

Original Article**Surgical Decompression for Lumbar Spinal Stenosis; Systematic Review and Meta-analysis**Rahman MM¹, Khan RA², Khan SIM KN³, Uddin MZ⁴

Conflict of Interest: There is no conflict of interest relevant to this paper to disclose.

Funding Agency: Was not funded by any institute or any group.

Contribution of Author: Principal Investigator- Dr. Md. Moshir Rahman

Manuscript Preparation- Dr. S.I.M. Khairun Nabi Khan

Data Collection- Dr. Robert Ahmed Khan

Editorial Formatting: Dr. Md. Zia Uddin

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Received: 02 August, 2021

Accepted: 15 August, 2021

Abstract:

The primary concern for symptomatic back pain in elderly patients is to treat them according to guidelines. Surgical decompression for lumbar spinal stenosis may be laminotomy, laminectomy, or unilateral approach. Endoscopic or microscopic approaches are also promising though bony decompression is still the gold standard. Functional evaluation for instability, endplate changes, facet hypertrophy, and diagnostic tools like electrophysiological studies have been proposed. ODI, Swiss Score, and other back pain questionnaires assess the need for surgery. Here in this article, the authors have done a literature review with PRISMA analysis for surgical decompression in lumbar spinal stenosis with a ten-year database from Google Scholar, PubMed and Medline.

Bang. J Neurosurgery 2021; 11(1): 36-40

Introduction:

Low back pain is one of the most disabling complaints in the elderly, and it is usually caused by age-related degenerative changes in the spine¹. The surrounding bone and soft tissues restrict the spinal canal, putting neural systems at risk. It's an anatomic diagnosis that is more common with age and can happen to people who don't have any symptoms². Radicular pain while walking or standing that resolves with lumbar flexion is common³, and 85% of patients have substantial long-term symptoms of intermittent neurogenic claudication (radicular pain during walking or standing that disappears with lumbar flexion)². Compression of the cauda, facet joint hypertrophy, and nerve root impingement cause back pain in lumbar

spinal stenosis, and the results can be severe, ranging from dependency to financial ramifications⁴. Both are caused by acquired lumbar spinal stenosis, with central spinal stenosis causing bilateral symptoms and lateral recess stenosis causing leg pain⁵.

The number of lumbar spinal stenosis surgical treatments performed has consistently increased over time⁶. Surgical technique selection by surgeons, however, continues to be very variable⁷. Bony decompression by laminectomy is the gold standard surgical technique for lumbar spinal stenosis⁸. However, less invasive surgical procedures have been proposed, such as unilateral or bilateral laminotomies⁹, and spinous process split-laminectomy, due to the prevalence of problems associated with this technique^{10,11}. Although there are

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numerous surgical approaches available for the treatment of lumbar spinal stenosis, there appears to be a paucity of evidence to support this rapid growth of surgical techniques, leaving physicians to rely on their own judgment and experiences¹².

Because the systemic changes associated with age make surgical therapy for older people more difficult than for younger people, spine surgeons must characterize the clinical characteristics and surgical outcomes of lumbar spinal stenosis (LSS) in the elderly. Despite a few reports on patients aged 80 or older, all previous studies used small samples and did not provide precise comparisons with younger people^{13,14}. Other medical problems, such as joint pain, could have influenced surgical results in elderly patients, which were not included in these investigations. Given this, it's difficult to understand why the prevalence of back pain decreases with age, particularly in older populations¹¹. The requirement for a scientific approach to literature study is time consuming, and the objective is to stop the progression of back pain by identifying the causal elements.

Objective

Aim of the study is to compare the different surgical approaches for lumbar spinal stenosis using PRIMA analysis.

Method:

The scheme to follow will be in accordance with the recommendations of the systematic reviews of the PRISMA declaration for the presentation of the systematic review.

Search

A search for prospective, retrospective observational studies and randomized clinical trials is carried out in the following databases: PUBMED (until 2020); MEDLINE (until 2020); Google scholar (until 2020) in addition to the reference list of included studies and other relevant data as well as potentially eligible studies. We conducted the internet search through the Google Scholar search engine (www.google.com) and Pubmed, Medline with the terms selected in the search strategy.

We searched using the keywords like- ("Surgical Decompression" OR "Decompression") AND ("Lumbar Spinal Stenosis" OR "Spinal Stenosis") AND ("Surgical Approaches" OR "Treatment Procedures") AND ("Factors" OR "Causative Risk Factors").

