canal decompression is one of these minimally invasive procedures. The most frequent surgical method for LCS decompression is a conventional decompressive laminectomy. It allows for maximum operational decompression of the neural canal and/or bilateral foramina, although it causes injury to the paraspinal muscles, posterior bone compartment, supraspinous ligament, interspinous ligament, and, on rare occasions, the capsular facet.[9-10]

The literature is limited toresearch comparing these two procedures in our general community. Some investigators determined that laminectomies should only be performed in the most severe instances of LCS. Surgeon experience in Bilateral interlaminar decompression will aid in reducing surgery time and complications.In the current study, individuals with lumbar canal stenosis undergoing bilateral interlaminar and

traditional laminectomy procedures had their postoperative back pain VAS scores compared.

MATERIAL AND METHODS
Study Design & Setting
A randomized controlled trial (RCT) was conducted in Ayub Teaching Hospital from 1st February 2021 to 30th July 2021.

Patients Groups
A total of 60 patients were included. In Group A (n = 30), the classic laminectomy was done, while in Group B (n = 30), the interlaminar decompression was done.

Inclusion Criteria
Male and female patients with Lumbar canal stenosis with ages ranging from 20 – 70 years were included. Those cases of low back pain were included whose VAS score was ≥ 7.

Exclusion Criteria
Patients with a history of disc herniation, lumbar fusion, LCS surgery, arthritis, and excessive smoking (20 cigarettes per day) were excluded from the study.

Data Collection
After receiving approval from the ethics committee, for patients who met the criteria for participation, their baseline demographic data (age, gender, length of complaint, and baseline VAS score) were obtained. Back pain was assessed by using the Visual Analogue Scale. Patients gave their informed agreement, guaranteeing anonymity and the knowledge that participating in the study carries no danger to them. Block randomization was used to accomplish the randomization. 30 patients were in the bilateral interlaminar (BIL) group (A) and 30 were in the

traditional laminectomy group (B).

Surgical Management

The bilateral interlaminar decompression technique was carried out utilizing the operating microscope while the patient was under general anesthesia. Both groups employed facet joint undercutting to reduce the facet joint excision. All patients had postoperative CT scans to assess how well the decompression went.

The medial end of the facet joint and the laminae and spinous processes of the stenotic segment(s) were removed from group A. In group B, the midline skin incision was done into the subcutaneous tissue at the appropriate levels with a sharp cut. The lumbar fascia was then reached and bilaterally incised. The musculature was raised off the lamina in a subperiosteal way without affecting the facet capsule. The technique continued using microscopic viewing once the microscope was transported into the field.

The ligamentum flavum was removed after the lower end of the superior lamina and a minor amount of the higher end of the inferior lamina was cut to expose the canal. To expand the lateral recess, the medial end of the facet joint was also resected. The supra- and interspinous ligaments, together with a sizeable portion of the lamina, were all preserved. Intraoperative parameters including the technique's length were observed. To properly measure back pain, VAS (visual analog scale) ratings were taken at follow-up appointments every week and at the end of the procedure's first month. This information was recorded on an individually created proforma.

Data Analysis

The data was processed for the following variables: age, gender, baseline, and postoperative VAS scores and their mean values, duration of complaints (months), and duration of the procedure (minutes). Postoperative VAS score was stratified to gender, duration of complaints,

and duration of the procedure. Post-stratification independent samples t-test was applied.

RESULTS

Age Distribution

The patients were from 20 to 70 years. In group A, the mean age of patients was 51.100 ± 5.86 years. In group B, the mean age was 54.500 ± 5.38 years (Table 1).

Table 1: Clinical Data of Both Groups.

