

Surgical Outcome of Lower Limbs Radiculopathy “due to Degenerative Lumbar Canal Stenosis” 12–24 Months after Decompression

Nashaddin Azeez Mohammed*, Ari Sami Hussain

Department of Neurosurgery, Shar Hospital, As-Sulaymaniyah, Iraq.

*Correspondence to: Nashaddin Azeez Mohammed (E-mail: nashaddinazeemohammed@gmail.com)

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Abstract

Objectives: Interlaminar decompression is a surgical procedure that decompresses the lumbar spinal canal in order to release neurovascular components that have been compromised by degenerative stenosis. It can significantly improve patient quality of life and reduce morbidity and the effects of lumbar canal stenosis.

Methods: A retrospective study of 57 patients, surgically operated for degenerative lumbar canal stenosis, at the Sulaymaniyah teaching hospital between Mar. 2018 and Mar. 2020. Diagnosis was achieved via history and clinical examination and radiological imaging (Lumbosacral spine MRI). Surgical procedure was standardized for all patients that was interlaminar decompression of the lumbar spinal canal, the postoperative follow up was after 12–24 months.

Results: In total, 57 patients with degenerative lumbar canal stenosis (due to ligamentum flavum hypertrophy) were included, male (26%) and female (74%), age of the cases were between 34–85 years, mean 57.39 and median 57 and standard deviation 10.96, there were no deference in the outcome of different ages and genders. Chief complain of patients were back pain and both lower limbs radiculopathy in the majority of the cases, associated with paresthesia and numbness of the lower limbs, which were improved modestly after surgical decompression.

Conclusion: Interlaminar decompression of the stenosed lumbar spinal canal is an effective and generally safe surgical procedure with high patient satisfaction and good functional outcomes expected.

Key words: Lumbar canal stenosis, radiculopathy, neurovascular, decompression

Introduction

Lumbar Spinal canal stenosis is defined as narrowing of the spinal canal and/or lateral recess, nerve root canal and intervertebral foramen, to a degree that gives rise to compression of lumbosacral nerve roots or the cauda equina and vascular elements in the lumbar spine canal, leading to symptoms of low back pain, radiculopathy or claudication.¹

Degenerative stenosis of lumbar spine is a significant cause of morbidity, and one of the most prevalent acquired conditions in the spine especially among elderly population, which generally becomes symptomatic after the age of 50, and can lower the quality of life, limit patients' ambulation, and hence causing serious health-related and psychosocial consequences like depression and isolation, among people ages between 60 to 69 years, mild spinal canal stenosis is seen in about 50%, and more severe findings in about 20% of non-symptomatic population.^{2,3} Lumbar spinal stenosis is the most frequent indication for lumbar spine surgery among elderly population.^{4,5}

Thickening of the ligamentum flavum and hypertrophied facet joints, together or alone, are the common causes of the narrowing of the lumbar spinal canal in degenerative LSS, and hence pressure on the neural elements.^{6,7}

Hypertrophy of the inferior articular process of superior vertebra is the main cause of lateral (subcapsular) stenosis.⁸

Lower limb pain and low back pain are the most prevalent symptoms in cases of LSS. Leg pain may be unilateral or bilateral, long-term compression of the spinal nerve roots will lead to symptoms of radicular pain and may be associated with sensory, motor, and/or reflex changes in one or both lower extremities. Symptoms are usually posture-dependent, getting worse by lumbar extension or weight-bearing, and alleviating with flexion or non-weight bearing body positions.^{9–11}

Conservative treatment of severe lumbar canal stenosis is not promising in a large number of cases, as the natural history of the disease tends to be progressive and more than 60% of patients fail to give a satisfying response to conservative treatment in forms of elimination of their symptoms.^{12,13}

Patients with server symptoms and signs of lumbar canal stenosis, in whom radiologically lumbar canal found to be severely compromised, and fail to respond to optimal conservative treatment, Surgical intervention is a good option, and must be offered to decompress the lumbar spinal canal and hence free the impinged neurovascular elements.^{14,15}

The aim of this study is to explore the functional outcome of our cases after 12–24 months form surgery in terms of their presenting symptoms and signs, as well as detecting the factors affected the good or bad outcome (predictors of prognosis).

Patients and Methods

This is a retrospective single center study of 57 patients, 13 males and 44 females with lumbar spinal canal stenosis, with age ranging from 34 to 85 years, conducted in Sulaymaniyah university teaching hospital/Shar hospital, Department of neurosurgery, between March 2018 to March 2020, after obtaining clearance from the institutional ethical committee.

