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Lumbar Canal Stenosis: Pre and Post Decompression laminectomy Outcomes in a Single Neurosurgery Private Practice

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Abstract: Lumbar canal stenosis (LCS) or Lumbar Spinal Stenosis (LSS) is the most common degenerative condition affecting older adults. The clinical presentation of LCS includes lower back pain, radiating pain, tingling sensation, and numbness in the lower limbs, as well as nocturnal leg cramps, and bladder dysfunction due to neurological compression. Laminectomy is one of the most common procedures performed for the treatment of LCS. This study aimed to examine the pre-surgical presentations and post-surgical outcomes based on the available clinical records from a single neurosurgeon private practice based in Melbourne, Victoria, Australia. The clinical records of 166 patients were extracted and reviewed for clinical presentation notes, surgical notes, post-surgery follow-up letters between 2010 and 2019. Records without follow-up notes were excluded. The presurgical presentation symptoms included lower back pain, weakness, neurogenic claudication, pins and needles, and sensory and motor deficits. Post-surgical outcomes were evaluated based on the 1-month, 3-month, and 1-year follow up based on the notes and letters. Many patients mentioned significant improvement in symptoms immediately after the decompressive laminectomy. Descriptive analysis was performed; the results have been presented as percentages and charts. Post- laminectomy results reported that 87% improvement in back pain and 85% people reported improvements in neurogenic claudication. This study suggested that decompressive laminectomy was effective in the management of LCS. However, further studies are required due to the limitations, such as small population size, data availability, multiple re-presentations, and lack of proper follow-up.

Keywords: Back Pain, Neurogenic Claudication, Neurosurgery, Laminectomy

1. Introduction

Lumbar canal stenosis (LCS), alternately known as Lumbar Spinal Stenosis (LSS) is the most common degenerative condition affecting older adults. LCS constitutes one of the most common causes for lower back pain syndrome. LCS is usually associated with lower back pain and radicular symptoms, such as radiating pain, tingling sensation, and numbness in the lower limbs [1, 2] nocturnal leg cramps [3], as well as bladder dysfunction due to neurological disturbances [4]. Laminectomy is one of the most common procedures performed for LCS.

LCS involves the narrowing of the canal in the lower back area due to increased thickening of the ligamentum flavum, or that of the soft tissue that surrounds the thecal sac of the lumbar spinal canal and the bone, causing disk herniation. It can also result from anatomical or congenital changes, such as osteophyte degradation, spondylolisthesis, or facet joint hypertrophy [2]. LCS requires surgical treatment if all the medical and physical management techniques have failed to provide relief to the patient [5]. Although it is usually discovered incidentally [4], most patients present with clinical symptoms, approximately 30% of patients present with severe symptoms, and approximately 17% of patients present with long-term symptoms, including recurrent or intermittent neurological claudication. Neurologic claudication is one of the most important clinical symptoms of LCS, which involves unilateral or bilateral radicular pain while walking or standing, resulting in restrictive walking. Furthermore, it has been shown to significantly impact the quality of life of the patient

and can be relieved by either flexing the lower back or by sitting down [6].

In 1829, Alban Smith first explained bony decompressive laminectomy [7], which was first performed on a patient with LCS in 1893 [8]. This surgical technique addresses the issues involving lower back pain, as well as intermittent radicular pain with approximately 64% of patients reporting good to excellent outcomes. However, further studies are required to substantiate these claims since laminectomy remains one of the main surgical procedures for the treatment of LCS [1]. The annual average healthcare expenditure on laminectomy procedure in the USA has approximately doubled between 1998 and 2008 [9]. In 2016, Zaina et al. reviewed the effectiveness of various surgical procedures compared with non-surgical interventions in adults with symptomatic LCS and found inconclusive evidence supporting the superiority of surgical or medical approaches. The study indicated that compared with the surgical approach, which had a higher rate of side effects, no side effects were reported for conservative management techniques. Thus, these contradictory observations warrant further evaluation of the efficacy of these techniques [10].

Current recommendations in the management of lower back pain or radiculopathy in LCS involve lifestyle and activity modifications, exercise therapy, physical therapy, posture and ergonomic modifications, medications, and spinal injections [11]. Although pre-surgical therapies have shown insignificant efficacy for the long-term management of the LCS [12]; the local use of steroid injections has been shown to provide relief to radicular symptoms between 2-6 weeks [13].

