

**ORIGINAL RESEARCH**

# Functional Outcome of Surgical Management of Lumbar Canal Stenosis

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### ABSTRACT

**Background:** Degenerative lumbar spinal stenosis is one of the common indications for spine surgery in elderly patients. Because non-operative therapy seldom results in sustained improvement, many patients consider surgery (decompression laminectomy with or without arthrodesis). Increasing pain not relieved by conservative measures forms indication for surgery. **Methods:** Single centre prospective study was conducted in tertiary care centre in Maharashtra for period of June 2021 to May 2023. 60 patients of age 45 and more with claudication distance <200 m were included and followed up for 1 yr. Patient with previous spine surgery and absent distal pulse were excluded. JOA score was used to assess functional outcome. Baseline details including their demographics, clinical assessment including neurological deficit, MRI lumbar spine, & JOA score for lumbar spine taken. Flexion extension X-ray taken to assess preop instability. Patient followed up at 1, 6 & 12 month and assessed based on JOA score. **Result:** Significant improvement in JOA score was seen at the end of one year with improvement in walking ability and quality of life. The change in JOA score for patients with pre-operative instability and one's with symptoms of lesser duration was significantly better. **Conclusion:** Operative intervention should be expected to give relief of claudication leg pain with significant response to backpain. Most series report a 64% to 91% of improvement, but most patients still have some minor complaints, usually referable to the pre-existing degenerative arthritis of spine. Neurological findings, if present, improve inconsistently.

**Key words:** Lumbar, stenosis, claudication, JOA.

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### INTRODUCTION

Degenerative lumbar spinal stenosis is one of the major cause of low back and lower extremity discomfort and disability in the elderly. In patients with degenerative lumbar spinal stenosis, symptoms include back pain (95%), sciatica (91%), sensory disturbance in the legs (70%), motor weakness (33%), and urinary disturbance (12%). It is vital to differentiate neurogenic claudication from vascular claudication. Vascular symptoms typically are felt in the upper calf, are relieved after a short period of rest (5 minutes) while still standing, do not require sitting or bending, and worsen on walking uphill or riding a stationary bicycle. Neurogenic claudication improves with trunk flexion, stooping, or lying but may require 20 minutes to improve. Patients often report better endurance walking uphill or up steps and tolerate riding a bicycle better than walking on a treadmill because of the flexed posture that occurs. Studies have reported that MRI imaging findings did not correlate

with patient's symptoms. Thus, careful clinical correlation between symptoms and imaging is critical. Magnetic resonance imaging (MRI) is still widely used in the evaluation of lumbar canal stenosis as showing morphological image of the intervertebral foramen in affected patients.

Degenerative lumbar spinal stenosis has become one of the common indications for spine surgery in patients older than 65 years. Because non-operative therapy for this condition seldom results in sustained improvement, many patients consider surgery, which includes decompression laminectomy with or without a concomitant arthrodesis. The primary indication for surgery in patients with spinal stenosis is increasing pain that is not relieved by conservative measures. Because the primary complaint often is back pain and some leg pain, pain relief after surgery may not be complete. Operative intervention should be expected to give good relief of claudication leg pain with variable response to back pain. Most series report a

64% to 91% rate of improvement, with 42% in patients with diabetes, but most patients still have some minor complaints, usually referable to the pre-existing degenerative arthritis of the spine. Neurological findings, if present, improve inconsistently after surgery. Reported success rates for decompressive surgery for spinal stenosis vary.

## MATERIALS AND METHODS

This is a prospective observational study conducted at single centre between June 2021 to may 2023.during the stipulated time frame 74 patients where successfully managed with surgical management of which 4 patients had significant leg pain relations to causes other than lumbar canal stenosis (E.g. knee OA, vascular claudication), 3 patients had previous history of spinal surgeries and 7 patients had loss of follow up and they were excluded from the study.

### Inclusion Criteria

Age>40 yr

Claudication distance <200m with or without neurodeficit

MRI showing lumbar canal stenosis

### Exclusion Criteria

Age< 40 yr

Traumatic vertebral injuries

Prior lumbar spine surgery

Patients without neurogenic claudication or with claudication distance more than 200 m

Vascular claudication

Tendem stenosis

This study was conducted after necessary approval of ethics committee and informed consent from patient. A total of 60 patients where included in the study. The type and severity of lumbar canal was noted from clinical assessment and radiological findings on MRI. Flexion and extension. X-rays of lumbar spine was taken to assess the instability. For lumbar spine was noted based on patient status preoperatively The modality of management on how the patients will be managed was taken as per qualified orthopedician's discretion. Patients were followed up post operatively at 1 month, 6 months and 12 months and assessed for functional and radio logical outcome based on.