Patients who were diagnosed as LSS and were surgical candidates, involved in this study, for all patients, preoperatively patient's ID recorded; Age, Gender, occupation, and residency, then patients asked for history of smocking, their Body mass index before operation, their chief complain (Back ache, lower limbs pain or paresthesia, and limited walking distance) and the duration of their symptoms, and any other patients' comorbidities; like Diabetes mellitus, Hypertension, or any other chronic illness, were asked and recorded.

After that Oswestry disability index form filled for all patients, and ranking their disability form 0–20 which is minimal disability, 21–40 regarded as moderate disability, 41–60 regarded as severe disability, and 81–100 which is bed bound and severely disabled.

Neurological examination performed for all patients, with (Motor function of the limbs, Sensory examination, tone of the lower extremities, lower limbs' reflexes and Sphincters' function) all taken into consideration, and the diagnosis were made by plain lumbosacral spine x-ray, CT scan in selected cases (if a boney pathology, like fracture, suspected) and magnetic resonance imaging (MRI).

MRI axial images used to categorize the severity of stenosis according to Schizas classification.

Patient were asked if they tried prior trail of conservative (non-surgical) mode of treatment, like medications, physiotherapy, ESI and tradition non-scientific manipulations (tried by some of the patients as alternative medicine).

Interlaminar decompression done for all patients by senior neurosurgeon,

Post operatively, lately after 12–24 months, patients contacted via phone calls, and been asked for their neurological status and their level of satisfaction.

Oswestry disability index form again filled for their post operative condition, and patients asked about any remaining complains they had after that period of time, and recorded for our study, like: Post operative paresthesia and Numbness (relieved, still there but better, or not relieved at all), pain and neurogenic claudication (relieved, still there but better than pre-operative time, or not relieved at all).

Results

In this retrospective study, totally 57 patients with degenerative lumbar canal stenosis (due to ligamentum flavum hypertrophy) were included, male (26%) and female (74%), age of the cases were between 34–85 years, mean 57.39 and median 57 and standard deviation 10.96, chief complain of patients were back pain and both lower limbs radiculopathy in (71.9%, $n = 41$) of cases, back pain with only right side lower limb radiculopathy

(12.3%, $n = 7$), back pain with only left lower limb radiculopathy (12.3%, $n = 7$), and in (3.5%, $n = 2$) patients the chief complain was only lower limbs radiculopathy without back pain, Most of the cases were nonsmokers (82.5%, $n = 47$), chronic smokers (8.5%, $n = 5$ cases), ex-Smokers (8.5%, $n = 5$) cases.

Lower limbs radiculopathy had modest response to surgical decompression, (54.4%, $n = 31$) patients achieved complete resolution of their radiculopathy, and (40.4%, $n = 23$) cases had signification reduction of their radiculopathy as compared to their pre-operative complain, but still there was some degree of radiculopathy remaining, which is not significantly affecting their life style, while (5.3%, $n = 3$) cases claiming no alleviation of their symptoms at all, (Tables 1 and 2).

Predictors of Outcome

Patients who were included in this study were asked pre-operatively for their: Body mass index, Duration of their symptoms, and also assessed radiologically for the number of levels been stenosed (single level or multiple?), all of the above parameters measured and documented pre-operatively to evaluate their influence on the outcome of radiculopathy post operatively.

Longer duration of symptoms (more than one year) pre-operatively lead to worse outcome, i.e., patients who presented with prolonged complains of radiculopathy had worse outcome in comparison to those with shorter durations (Table 3).

Number of stenosed levels barely affected the outcome, patients with multiple levels of lumbar canal stenosis, for whom multi-level decompression performed, had slightly lower rates of satisfaction in terms of radiculopathy post operatively (Table 4).

Body mass index found to have statistically no significant effect on the outcome, there was no appreciable difference between those with normal BMI and those with high BMI (Table 5).

