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Evaluation of posterior decompressive lumbar surgery for multilevel lumbar spinal canal stenosis with and without fusion

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Abstract

Background
There is no consensus regarding the best treatment of patients with multilevel lumbar stenosis. Surgical and invasive procedures are widely used in adults with degenerative lumbar spinal stenosis when conservative treatments fail. However, little is known about the comparative efficacy and safety of these interventions.

Aim and objective
The aim was to study and evaluate the outcome of surgery for degenerative lumbar canal stenosis (LCS) on a clinical, radiological, and functional basis and to identify whether spinal decompression with fusion has a better effect than decompression alone for patients with degenerative lumbar spinal stenosis or not.

Patients and methods
A prospective study of 50 patients was carried out at the Department of Neurosurgery, Matarya Teaching Hospital, in whom the lumbar canal stenosis was confirmed. The functional assessment preoperatively and postoperatively was calculated according to the Japanese Orthopedic Association (JOA) score.

Results
Successful outcomes were significantly associated with posterior decompression and fusion. Clinical outcome assessed according to the JOA score was excellent or good in 68% of the patients who underwent posterior decompression alone and in 84% of patients who underwent posterior decompression with posterolateral fusion.

Conclusion
Surgical treatment of degenerative lumbar canal stenosis with posterior decompression and spinal fusion yields excellent results as observed on the basis of JOA scoring system.

Keywords: Decompression, laminectomy, lumbar spinal stenosis, spinal fusion

Introduction

Degenerative lumbar spinal canal stenosis is characterized by decreased spinal canal diameter owing to structural changes of the spine (e.g., facet joints and ligaments) because of ageing [1].

Congenital, developmental, acquired, degenerative, iatrogenic, post-traumatic, and metabolic are the basic classification types for spinal canal stenosis. Acquired senile degenerative stenosis is the most common and observed type, which is further classified into central, peripheral, and degenerative spondylolisthesis types [2].

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Typically, patients will present with neurogenic claudication, defined as pain, numbness, and/or fatigue in the lower limbs that is worsened during walking and standing, and alleviated with forward bending or sitting [3].

MRI now provides a confirmation in many cases, and now routine myelography is no longer necessary. The anatomic

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presence of spinal stenosis is confirmed radiologically with radiography or MRI. The correlation of clinical symptoms with radiographic imaging is necessary to make the clinical diagnosis of lumbar spinal stenosis (LSS) [2].

Surgical decompression (including laminectomies or laminotomies), with or without fusion; interspinous process spacer devices; minimally invasive surgical decompression; and corticosteroidal epidural injections are commonly used in the management of spinal stenosis [4–9]. However, the evidence supporting the superiority of one option over the other is still unclear for most [3,5,10].

The aim of this work was to evaluate the functional outcome of posterior decompression alone or with fusion in treating patients with multilevel lumbar canal stenosis.

Patients and Methods

This is a prospective study done at the Neurosurgery Department of Al Matarya Teaching Hospital starting from October 2016 to October 2018. A total of 50 patients with degenerative multilevel lumbar canal stenosis, comprising 31 males and 19 females, were included in this study. The age ranged from 33 to 65 years, with a mean of 56.34 years.

The study comprised patients having multiple levels of degenerative lumbar canal stenosis. The diagnosis of LSS was based on the presence of typical symptoms, such as neurogenic claudication or radicular leg pain, with associated neurological signs.

All patients had full general and neurological examination. Preoperative examination included plain radiographies lumbosacral spine (anteroposterior, lateral, and dynamic films 'flexion/extension' showing no instability), MRI, and/or myelograms.

The exclusion criteria were prior lumbar spine surgery owing to other causes of lumbar canal stenosis like traumatic, metabolic, congenital, tumors, and infection, and also patients who were medically unfit for surgery owing to other comorbidities. All eligible patients were given verbal and written information about the study and the two treatment alternatives. Each patient signed an informed consent before participating in the study.