Symptoms and signs	Evaluation and score		
<b>I. Subjective symptoms</b>			
Low back pain	None		3
	Occasional, mild		2
	Occasional, severe		1
	Continuous, severe		0
Leg pain and/or tingling	None		3
	Occasional, slight		2
	Occasional, severe		1
	Continuous, severe		0
Gait	Normal		3
	Able to walk farther than 500 m but results in symptoms		2
	Unable to walk farther than 500 m		1
	Unable to walk farther than 100 m		0
<b>II. Clinical signs</b>			
Straight-leg-raising test	Normal		2
	30°-70°		1
	Less than 30°		0
Sensory disturbance	None		2
	Slight disturbance (not subjective)		1
	Marked disturbance		0
Motor disturbance	Normal		2
	Slight weakness (MMT 4)		1
	Marked weakness (MMT 3-0)		0
<b>III. Restriction of ADL</b>			
	Severe	Moderate	None
Turn over while recumbent	0	1	2
Standing	0	1	2
Washing	0	1	2
Leaning forward	0	1	2
Sitting (about 1 h)	0	1	2
Lifting or holding heavy objects	0	1	2
Walking	0	1	2
<b>IV. Urinary bladder function</b>			
	Normal		0
	Mild dysuria		-3

JOA scoring lumbar spine.

## RESULT

This is a prospective study including 28 (46.7%) females and 32 (53.3%) males. Mean age of patients was 58.37 ( range 40 -80 years) of which 12(20.0%)patients were between 41-50 years ,26(43.3%) between 51-60 years, 18 (30.0%) between 61-70 years and 4(6.7%) between 71 -80 years. On clinicoradiological analysis, 14 (23.3%) patients had involvement at L3-L4 spinal level, 40(66.7%) at L4-L5 level, and 6 (10.0%) patients had multilevel compression including L3-L4 and L4-L5.

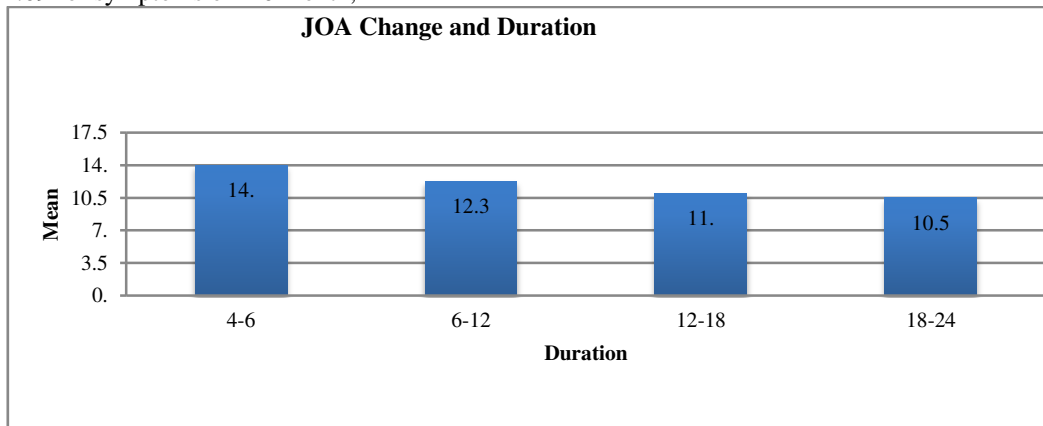
Of N=60 patients,8(13.3%) patients had symptoms for 4-6 months , 32( 53.3%) for 7-12 months and 20(33.3%) for over 12 months.18 (30.0%) patients had preoperative instability as assessed by Flexion extension x-rays. 22 patients had neurodeficit of which 16 (26.7%) had decreased sensation in at least one dermatome and 6 patients had decreased power(grade 4) at respective level. Patients where distributed based on their claudication distance. 26.7%(16) patients could not walk more than 200 m comfortably without pause, while for 43.3% (26) patients it was further reduced to less than 100 m while rest 30.0%(18 ) patients could not even walk 50 m in continuation causing significant disability in

performing activities of daily living. Patients were operated after fair trial of conservative management failed to provide significant relief to the patients and duration of symptoms before surgery was recorded. 8 patients had symptoms for 4-6 months, 32 for 7-12 months and 20 for over an year.