Inclusion criteria

- Studies that include patients with lumbar spinal stenosis,
- Subgroup analyzes are accepted, randomized clinical trials
- Prospective or retrospective cohort studies describing clinical studies
- Studies that include more than 100 patients with lumbar spinal stenosis, since a smaller number increases the probability of error attributed to chance.

Exclusion criteria

- Studies that do not include lumbar spinal stenosis as a defined subgroup
- Cross-sectional or case control studies
- Studies with a sample size of less than 100

Results:

After following PRISMA flow chart (Figure 1) and conducting the systematic search of the information following our strategy, 138 bibliographic citations were

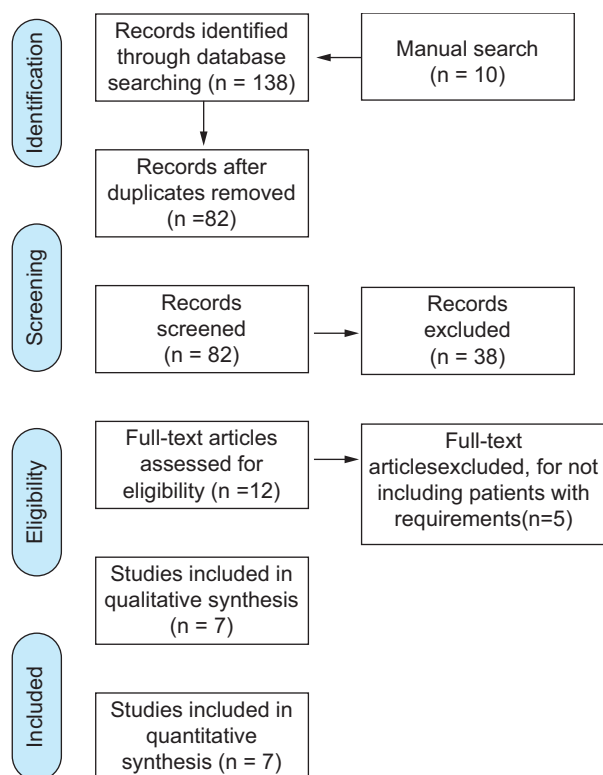


Fig.-1: Process of study selection – Flow chart of our search strategy and inclusion and exclusion criteria.

Table-I
Characteristics and outcomes of the included studies

Study	Type	Patients	Surgical procedures	Outcome
Shreya et al 2019 [26]	Retrospective study	N=1221 Mean age=63.9 yearsold	Discectomy, Decompression, Fusion with discectomy	NRS score, Mean (SD) 3 Mo=-3.29 (2.47) 24 mo= -3.58 (2.82)
John et al 2013 [27]	Retrospective observational study	N= 320 Mean age=60.8 yearsold	Lumbar endoscopic laminotomy, Foraminotomy	VAS Pre=6.0 (2.0), Post=3.0 (2.7) ODI Pre=40.1 (17.2), Post= 22.6 (19.8)
Jong-myung et al 2020 [28]	Prospective study	N= 110 Mean age= 67.1 years old	Decompressive laminectomy, Open discectomy, Endoscopic discectomy, Interbody fusion	VAS-B Pre=6.72±1.60, Post=3.11±2.47 VAS-L Pre=6.86±1.71, Post=3.14±2.43 K-ODI Pre=21.02±7.05, Post=10.68± 7.89 EQ-5D utility index Pre=0.48±0.15, Post=0.76±0.19 EQ-5D VAS Pre=55.60±20.47, Post=71.43±17.94
Akihito et al 2013 [29]	Retrospective observational study	N=366 Mean age= 68.7 years old	Microendoscopic laminotomy	JOA score Pre=14.1 ± 4.2, 2-yr=22.6 ± 4.5 RMDQ score Pre=11.3±4.9, 2-yr=4.8±5.4
Yoshiro et al 2013 [30]	Retrospective observational study	N=241 Mean age= 72.2 years old	Decompression surgery without fusion	JOA score Pre=GroupA:12.5(5.5), GroupB: 13.9(4.5); Post=GroupA:21.4(5.0), GroupB: 22.7(4.3) Postoperative complications Group A=19.6%, Group B=13.3%
Anthony et al 2015 [31]	Randomized Trial	N=169 Mean age= 66.6 years old	Decompressive laminectomies, Partial facet resection, Neuroforaminotomies	ODI score Pre= 42.6, 26 wk= 28.5 NASS pain and disability scale Pre= 2.6, 26 wk=1.7 NASS neurogenic symptoms scale Pre= 3.7, 26 wk=2.4 NASS treatment expectation scale Pre= 3.8, 26 wk=2.5
Asgeir et al 2010 [32]	Prospective cohort	N=101 Mean age=75.3 yearsold	Decompressive laminectomy	EQ-5D Pre= 0.32, 12 mo= 0.60 ODI score Pre= 44.2, 12 mo= 27.9