Based on current data, decompressive laminectomy has been shown to provide relief from the symptoms of LCS [15]. However, the results of a recent randomized control trial (RCT) by Ghogawala et al. reported that 4-year follow up following laminectomy with fusion had slightly better outcomes than laminectomy alone. The study also reported that laminectomy was associated with higher reoperation rates, prolonged hospital stay, and increased blood loss during the procedure [14]. On the contrary, another RCT by Forsth et al. reported that there were no additional benefits of adding fusion to the laminectomy procedure, if the fusion was being considered for the back pain. The study reported similar clinical outcomes, reoperation, and complication rates, along with increased expenditure [15]. Hence, it was evident that further research was required in this area to refine the current understanding.

Until now, there is a lack of sufficient data regarding the pre-and post-surgical outcomes following decompressive laminectomy for the management of LCS. This study aimed to determine the post-laminectomy clinical and surgical outcomes in patients with LCS in a single surgeon private practice based in Melbourne. Additionally, the long-term efficacy of laminectomy in the management of clinical symptoms of LCS was evaluated.

2. Methods

After the IRB and ethics committee approval, a retrospective review of medical records from 166 patients was conducted, including those who underwent first-time or second-time bilateral/unilateral or single/multiple level laminectomy between 2010 to 2019 at a Melbourne-based single surgeon private practice. The records were manually reviewed, and the data were segregated into an excel datasheet for analysis. Twenty-six patients were excluded who were either lost to follow-up after the discharge or for whom no clinical records found. Thus, the remaining 140 patients who underwent one-, two-, or three-level laminectomy and had multiple co-morbidities such as diabetes, hypertension, CVD, stroke, TIA, Parkinson's Disease, asthma, COPD, and osteoporosis were assessed.

The presenting symptoms such as lower back pain, neurogenic claudication, radiculopathy, sensory and motor deficits, and weakness were retrospectively ascertained from the clinical notes and communication letters. Additionally, operative diagnosis, type of procedure, and peri- and post-operative complications, such as wound infection, hematoma, durotomy, pneumonia, and urinary retention were extracted from the operative notes. Perioperative information, such as gender, age, and sex were collected from the records. The information regarding re-presentation and re-surgery was also extracted and ascertained. Pre-surgical presentations, peri-operative and post-operative findings, surgical complications, co-morbidities, symptoms leading to representation and eventually re-surgery were assessed and presented as counts and percentages using Microsoft Excel and SPSS Statistical data analysis software.

3. Results

Pre- Surgical presentations

Of the 140 patients with LCS, 66 were female and 74 were male with a median age of presentation of 70. The median age of female and male patients at the time of presentation was 72 years and 68 years, respectively (Table 1). Single-level laminectomy was performed in 61 patients (43.5%), whereas the remaining patients underwent double-level laminectomy, which is conducted at L3-L5 level (Table 2).

Table 1. *Study characteristics.*

Study Characteristics	
Total number of records ascertained	166
Excluded	26
Total number of records utilized	140 (n=140)
Median age of presentation	70 years
Median age of female patients	72 years
Median age of male patients	68 years

Table 2. *Number of levels that were operated and their frequencies.*

Levels Operated		
Levels	**Frequency**	**Percentage**
1	61	43.5%
2	52	37.1%
3	25	17.8%
4	2	1.4%
Total	140	

Spinal Level at which the laminectomy was performed.

Table 3. *Spinal levels that were operated and their percentages.*

	Frequency	Percentage
L1-2	1	0.7%
L1-2, L3-4	1	0.7%
L1-3	1	0.7%
L1-5	2	1.4%
L1/2 -L2/L3	1	0.7%
L2-3	4	2.8%
L2-3, L4-5	1	0.7%
L2-4	10	7.1%
L2-5	23	16.4%
L2-S1	4	2.8%
L3-4	17	12.1%
L3-4 ?5	1	0.7%
L3-4	1	0.7%
L3-5	32	22.8%
L3-S1	5	3.5%
L4-5	23	16.4%
L4-S1	9	6.4%
L5-S1	3	2.1%
T12-L2, L4-5	1	0.7%
Total	140	

The most commonly reported symptoms included neurological claudication (94%), lower back pain (87%), thigh/buttock pain (78%), weakness (31%), pins and needles, tingling sensation, bladder issues, mobility, as well as other sensory and motor deficits (31%) (Figure 1). The common comorbidities such as Hypertension, Diabetes, Coronary Artery Disease, GERD, and other conditions were extracted and summarised in Table 4. 21.4% of patents in the study reported to have hypertension and 15.7% of patients presented with GERD, whereas many other conditions were ascertained and presented in Table 4.