Low back pain and leg pain were graded according to 'Japanese Orthopedic Association's Evaluation System for low back pain syndrome (JOA score)'. The JOA score was determined via direct questioning to assess subjective symptoms, clinical signs, and restriction of activities of daily life. The normal score was 29 points (Table 1) [11].

Participants were allocated by simple unblinded randomization to one of two treatment groups: posterior decompression and posterolateral fusion with transpedicular screws or posterior decompression alone. The minimum duration of follow-up in both groups was 12 months, and the maximum duration of follow-up was 36 months, with a mean duration of 18.08 months. All medical and surgical records were examined, including pain-free interval, intraoperative blood loss, length of surgery, and duration of hospital stay following the operation. Clinical symptoms were assessed before surgery and at the final follow-up. Surgery outcomes were assessed based on the recovery rate and were classified using a four-grade scale: excellent, improvement of more than 90%; good, 75–89% improvement; fair, 50–74% improvement; and poor, less than 49% improvement (Table 2) [12].

Results

Preoperative clinical state

There was male predominance in the two groups (17 males and eight females in the fusion group and 14 males and 11 females

Table 1: Japanese Orthopedic Association's evaluation system for lower back pain syndrome (JOA score)

	Evaluation	Score
Subjective symptoms		
Lower back pain	Non	3
	Occasional, mild	2
	Occasional, severe	1
	Continuous, severe	0
Leg pain and/or tingling	Non	3
	Occasional, light	2
	Occasional, severe	1
	Continuous, severe	0
Gait	Normal	3
	Able to walk farther than 500 m, although it results in symptoms	2
	Unable to walk farther than 500 m because of symptoms	1
	Unable to walk farther than 100 m because of symptoms	0
Clinical signs		
Straight-leg raising test	Normal	2
	30-70	1
	<30	0
Sensory disturbance	None	2
	Slight disturbance	1
	Marked disturbance	0
Motor disturbance (MMT)	Normal (grade 5)	2
	Slight weakness (grade 4)	1
	Marked weakness (grade 3-0)	0
Restriction of activities of daily living (14 points)	Activities of daily living	S M N
	Turning over while lying	0 1 2
	Standing	0 1 2
	Washing	0 1 2
	Leaning forward	0 1 2
	Sitting (1 h)	0 1 2
	Lifting or holding	0 1 2
	Walking	0 1 2
Urinary bladder function (6 points)	Normal	0
	Mild dysuria	−3
	Severe dysuria	−6

Table 2: Macnab criteria

Results	Criteria
Excellent	No pain; no restriction of activity
Good	Occasional back or leg pain not interfering with the patient's ability to do his or her normal work, or to enjoy leisure activities
Fair	Improved functional capacity; but still handicapped by intermittent pain of sufficient severity to curtail or modify work or leisure activities
Poor	No improvement or insufficient improvement to enable an increase in activities/or further operative intervention required

in the nonfusion group), and ages of the patients ranged from 35 to 65 years, with a mean age of 55.47 years, in the fusion group, and 33 to 65 years, with a mean of 56.21 years, in the nonfusion group.

Among the patients of the fusion group, 12 (48%) patients were smokers, and among those of the nonfusion group, nine (36%) patients were smokers. Diabetes mellitus was found in six (24%) patients of the fusion group (24%) and in five (20%) patients of the nonfusion group.

Low back pain was found in all patients preoperatively, with 36% of cases having occasional mild pain, 56% having occasional severe pain, and 8% having continuous severe pain among patients of fusion group. In the nonfusion group, 28% of cases had occasional mild pain, 60% had occasional severe pain, and 12% had continuous severe pain.

Claudication pain was found in all cases with variable walking distances. Sciatic pain was found in 67% of cases of the fusion group and in 72% of patients of the nonfusion group. Sensory disturbances were seen in 14 (56%) patients of fusion group and in 16 (64%) patients of nonfusion group preoperatively. Three cases of the fusion group had motor deficit in the form of two cases had weakness in foot dorsiflexion and one case had weakness in big toe dorsiflexion, whereas two cases of the nonfusion group had weakness in foot dorsiflexion.