Discussion

The study revealed a clear female predominance among cases underwent surgical intervention over male gender, but there

Table 1. Showing pre-operative lower limbs radiculopathy of the patients, P . Value = 0.0018

		Chief complain			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Back pain and both lower limbs	41	71.9	71.9	71.9
	Back pain and Right lower limb radiculopathy	7	12.3	12.3	84.2
	Back pain and left lower limb radiculopathy	7	12.3	12.3	96.5
	Only lower limbs	2	3.5	3.5	100.0
	Total	57	100.0	100.0	

Table 2. Showing post-operative lower limbs radiculopathy of the patients, P . Value = 0.0027

		Post op lower limbs radicular pain			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Relieved at all	31	54.4	54.4	54.4
	Still there, but better than preop	23	40.4	40.4	94.7
	Not relieved at all	3	5.3	5.3	100.0
	Total	57	100.0	100.0	

Table 3. Showing adverse effect of pre-operatively prolonged symptoms on post the operative radiculopathy of lower limbs, P. Value = 0.0031

		Post op lower limbs radicular pain			Total
		Relieved at all	Still there, but better than preop	Not relieved at all	
Duration of symptoms	Less than 3 months	5	3	0	8
	3 months-12 months	3	1	0	4
	More than 1 year	23	19	3	45
Total		31	23	3	57

Table 4. Shows slightly worse outcome of post operative lower limbs radiculopathy among patients with multiple level stenosis compared to patients with single level stenosis, P. Value = 0.0038

		Post op lower limbs radicular pain			Total
		Relieved at all	Still there, but better than preop	Not relieved at all	
Stenosed levels	Single level	21	9	1	31
	More than 1 level	10	14	2	26
Total		31	23	3	57

Table 5. Showing pre-operative BMI and correlation with the outcome of post operative lower limbs radiculopathy, P. Value = 0.0032

		Post op lower limbs radicular pain			Total
		Relieved at all	Still there, but better than preop	Not relieved at all	
BMI before operation	18.2–24.9	18	9	1	28
	25–36	13	14	2	29
Total		31	23	3	57

was no difference between the two genders in the functional outcome and level of satisfaction in terms of post operative lower limbs radiculopathy, this result was concordant with the findings of Elisabeth Thornes et al. in their prospective Cohort Study that they claimed no gender influences on the outcome¹⁶ and Shay Shabat et al. also stated in their study that gender differences had no influence on patients' satisfaction rates in lumbar spinal stenosis surgery.¹⁷

Most of the cases in this study were nonsmokers 82.5%, and 8.5% were chronic smokers, while 8.5% were Ex-Smokers, however this study didn't reveal any significant correlation between smoking and post operative worse outcome, there was no different between smokers, non-smokers, and ex-smokers in terms post-operative radiculopathy resolving, and this result was almost the same as the outcomes of the two studies conducted by Shaun Previn Appaduray et al., and the other by Martin N. Stienen et al. they found that no relation between smoking and good or unfavorable outcomes.^{18,19}

More than half of patients, 54.4% had achieved full recovery from lower limbs radiculopathy, and another 40.4% of cases had signification reduction of their radiculopathy as compared to their pre-operative complain, but there was still some degree of lower limbs radiculopathy remaining, which is not significantly affecting their life style, that means almost 94.4% of patients achieved excellent to fair results satisfying them, results in this study were superior, but close, to the

results of the literature by Kazuo Yamashita, who found a good proportion of cases improved their leg pain and paresthesia post operatively.²⁰

Duration of symptoms was another influencer of the outcome in this study, patients with shorter duration of symptoms (less than one year) pre-operatively, had better post operative results, while those with prolonged pre operative symptoms (more than one year) noted to have higher rates of dissatisfaction (remaining radiculopathy) after surgery, this was also noted by Leslie C. L. Ng et al. who found prolonged duration of symptoms is associated with a less favorable outcome in their study.²¹

More than half of the patients in this study were overweight (BMI ≥ 25) and the other half were normal weighted (BMI 18.2–24.9), the results of patients with normal BMI were not significantly better than those with high BMI (over weighted), while a study done by R. Gepstein, MD et al., detected higher rates of dis-satisfaction among obese and high BMI cases, probably because of the associated comorbidities like (Diabetes Mellitus) which was common co-morbidity among the cases by the study by R. Gepstein, MD et al.²²

Conclusion

Patients with significant stenosis of the lumbar canal caused by thickened ligamentum flavum can be offered surgical intervention with expected good results, which can significantly

improve patients' quality of life by alleviating post operative radiculopathy, Interlaminar decompression is an effective and generally safe surgical procedure.

The outcome and hence the level of patients' satisfaction are influenced by duration of symptoms before operation, little influence by number of levels been stenosed, while the

results are not affected by age, gender, history of smoking, and body mass index before operation.

Conflict of Interest

None. ■

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