Table 4. *Co-morbidities that were assessed pre-operative laminectomy.*

Comorbidities		
Hypertension	30	21.4%
NIDDM	18	12.8%
IDDM	3	2.1%
COPD	8	5.7%
Depression	4	2.8%
Osteoarthritis	12	8.5%
Osteoporosis	4	2.8%
Rheumatoid arthritis	4	2.8%
Glaucoma	8	5.7%
GERD	22	15.7%
Coronary artery disease	4	2.8%
Hypothyroidism	6	4.2%
Stroke / TIA	2	1.4%
Parkinson's Disease	2	1.4%
Cancer	6	4.2%

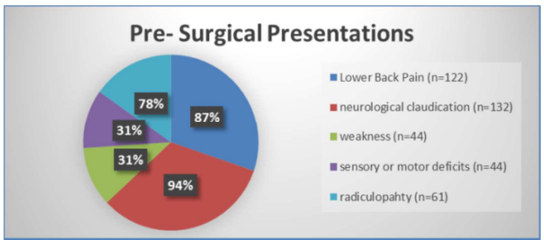

Figure 1. *Pre – Surgical Presentations.*

Peri-operative findings:

Decompressive Laminectomy surgery can be complicated by dural tears, infection, nerve root injury, deep venous thrombosis, and epidural hematoma [7]. However, perioperative complications of multilevel or single level laminectomies are rarely reported, the peri-operative complications in our study are atrial fibrillation (0.7%) and dural tear (1.7%) along with median levels decompressed are 2.

Postoperative clinical outcomes:

A significantly high number of patients showed clinical improvement after laminectomy based on all clinical outcomes. Of the 122 patients (87%) who reported lower back pain pre-surgically, 56 (40%) reported improvement post-surgically. Similarly, of the 132 patients (94%) who reported neurological claudication pre-surgically, 120 patients (85%) reported improvement in the symptoms post-surgically (Figure 2).

Weakness or atrophy was reported by 44 patients (31%) pre-surgically; however, only 8 (5.7%) patients reported the absence of a significant difference in their symptoms post-surgically. Furthermore, immediate improvement in radiculopathy (43% vs 18%) and sensory deficits (31% vs 6%) was reported after the surgery.

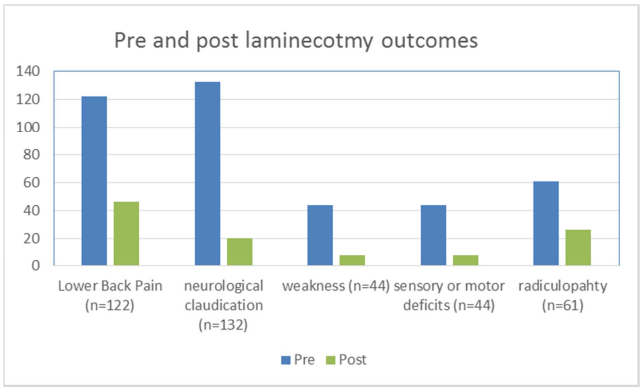

Figure 2. *Pre-operative clinical presentations versus post-operative clinical outcomes among 140 patients who underwent laminectomy.*

Additionally, 48 patients (34%) reported absence of any improvement in symptoms at the three-month follow up, whereas 28 (20%) patients reported that symptoms were almost back to the pre-surgical level at the one-year follow up. After the one-year follow-up, 78 (55%) patients needed no further review as they had no ongoing symptoms. Of the 28 (20%) patients who had similar symptoms again, 11 (7.8%) had a re-surgery, of which 8 (72%) underwent decompression with discectomy, whereas 3 (27%) had a decompression at the different level with fusion.

Post-operative complications:

The post-operative complications included pneumonia (0.7%), hematoma (3.5%), wound infection/dehiscence (2.8%), urinary retention (0.7%), hyponatremia (0.7%), hypercalcemia (0.7%), and muscle laxity (1.4%). The representation rate for similar complaints with one to three years-period was 38.5% whereas, 28 patients required re-surgery for degenerative or disc-related disease after the

laminectomy within one to five years of the procedure.

Table 5. *Post-operative complications.*

Post-operative complications:		
Hematoma	5	3.5%
wound infection/ dehiscence	4	2.8%
Muscle laxity	2	1.4%
Pneumonia	1	0.7%
Urinary retention	1	0.7%
Hyponatremia	1	0.7%
Hypercalcemia	1	0.7%

Symptoms lead to re-presentation and re- surgery

Back pain (43%), gluteal pain (32%), and neurological claudication (12%) remain some of the main reasons for the representation among the 28 (20%) patients. Among 28 patients (Figure 3) presented in total for re- presentation 14% presented within one month, 39% presented with in 3months and 47% presented with in 12months. However, the re-operation characteristics presented in table 5 explains one among the most common findings were due to adjacent disc level disease 19 (67%) and disc prolapse or herniation 15 (53%).