Operative specifications and early follow-up

Discectomy was done in 68% of cases with posterior decompression alone and in 77% of cases of posterior decompression and posterolateral fusion.

The average intraoperative blood loss was 250 ml in the nonfusion group and 355 ml in the fusion group. The average length of surgery was 118.4 min in the nonfusion group and 167.18 min in the fusion group. The average length of postoperative hospital stay was 3.72 days in the nonfusion group and 3.13 days in the fusion group.

Intraoperative blood loss and length of surgery were significantly less in patients undergoing posterior decompression alone than in patients with posterolateral fusion, whereas the average length of postoperative stay was less in the fusion group than the nonfusion group.

Clinical outcomes assessed according to the JOA score was excellent or good in 68% of the patients who had posterior decompression alone and in 84% of patients who had posterior decompression with posterolateral fusion.

All patients reported low back pain before surgery in both groups. In the nonfusion group, postoperative low back pain was noted in 14 (56%) patients of the 25 patients at follow-up, 10 patients showed improvement despite some pain, and four patients were unchanged. In the fusion group, postoperative low back pain was noted in five (20%) patients of 25 patients at follow-up, many of whom reported stiffness or dullness in the low back region. No patients showed worsening of their preoperative status. Three patients showed improvement despite some pain and two patients were unchanged.

Groups' statistics for postoperative low back pain were assessed. There was significant improvement among patients of the fusion group than those of nonfusion group ($P < 0.05$).

Statistics for postoperative sciatic pain among both groups were assessed. Overall, 96.34% among patients of fusion group had no leg pain, and 93.46% among patients of posterior decompression alone had no leg pain. The rest of the patients improved but with residual mild complaints. There were no significant differences between fusion and nonfusion groups regarding changes in the postoperative sciatic pain and claudication ($P > 0.05$).

The mean follow-up was 18.26 months in the fusion group and 17.56 months in the nonfusion group. All patients were followed up clinically and radiographically by plain radiography of the lumbosacral spine. Plain radiography was a quiet and informative tool in the follow-up of the lumbosacral spine surgery regarding assessment of alignment, curvature, fusion, and stability. MRI of lumbosacral spine was done for all complicated and symptomatic patients.

None of the patients experienced major complications. There were three cases of superficial infection requiring parenteral antibiotics, but no formal surgical incision for drainage was necessary, and five patients had a dural tear, which was repaired intraoperatively and caused no subsequent sequelae. One case among the nonfusion group with low back pain had spondylolysis with no displacement after 6 months of surgery, and one case had first degree spondylolithesis after 2 years of follow-up, and both of them refused a redosurgery and were managed conservatively. One case of nonfusion group with annoying back pain and mild sensory manifestations in lower limbs had epidural injection once, with significant improvement during follow-up.

Discussion

LSS is probably one of the most prevalent symptomatic spinal diseases in older patients, with most of them requiring surgical treatment to relieve their symptoms [6,13,14].

Surgical treatment of LSS has two aims. The first is the decompression of neural structures (cauda equina and nerve

roots), which are mechanically compressed by the degenerative tissues that form the spinal canal and the intervertebral foramina. The second aim is the correction of deformities on a sagittal and coronal plane and the maintenance of spinal column stability [15].

For patients who were ineffective by conservative treatment, decompression of the neural elements by surgery such as laminectomy has been the treatment of choice. It is important that the whole length of the facetal joint complex is adequately decompressed. However, a standard wide decompression involves removal of the lamina and ligamentum flavum from the lateral border of one lateral recess to that of the other at all involved spinal levels, which will induce instability in the lumbar spine [16].

Several authors have noticed that patients with spinal stenosis usually experience instability after decompression, and decompression without fusion might led to a higher rate of recurrence of stenotic symptoms [17,18].