*NRS= Numeric Rating Scale; VAS=Visual analog scale; ODI= Oswestry disability index; VAS-B= Visual analog scale for back pain; VAS-L= Visual analog scale for leg pain, K- ODI= the Korean version of the Oswestry Disability Index; EQ-5D utility index= EuroQol 5-Dimension utility index; EQ-5D VAS= EuroQol 5-Dimension visual analog scale; JOA= Japanese Orthopaedic Association scoring system; NASS= North American Spine Society.

identified (PUBMED, MEDLINE, Google Scholar). 82 were considered potentially eligible on the basis of title or abstract, or both, and full texts were obtained. Among them, 38 were discarded because they did not contain required required patients. After a full text review, 12 studies were considered eligible, 5 were discarded for not meeting the research inclusion criteria and 7 met the inclusion criteria for the review (Table I).

Discussion:

The purpose of lumbar stenosis surgery is to all eviate the symptoms of neurogenic claudication by increasing walking distance and reducing leg pain. Back pain relief is seen as unreliable¹⁵, and patients are frequently advised to temper their expectations.

The effectiveness of surgery for lumbar spinal stenosis was found in our systematic study. We found seven studies that compared the effectiveness of various

surgical procedures. The findings suggest that the efficiency of the most commonly used surgical methods for lumbar spinal stenosis is not significantly different.

We have used a PRISMA flow chart, performed a sensitive electronic search on ten years three different databases, and selected studies with no restrictions. Here we estimated effectiveness of surgical decompression in lumbar spinal stenosis amongst all surgical techniques focusing on patient's surgical outcomes.

In a study, the addition of fusion to decompression for spinal stenosis has already been explored, with mixed results¹⁶. A cost difference for an extra fusion implant was discovered in one high-quality trial¹⁷. As a result, the superiority of decompression with fusion over decompression alone is still debatable, and surgeons should proceed with caution when choosing between both methods, especially given the fusion's related costs and perioperative risks. A systematic study of the efficiency of interspinous process spacer devices for spinal stenosis found that they are more successful than bone decompression¹⁸.

In a study, researchers pooled the results of two high-quality randomised trials to find no difference in pain, disability, or walking ability between treatments. Despite the fact that the spacer devices took less time to operate, they resulted in a higher frequency of revision procedures. As a result, the prescription for the use of decompressive devices is questionable due to their lack of effectiveness and increased reoperation rates when compared to bone decompression.

It's likely that the benefit of surgery for relieving low back pain is greatest for those with the worse baseline scores. With regard to ODI, a similar treatment effect trend was also identified in a study^{19,20}.

Decompression alone for spinal stenosis without instability, according to another study^{21,22}, gives good pain alleviation. They recommended that the presence of back discomfort in patients with spinal stenosis isn't a justification to combine the decompression and fusion procedures. Patient expectation that is unrealistic is linked to a poor outcome following

Surgery for symptomatic lumbar stenosis²³. These treatments are frequently performed in older patients who have complex medical issues and are at higher

risk for spine surgery^{24,25}. It's critical that we assess the outcomes of surgical intervention and can explain the benefits and dangers with each patient individually.

Conclusion:

Overall surgical outcome is good for symptomatic lumbar spinal stenosis. Treating physicians should use research and reviews as evidence-based tools to assist them choose the optimal surgical approach for this problem. Natural history of patients having symptomatic lumbar spinal stenosis suggests reluctance of surgery if the pain is tolerable. Patients, and surgeons, should have open and honest discussions about surgical procedures for LSS, including full disclosure of the data. Finally, additional research is needed to determine the advantages and disadvantages of decompression surgery for patients.

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