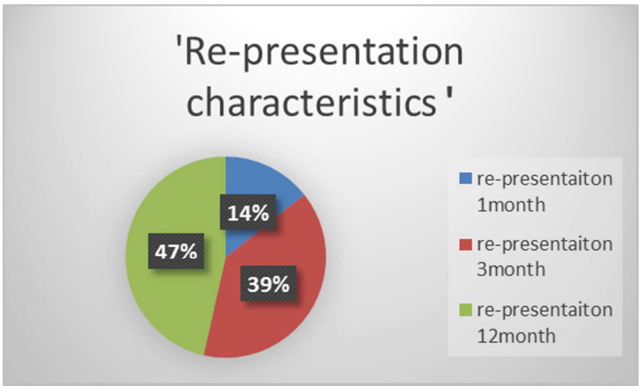

Figure 3. *Re-Presentation characteristics.*

Table 6. *Re presentations and re -operation characteristics.*

Re-Operation Characteristics		
Adjacent level disease	19	67%
Disc prolapse or herniation	15	53%
Spinal cyst	2	7.1%
Tumour	4	14.2%
Prostate Cancer	1	3.5%

4. Discussion

Of the 140 patients, most patients with the presurgical presentation of the classical symptoms of LCS, such as lower back pain, buttock pain, leg pain, neurological claudication, urinary bladder issues, sensory and motor deficits showed substantial improved after decompressive laminectomy (figure 1). Additionally, a significant number of patients mentioned that their lower back pain and neurogenic claudication improved immediately after the surgery. Nevertheless, considerable clinical improvements, such as neurogenic claudication, sensory disturbances and weakness after the laminectomy were still reported by some after the decompression. Most of the clinical symptoms presented in our study group agreed with the results published by Bydon et al. in 2015 [2].

The peri-operative complications included atrial fibrillation and dural tear. However, incidental dural tear was observed in only 1.4% patients compared with 11.3% observed in the retrospective assessment of 4835 lumbar spinal surgeries over the period of 10 years [2]. Furthermore, another study by Bydon et al. on clinical and surgical outcomes after lumbar laminectomy, reported the incidence of intra-operative durotomy at 10% [4]; however, compared with both these studies, the intra-operative complications were found to be very low in our study group.

Post-operative complications included wound dehiscence, pneumonia, haematoma, urinary retention, hyponatremia, hypercalcemia, and muscle laxity. However, post-operative urinary retention was considered a minor side effect after the surgery, usually occurring in 10.7-84% after joint-arthroplasty, 1-52% after the anorectal surgeries, 5.9-38% after the hernia repair, and 4-15% after the gynaecological surgeries [16, 17]. In the current study, the rate of urinary retention was very low (0.6%).

Back pain, gluteal pain, and neurological claudication were the main reasons for re-surgery in 28 patients who underwent either reoperation for another level of LCS or for disc prolapse. Based on the comparative assessment of the percentages, it was evident that the risk for patients undergoing re-operation with post-operative back pain was higher than the patients without back pain. The rate of re-surgery among the patients with back pain was relatively higher than other symptoms, such as radiculopathy, neurogenic claudication, and sensory and motor deficits.

In 1991, a study by Kartz et al. mentioned a one-year reoperation incidence of 6% and overall total reoperation incidence of 17% [18]; however, here, the total reoperation incidence was found to be 7.8%, consistent with the previous findings. In the present study, 11 patients reported the absence of any improvement at the three-month follow up, and at the one-year follow up, 28 patients reported that symptoms were almost back to the pre-surgical level. Of these 28 patients, 11 underwent reoperation. However, 78 patients were told that no further review was required due to the absence of ongoing symptoms.

Post-operative back pain was a primary reason for reoperation. According to the study conducted by Kartz et al. on patient satisfaction after the laminectomy for the degenerative lumbar stenosis, the reoccurrence of back pain was primarily responsible for lower patient satisfaction in comparison to other symptoms, such as leg pain or buttock pain [18]. The current study results were consistent with the results of Kartz et al. [18], showing that back pain along with neurogenic claudication were one of the major complaints leading to re-operation.

In summary, our study highlighted the most common pre-clinical presentations and post clinical outcomes of patients (Figure 2) who underwent laminectomy. Furthermore, the study also highlighted the peri-operative complications

such as dural tear and atrial fibrillations. There are many limitations to the current study. First, the study is retrospective. Secondly, the records were extracted from the single neurosurgery practice and the number of clinical records were relatively small. To resolve these limitations, a prospective randomised multi- institutional study is warranted.