In this study, 50 patients were operated for multilevel lumbar canal stenosis after being evaluated clinically and radiologically and after failure of conservative measures. A total of 25 patients (17 males and 8 females) with a mean age 55.47 years had posterior decompression with posterolateral fusion and 25 patients (14 males and 11 females) with a mean age 56.21 years had posterior decompression alone.

Low back pain was found in all cases of this study with variable intensities. Postoperatively five (20%) patients had mild low back pain in the form of stiffness or dullness in the low back region among patients of fusion group. Three patients showed improvement despite some pain and two patients were unchanged. In the nonfusion group, postoperative low back pain was noted in 14 (56%) patients of the 25 patients at follow-up, 10 patients showed improvement despite some pain, and four patients were unchanged. No patients showed worsening of their preoperative status.

Weinstein *et al.* [19] in their prospective study of 654 patients observed that patients with significant spinal canal stenosis treated surgically compared with those treated conservatively had substantially greater findings in pain and function through 4 years.

Singh *et al.* [2] in their prospective study of 24 patients with lumbar canal stenosis treated by posterior decompression and spinal instrumentation observed that postoperatively 83.33% patients had no back pain, and occasional mild pain was seen in 16.66%.

In this study, clinical outcome assessed according to the JOA score was excellent or good in 68% of the patients who had posterior decompression alone and in 84% of patients who had posterior decompression with posterolateral fusion.

Liang *et al.* [20], in their meta-analysis of 23 included studies involving 61 576 participants, support a result that decompression with fusion is significantly beneficial than decompression alone from clinical outcome but has a higher chance of reoperation rate for patients with LSS.

In the study by Singh *et al.* [2], 66.66% patients showed excellent and 25% showed good outcome at the final follow-up.

In this study, 96.34% of patients in the fusion group had no leg pain, and 93.46% of patients with posterior decompression alone had no leg pain. The rest of the patients improved but with residual mild complaints.

In the study by Singh *et al.* [19], 95.83% had no leg pain at all, 95.83% had normal gait, 91.66% had normal straight-leg raising test, and 100% had sensory improvement.

Three patients in this study had superficial wound infection requiring parenteral antibiotics, but no formal surgical incision for drainage was necessary, and five patients had a dural tear, which was repaired intraoperatively and caused no subsequent sequelae.

In the study by Duan *et al.* [16], overall intraoperative and postoperative complications occurred in three (7.1%) patients in the decompression group (two cerebrospinal fluid leakage and one wound infection) whereas in eight (15%) patients in the fusion group (three wound infection, two cerebrospinal fluid leakage, one renal failure, and two urinary tract infection) ($P < 0.05$).

In the study by Singh *et al.* [2], complications were found in three (12.5%) cases. Of those three cases, two (8.33%) had dural ruptures and one (4%) case was of infection.

Conclusion

Posterior decompression is a common procedure in treating patients with lumbar canal stenosis. The consequences of bone and ligament removal must be considered when performing decompression for spinal stenosis treated with laminectomy. Decompression with posterolateral fusion by pedicle screw fixation with discectomy when required gives long-term satisfactory results and is generally considered to be the best and safest method of treatment.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