Clinical Information	Group A	Group B
Age (years)	51.100 ± 5.86	54.500 ± 5.38
Duration of Complaints (months)	7.466 ± 1.73	6.566 ± 1.85
Baseline VAS Score	7.900 ± 0.60	7.900 ± 0.54
Duration of Procedure (mins)	71.200 ± 7.61	104.700 ± 9.78
Postoperative VAS Score	5.400 ± 0.62	3.300 ± 0.46

Gender Distribution

There were 17 (56.7%) male patients in group A, and 20 (66.7%) in group B. There were 13 (43.3%) female patients in group A and 10 (33.3%) in group B (Table 2).

Table 2: Gender information in both groups (30 patients in each group).

Gender	Group A	Group B
Male	17 (56.7%)	20 (66.7%)
Female	13 (43.3%)	10 (33.3%)
Total	30 (100%)	30 (100%)

Clinical Information

The mean duration of complaints was 7.466 months in group A and 6.566 months in group B. Baseline mean VAS score was 7.9 in both groups. The duration of the procedure was 71.2 minutes in group A, and 104.7 minutes in group B. Mean postoperative VAS score was 5.4 in group A and 3.3 in group B. See Table 1.

Stratification of VAS Scores with Gender, Duration of Complaints & Procedures

There existed a significant difference (p-value: 0.000) for mean postoperative VAS scores between groups concerning gender. Similarly, a significant difference (p-value: 0.000) was observed for mean postoperative VAS scores between groups concerning the duration of complaints (greater than or less than 6 months). The patient groups were significantly different (p-value: 0.000) for mean postoperative VAS scores concerning the duration of procedures (less than or greater than 90 minutes). See Tables 3 – 5 for the details on postoperative VAS scores.

DISCUSSION

In patients with lumbar canal stenosis, we evaluated the postoperative VAS score in bilateral interlaminar and conventional laminectomy procedures. Male patients outnumbered female patients in both categories. The average length of complaints in group A was 7.466 months and 6.566 months in group B. The baseline mean VAS score in both groups A and B was 7.9. The operation took 71.2 minutes in group A and 104.7 minutes in group B. The mean postoperative VAS score in group A was 5.4 and 3.3 in group B. Patient groups were significantly different in mean postoperative VAS ratings in terms of gender, length of complaints, and duration of operations (p-value: 0.000). According to Soliman and Ali, a bilateral interlaminar procedure resulted in a mean postoperative back pain VAS score of 3.02 as opposed to 5.85 with a conventional laminectomy. A traditional laminectomy has the advantage of increasing working space by removing the posterior parts of the spine, such as the spinous process, interspinous ligament, and supraspinous ligament, which improves visibility.[10]

The success rate of the traditional laminectomy is just 64%, there is substantial intraoperative bleeding, and there are perioperative problems such as postoperative incisional discomfort, prolonged recovery, disruption of the normal anatomy, and maybe failing back syndrome. Although the osteoligamentous complex may be preserved using minimally invasive techniques, these techniques nevertheless upset the paraspinal muscle and carry a risk of neurological damage, especially in individuals with tight LCS.[10-14] The downside of bilateral canal decompression is the

Table 3: Postoperative VAS scores concerning gender.

Gender	Groups	Postoperative VAS (Mean Score)	p-value
Male	A (n = 17)	5.11 ± 0.61	0.000
	B (n = 20)	3.250 ± 0.44	(significant result)
Female	A (n = 13)	5.384 ± 0.65	0.000
	B (n = 10)	3.400 ± 0.51	(significant result)

Table 4: Postoperative VAS scores concerning the duration of complaints.

Duration of Complaints (Months)	Groups	Postoperative VAS (Mean Score)	p-value
≤ 6	A (n = 8)	5.125 ± 0.64	0.000 (significant result)
	B (n = 15)	3.200 ± 0.41	
> 6	A (n = 22)	5.500 ± 0.59	0.000 (significant result)
	B (n = 15)	3.400 ± 0.51	

Table 5: Postoperative VAS scores concerning the duration of the procedure.