5. Conclusion

Thus, decompressive laminectomy showed both short-term and long-term benefits in most of the patients; short term benefits included relief from the lower back pain, radiculopathy, neurogenic claudication, and leg/gluteal/buttock pain; long-term benefits included the relief from the above symptoms along with increased mobility and sensory disturbances. Most patients did not present again with similar symptoms. However, the neurological and clinical symptoms persisted in some patients even immediately after the decompressive laminectomy. Finally, due to the small sample size, non-randomization, lack of follow-up records, inadequate measurement of clinical parameters in the clinical notes and communication letters, further research is required to evaluate the efficacy of decompressive laminectomy in LCS.

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References

[1] Turner JA, Ersek M, Herron L, Deyo R. Surgery for lumbar spinal stenosis. Attempted meta-analysis of the literature. Spine 1992 Jan; 17 (1): 1–8.

[2] Jankowitz BT, Atteberry DS, Gerszten PC, Karausky P, Cheng BC, Faught R, et al. Effect of fibrin glue on the prevention of persistent cerebral spinal fluid leakage after incidental durotomy during lumbar spinal surgery. Eur Spine J 2009; 18: 1169-74.

[3] Katz J. N., Harris M. B.: Clinical practice. Lumbar spinal stenosis. New England Journal of Medicine 2008; 358: pp. 818-825.

[4] Bydon M, Macki M, Abt NB, Sciubba DM, Wolinsky JP, Witham TF, et al. Clinical and surgical outcomes after lumbar laminectomy: An analysis of 500 patients. Surg Neurol Int 2015; 6: S190-3.

[5] Bailey P, Casamajor L. Osteo-arthritis of the spine as a cause of compression of the spinal cord and its roots: with report of five cases. The Journal of Nervous and Mental Disease 1911; 38: 588–609.

[6] Blau JN, Logue V. Intermittent claudication of the cauda equina: an unusual syndrome resulting from central protrusion of a lumbar intervertebral disc. Lancet 1961; 277: 1081–6.

[7] Smith AG. Account of a case in which portions of three dorsal vertebrae were removed for the relief of paralysis from fracture, with partial success. North American Medical and Surgical Journal 1829; 8: 94–7.

[8] Lane A. Case of spondylolisthesis associated with progressive paraplegia; laminectomy. Lancet 1893; 1: 991–2.

[9] Rajaee SS, Bae HW, Kanim LE, Delamarter RB. Spinal fusion in the United States: Analysis of trends from 1998 to 2008. Spine. 2012; 37: 67–76.

[10] Zaina F, Tomkins-Lane C, Carragee E, Negrini S. Surgical versus non-surgical treatment for lumbar spinal stenosis. Cochrane Database Syst Rev. 2016 Jan 29; 2016 (1): CD010264. doi: 10.1002/14651858.CD010264.pub2. PMID: 26824399; PMCID: PMC6669253.

[11] Daffner SD, Wang JC. The pathophysiology and nonsurgical treatment of lumbar spinal stenosis. Instr Course Lect 2009; 58: 657–68.

[12] Chou R., Baisden J., Carragee E. J., et. al.: Surgery for low back pain: A review of the evidence for an American Pain Society clinical practice guideline. Spine 2009; 34: pp. 1094-1109.

[13] Armon C., Argoff C E., Samels J., et. al.: Assessment: Use of epidural steroid injections to treat radicular lumbosacral pain: Report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. Neurology 2007; 68: pp. 723-729.

[14] Ghogawala Z., Dziura J., Butler W., et. al.: Laminectomy plus fusion versus laminectomy alone for lumbar spondylolisthesis. New England Journal of Medicine 2016; 374: pp. 1424-1434.

[15] Katz JN, Lipson SJ, Larson MG, McInnes JM, Fossel AH, Liang MH. The outcome of decompressive laminectomy for degenerative lumbar stenosis. J Bone Joint Surg Am 1991; 73: 809-16.

[16] Baldini G, Bagry H, Aprikian A, Carli F. Postoperative urinary retention: anesthetic and perioperative considerations. Anesthesiology 2009; 110: 1139–1157.

[17] Kandadai P, Saini J, Patterson D, O'Dell K, Flynn M. Urinary retention after hysterectomy and postoperative analgesic use. Female Pelvic Med Reconstr Surg 2015; 21: 257–262.

[18] Katz JN, Lipson SJ, Brick GW, Grobler LJ, Weinstein JN, Fossel AH, et al. Clinical correlates of patient satisfaction after laminectomy for degenerative lumbar spinal stenosis. Spine 1995; 20: 1155-60.