References

1. Benyamin RM, Staats PS, MiDAS Encore I. MILD® is an effective

treatment for lumbar spinal stenosis with neurogenic claudication: MiDAS ENCORE randomized controlled trial. Pain Physician 2016;19:229-42.
2. Chen L, H Ferreira P, R Beckenkamp P, Ferreira ML. Comparative efficacy and safety of surgical and invasive treatments for adults with degenerative lumbar spinal stenosis: Protocol for a network meta-analysis and systematic review. BMJ Open 2019;9:e024752. doi: 10.1136/ bmjopen-2018-024752.
3. Deyo RA, Martin BI, Ching A, Tosteson A, Jarvik J, Kreuter W, Mirza S. Interspinous spacers compared with decompression or fusion for lumbar stenosis: Complications and repeat operations in the medicare population. Spine 2013;38:865-72.
4. Deyo RA, Mirza SK, Martin BI, Kreuter W, Goodman D, Jarvik J. Trends, major medical complications, and charges associated with surgery for lumbar spinal stenosis in older adults. JAMA 2010;303:1259-65.
5. Dohzono S, Matsumura A, Terai H, Toyoda H, Suzuki A, Nakamura H. Radiographic evaluation of postoperative bone regrowth after microscopic bilateral decompression via a unilateral approach for degenerative lumbar spondylolisthesis. J Neurosurg Spine 2013;18:472-8.
6. Duan C, Hu J, Cao Y, Wang X, Wu J. Comparison of decompression only versus posterior lumbar interbody fusion for lumbar nerve root canal stenosis in elderly patients. Int J Clin Exp Med 2016;9:16491-7.
7. Elsheikh NA, Amr YM. Effect of adding calcitonin to translaminar epidural steroid in degenerative lumbar spinal canal stenosis. Pain Physician 2016;19:139-46.
8. Forsth P, Michaelsson K, Sanden B. Does fusion improve the outcome after decompressive surgery for lumbar spinal stenosis? A two-year follow-up study involving 5390 patients. Bone Joint J; 2013;95-B:960-5.
9. Forsth P, Olafsson G, Carlsson T, Frost A, Borgstrom F, Fritzell P, *et al*. A randomized, controlled trial of fusion surgery for lumbar spinal stenosis. N Engl J Med 2016;374:1413-23.
10. Fu TS, Lai PL, Tsai TT, Niu CC, Chen LH, Chen WJ. Long-term results of disc excision for recurrent lumbar disc herniation with or without postero-lateral fusion. Spine 2005;30:2830-4.
11. Ghogawala Z, Dziura J, Butler WE, Dai F, Terrin N, Magge S, *et al*. Laminectomy plus fusion versus laminectomy alone for lumbar spondylolisthesis. N Engl J Med 2016;374:1424-34.
12. Hoogland T, Brekel-Dijkstra K, Schubert M, Miklitz B. Endoscopic transforaminal discectomy for recurrent lumbar disc herniation. Spine 2008;33:973-8.
13. Jansson KA, Blomqvist P, Granath F, Nemeth G. Spinal stenosis surgery in Sweden 1987-1999. Eur Spine J 2003;12:535-4.
14. Joaquim AF, Milano JB, Ghizoni E, Patel AA. Is there a role for decompression alone for treating symptomatic degenerative lumbar spondylolisthesis? A systematic review. Clin Spine Surg 2016;29:191-202.
15. Joaquim AF, Sansur CA, Hamilton DK, Shaffrey CI. Degenerative lumbar stenosis: Update. Arq Neuropsiquiatr 2009;67:553-8.
16. Liang L, Jiang W, Li X, Wang H. Effect of fusion following decompression for lumbar spinal stenosis: A meta-analysis and systematic review. Int J Clin Exp Med 2015;8:14615-24.
17. Manchikanti L, Knezevic NN, Boswell MV, Kaye AD, Hirsch JA. Epidural injections for lumbar radiculopathy and spinal stenosis: A comparative systematic review and meta-analysis. Pain Physician 2016;19:E365-410.
18. Panagiotis Z, Athanasios K, Panagiotis D, Minos T, Charis M, Elias L. Functional outcome of surgical treatment for multilevel lumbar spinal stenosis. Acta Orthopaedica 2006;77:670-6.
19. Singh V, Bansal A, Kumar A, Rawat S, Kela BS. Outcomes of lumbar canal stenosis treated with posterior decompression and spinal. Indian J Orthop Surg 2019;5:21-8.
20. Weinstein JN, Tosteson TD, Lurie JD, Tosteson A, Blood E, Herkowitz H, *et al*. Surgical versus nonoperative treatment for lumbar spinal stenosis four-year results of the spine patient outcomes research trial. Spine (Phila Pa 1976) 2010;35:1329-38