Duration of Procedure (Minutes)	Groups	Mean Postoperative VAS Score	p-value
≤ 90	A (n = 28)	5.392 ± 0.62	0.000
	B (n = 3)	3.000 ± 0.01	(significant result)
> 90	A (n = 2)	5.500 ± 0.70	0.000
	B (n = 27)	3.333 ± 0.48	(significant result)

narrower operating space and the potential for a surgical time extension due to technical difficulties. Furthermore, if an unintentional durotomy develops, a full laminectomy may be required to properly view and treat the dural defect.[14]

It has been suggested that bilateral laminotomy is for mild to moderate stenosis and laminectomy is for severe stenosis or spondylolisthesis. Some researchers thought that bilateral laminotomy should be avoided in patients with severe stenosis. Numerous authors have devised more modified techniques, including unilateral and bilateral laminotomy for bilateral canal decompression, with success rates ranging from 60 – 80%.[15-20] The benefits of unilateral and bilateral laminotomy over standard laminectomy include less postoperative discomfort and increased health-related quality of life.[21,22]

Interlaminar decompression offers the advantage of preventing atrophy of the inferior levels of the paraspinal muscle by reducing muscular damage. Thomé et al, published the results of randomized research including 120 individuals who underwent LCS decompression. [13] Total complication rates were lowest in the bilateral laminotomy group. Ninety-four percent of patients were followed for at least one year. The group with bilateral laminotomies had the least amount of residual discomfort. Bilateral laminotomy provided significant benefits in the majority of patients, and it showed to be a viable therapeutic option in cases with LCS. Researchers discovered clinical case series demonstrating favorable outcomes in 91% of cases in one year.[23-30]

To minimize difficulties during surgery, doctors utilize tiny Kerrison rongeurs rather than a high-speed drill, which adds to the operating time. In comparison to the conventional laminectomy, prolonged operation duration has always been linked with BIL canal decompression.[22,31] The mean operating time in

our investigation was 71.20 (min) for group A and 104.70 (min) for group B. The lengthier duration was linked to a lack of knowledge of the BIL canal decompression method, which decreased as our series progressed due to the learning curve. Khoo and Fessler reported that microendoscopic unilateral laminectomy took 109 minutes per level while conventional laminectomy took 88 minutes per level. Other studies have found that conventional 75 laminectomies need less surgical time per level.[32-33]

Although adverse blood loss requiring transfusion is uncommon in all lumbar canal decompression operations, estimated blood loss was lower in the bilateral interlaminar group. The primary objective of a spine surgeon is to decompress the LCS as minimally as possible; nonetheless, there has been a rise in neurological damage. Verbiest et al, observed that 5% of laminectomy patients had greater radicular impairment postoperatively.[31-36] Some researchers have indicated that radicular deficiency develops in just 1% of instances when employing the BIL canal decompression technique. In general, the incidence of accidental durotomy for BIL decompression ranges from 2% to 6%, whereas traditional laminectomy may result in dural tears in 5% – 15% of instances.[31-37] Wound infection is a 2% risk in all spinal surgery cases, 188 but it was more common in previous research. The incidence of postoperative epidural hematoma is between 1% and 3%.[37-40]

CONCLUSION

BIL decompression is a good therapy choice for individuals with LCS, independent of sickness severity or patient age. BIL decompression allows for safe and satisfactory spinal canal decompression in patients with lumbar canal stenosis. Surgeon familiarity with this strategy will aid in shortening surgery time and reducing complications.

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Additional Information

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AUTHOR CONTRIBUTIONS

Sr. No.	Author's Full Name	Intellectual Contribution to Paper in Terms of
1	Ehtisham Ahmed	Study Design, Methodology, and Paper Writing.
2	Ehtisham Ahmed	Data Calculation and Data Analysis.
3	Muhammad Wasim	Interpretation of Results.
4	Gohar Ali	Statistical Analysis.
5	Aqsa Shahzadi	Literature Review.
6	Ehtisham Ahmed	Literature Review and Quality Insurer.