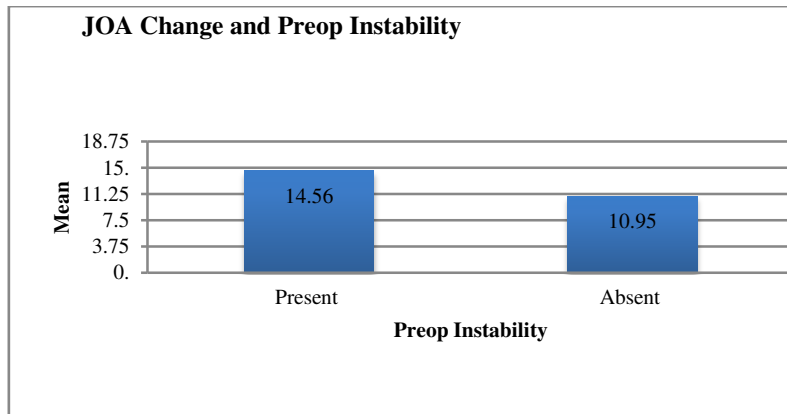
Patients were evaluated and change in JOA score was analysed 12 months post surgery. Change in JOA was 10.5+2.88 for age 41-50years, 12.85+1.86 for age 51-60,

12.22+2.77 for age 61-70 and 10.50+4.95 for 71-80 years. The association between change in JOA score and age is non-significant (p=0.260) . On correlation with duration of symptoms, change in JOA was 14.00+4.69 for symptoms of 4-6 month,

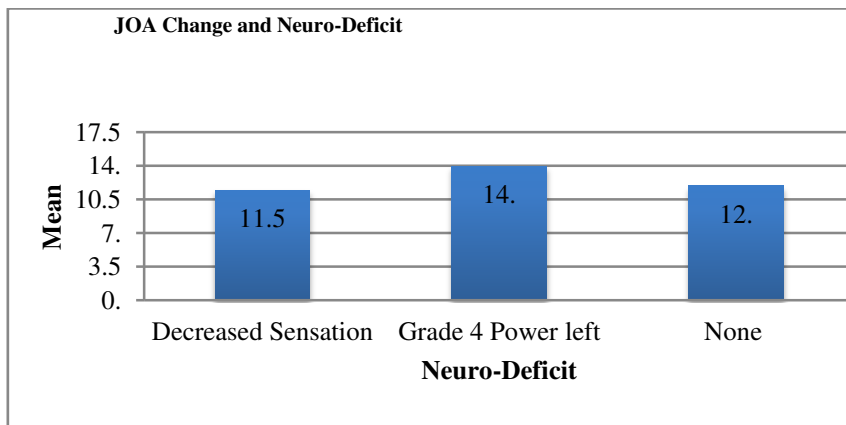
12.31+2.15 for symptoms of 7-12 month duration, 11.00+1.54 for 12-18 months and 10.50+2.38 for symptoms of 18-24 month duration. The change in JOA score for symptoms of lesser duration is significantly better (p=0.049). Change in JOA was 14.56+1.66 for patients with preop instability and 10.95+2.15 for patients without, denoting, results for patients with preoperative instability were significantly better (p<0.001). JOA did not significantly (P=0.369) change for people with ( sensory deficit mean= 11.50+3.29 , motor deficit mean = 14.00+3.60) or without (11.95+2.12) neurodeficit.



Correlation of change in JOA score with duration of symptoms



Correlation of change in JOA score with pre op instability



Correlation of change in JOA score with neurodeficit

## DISCUSSION

KIRKALDY- WILLIS<sup>1</sup> described degenerative lumbar spinal stenosis as a progressive disorder that involves the entire spinal motion segment. Degeneration of intervertebral disc result in initial relative instability and hypermobility of facet joints. An increase in pressure on the facet joints with disc space narrowing and increasing angles of extension occurs and can lead to hypertrophy of the facet joint, particularly the superior articular process. As joint destruction progresses, the hypertrophic process ultimately may result in local ankylosis. Calcification and hypertrophy of the ligamentum flavum commonly are contributing factors. The end result is reduced spinal canal dimensions and compression of the neural elements. The resultant venous congestion and hypertension likely are responsible for the symptom complex known as intermittent neurogenic claudication. Lumbar canal stenosis is one of the most common causes of disabilities in elderly. Patient walk with stooping forward as a habit as this posture decreases pain. Even though it is judicious to offer surgical management only if conservative method has failed, it is important to explain patients what is to be expected post surgery. How much recovery is to be expected and after what duration. Unrealistic goals can be dangerous for both patient as well as the surgeon. Lumbar canal stenosis is a long term disease, and despite our best efforts even with our current advancements we cannot reverse all the changes of degeneration. Various factors come into play in guiding the end result of surgery. In this study we have aimed to assess a few common ones. Our study reports patient profile, treatment modalities and short term functional outcome in management of surgical management of lumbar canal stenosis confirmed by clinicoradiological assessment.

In our study, 6.7% (n=4) patients were in the age group 71-80 years, 30% (n=18) patients age group 61-70, 43% (n=26) patients in age group 51-60 and 20% (n=12) patients in age group 41-50 and the average age was 58.37 years, with similar age and sex distribution reported by others.<sup>12</sup> 3.3% patients showed excellent and 46.7% showed good outcome and 50% showed fair at the end of 1 year follow-up, while Ganz et al. (1990) reported result showing 86% good outcome in their series of 33 patients treated by decompressive surgery. In their patients whose preoperative symptoms were relieved by postural changes, the success rate was 96% compared to only 50% in those unchanged by postural changes.<sup>3</sup>

Weinstein et al. (2010) showed that patients with degenerative spondylolisthesis and spinal stenosis treated surgically showed substantially greater improvement in pain and function during a period of 2 years than those treated non-surgically.<sup>4</sup>

In our study, finally, 62.5% patients had no back pain and 37.5% had occasional mild pain, 96.87% had no leg pain, 93.75% had normal gait, 100% had normal

straight leg raising, and 95% had sensory improvement. Similar findings were observed in the study of Herron et al. (1991) with average leg pain improvement of 82% and average back pain improvement of 71%.<sup>3</sup>

Weinstein et al. (2010) in their prospective multi-centre SPORT study of 654 patients concluded that patients with symptomatic spinal stenosis treated surgically compared to those treated non-operatively maintain substantially greater improvement in pain and function through 4 years. All patients in their study were surgical candidates with a history of at least 12 weeks of neurogenic claudication or radicular leg symptoms and spinal stenosis without spondylolisthesis (as confirmed on imaging). They were enrolled in either a randomised cohort (289 patients) or an observational cohort (365 patients) at 13 U.S. spine clinics and were treated by either standard decompressive laminectomy (414 patients) or usual nonsurgical care (240 patients).<sup>5</sup>

No patient in our series had poor result. This could be due to the fact that all patients underwent at least a 12 weeks trial of adequate conservative treatment and were only operated after clinicoradiological correlation of their symptoms with imaging was confirmed. Decompressive laminectomy was also adequately supplemented with pedicle screw fixation (in cases of preoperative instability or when more than one level laminectomy was performed) and/or posterior lumbar inter-body fusion (in cases of degenerative listhesis) and/or discectomy (cases with a soft bulging disc). 15 patients had fair outcome, 15 had good outcome at end of 1 month while 15 had fair, 14 good and 1 excellent outcome after 1 month. The failure of surgery to completely relieve pain may be attributed to the widespread degeneration. Outcome was also affected due to some variables in scoring system like running and heavy weight lifting in which female patients and patients over 50 years scored less despite being free of pain.

Getty (1980) personally reviewed 31 patients (age range 18 to 75 years) who had been treated surgically for lumbar spinal stenosis between 1968 and 1978 and followed them for an average of 42 months. In 28 (90%) patients, degenerative changes in the lumbar spine had been the principal etiological factor; the other 3 had idiopathic developmental lumbar spinal stenosis. In 17 (55%) patients, the result was classified as good, although a total of 26 (84%) patients were satisfied. This compares well with our study

in which 93.75% patients (n=30) were satisfied with their surgery. Good results of operation for lumbar spinal stenosis in series of Getty were characterised by rapid resolution of pain in the leg. The most important reason for failure to relieve symptoms in his series was stated to be inadequate decompression.<sup>6</sup>

The authors are of the opinion that operative treatment in patients of degenerative lumbar canal stenosis yields excellent long term functional results as

observed on the basis of JOA scoring system provided that patients are properly selected and decompressive surgery is performed simultaneously addressing the associated instability or listhesis. All activities of daily living which were assessed using JOA score showed significant improvement except for running and lifting heavy weight. No patient got recurrence of symptoms of nerve compression.

It is to be noted that this is a small scale study done on 60 patients. A larger study needs to be conducted to generalise the result on general population.

### CONCLUSION

Stenosis of the spine may have a negative impact on the quality of life of geriatric patients. Stooped gait with limitation of walking disability leads to cosmetic deformity as well restricts their functional capacity. There are many choices of treatment available.

The treatment regimen has to be individualised to meet the needs of each patient using a multidisciplinary approach. When followed in a systematic and planned manner, it is effective in hastening the recovery from pain, improving mobility and flexibility, alleviating the disability, and restoring independence to the life style of the patient. From this

study we conclude that surgical of management of lumbar canal stenosis is significantly effective but proper patient selection and timely intervention is of utmost importance of optimal outcome.

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