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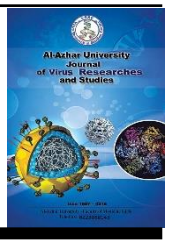

Treatment of Lumbar Spinal Stenosis in Elderly Patients: Systematic Review

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Abstract

Lumbar spinal stenosis (LSS) is a common disease among the elderly, but it can also affect people of younger ages. Back pain, lower limb pain, and claudication pain are common symptoms. Radiological examinations such as simple X-rays, CT, or MRI Lumbosacral spine are used to confirm the diagnosis. The aim of the present study is to organize and summarize the vast and diverse literature on the treatment of LSS in elderly patients (adults aged ≥65 years). We identified systematic reviews published from January 2015 to January 2021 and screened the reference lists from these reviews for additional relevant articles. This study found that surgery helped older patients with moderate to severe lumbar stenosis who did not have spondyloliathesis. Based on largely low-quality, retrospective evidence, we recommend that elderly patients should not be excluded from surgical intervention for symptomatic lumbar spinal stenosis.

Keywords: Treatment, Lumber spinal stenosis, Elderly.

1. Introduction

The narrowing of the spinal canal or the tunnels through which nerves and other structure communicate with it is known as lumbar canal stenosis. Arnoldi [1] classified spinal stenosis into congenital and acquired causes. The most prevalent cause of lumbar canal stenosis is degenerative or inflammatory changes in the intervertebral discs, ligaments, and facet joints (arthritis). These modifications include cartilaginous hypertrophy of the canal's articulations, intervertebral disc herniations or annular bulges, ligamentum flavum hypertrophy, and the production of bone spurs (osteophytes). [2] In older patients, simple radiological examinations may indicate degenerative alterations such as bone spurs, decreased disc space, and facet hypertrophy. A CT scan will reveal more information about the bony anatomy. Unless paired with a myeloghraphic effect, it is less reliable than MRI in determining the degree of soft tissue damage. As a result, the CT scan may understate the severity of the stenosis. The primary method diagnosing lumbar stenosis is magnetic resonance imaging (MRI). Soft tissues, such as neural elements, ligaments, epidural fat, subarachnoid space, and intervertebral discs, can be seen. [2] Patients with worsening neurological deficits or those who have failed a suitable

six-month trial of nonoperative care should consider for surgery. The basic purpose of all proposed surgical techniques is to decompress the neuronal elements. [3] The conventional The narrowing of the spinal canal or the tunnels through which nerves and other structure communicate with it is known as lumbar canal stenosis. Arnoldi [1] classified spinal stenosis into congenital and acquired causes. The most prevalent cause of lumbar canal stenosis is degenerative or inflammatory changes in the intervertebral discs, ligaments, and facet joints (arthritis). These modifications include cartilaginous hypertrophy of the canal's articulations, intervertebral disc herniations or annular bulges, ligamentum flavum hypertrophy, and the production of bone spurs (osteophytes). [2] In older patients, simple radiological examinations may indicate degenerative alterations such as bone spurs, decreased disc space, and facet hypertrophy. A CT scan will reveal more information about the bony anatomy. Unless paired with a myeloghraphic effect, it is less reliable than MRI in determining the degree of soft tissue damage. As a result, the CT scan may understate the severity of the stenosis. The primary method diagnosing lumbar stenosis is magnetic resonance imaging (MRI). Soft tissues, such as neural elements, ligaments, epidural fat, subarachnoid space, and intervertebral discs, can be seen. [2] Patients with worsening neurological deficits or those who have failed a suitable six-month trial of nonoperative care should consider for surgery. The basic purpose of all proposed surgical techniques is to decompress the neuronal elements. [3] The conventional treatment used to be a decompressive laminectomy with medial facetectomy and foraminotomy. A growing trend toward less invasive decompressive surgery has emerged as a viable surgical option for sparing anatomical structures and reducing the risk of post-operative instability. [4] For lumbar spinal stenosis, bilateral foraminotomy with decompression without laminectomy is a safe and gentle method for decompressing the spinal canal with outstanding results. [5] Transpedicular fixation is utilised to improve the chances of bone fusion while reducing the amount of time spent immobilised after surgery. [6] Patients with stenosis and concomitant degenerative spondylolisthesis who require decompression might consider for posterolateral fusion. Posterolateral and interbody fusion have both been shown to be effective, either alone or in combination. [7] The use of posterior lumbar interbody fusion (PLIF) as a biomechanically and possibly clinically superior fusion approach for a number of degenerative diseases has recently resurged. Total discectomy, neural decompression, restoration of disc space height, and solid mechanical arthrodesis are some of the benefits of PLIF. As an adjunct to PLIF, segmental instrumentation with a pedicel screw and rod or plate build may provide stability and improve fusion rates. [8] Foley and Smith published the use of a tubular retractor system for lumbar surgery. [9] Surgeons are treating patients with lumbar stenosis using a tubular retractor system and an operating microscope as their experience with this surgical approach grows. When compared to an open lumbar decompression, this method needs less soft tissue loss. The surgeon can expect less bleeding, less post-operative pain, and a lower chance of iatrogenic instability as a result. [10] Interspinal Process Decompression (IPD) is a minimally invasive spinal surgery (MISS) in which an implant is put between the adjacent spinal processes of the affected disc level. Patients with LSS and debilitating neurogenic intermittent claudication who can ease their symptoms by bending forward or flexing their spine were the target audience for the IPD system. The IPD is meant to keep the spinal segments in a neutral or slightly flexed position, allowing patients to regain their regular posture rather than flexing the entire spine for symptomatic relief. [11] The aim of the present study is to organize

and summarize the vast and diverse literature on the treatment of LSS in elderly patients (adults aged ≥65 years)**.**

2 .Methodology

Search strategy for identification of studies as follow**:**

2.1. Electronic search

We identified systematic reviews published from January 2015 to January 2021 and screened the reference lists from these reviews for additional relevant articles **.**

2.2. Data selection

Two review authors will independently assess for inclusion of all the potential studies that we identified as a result of the search strategy. If required, we will consult a third person. The abstracts collected by the above-mentioned search strategy will be first screened for identification of the relevant trials according to the inclusion criteria mentioned below**.**

2.3. Data extraction

For eligible studies, [at least two] review authors will extract the data using the agreed form. If required, we will consult [a third person]. Data from all the included studies will be summarized in tables including, the authors, year of publication and the full title of the study, participants, intervention used, control, outcome of interest and the measure used to assess that outcome .

2.4. Quality assessment

Risk of bias: Two independent reviewers will conduct the risk of bias of the included studies using "A revised Cochrane risk-of-bias tool for randomized trial**s**.

2.5. Data analysis

If appropriate with available data, results from comparable groups of studies will be pooled into statistical meta-analysis using Review Manager Software from the Cochrane Collaboration**.**

2.6. Inclusion criteria for considering studies for this review

1**.** Clinical studies reporting the methods of treatment of lumber spinal stenosis**.**

2**.** Studies included patients with any type of lumber spinal stenosis. (Degenerative, elderly) undergoing conservative or surgical (decompression, instrumented, or non-instrumented procedures) in lumber region**.**

3**.** English literature **.**

4**.** Human Studies with clear reporting of methods and results**.**

5**.** Lumbar spinal stenosis patients ≥ 65 years **.**

6**.** Patient with long follow up more than 6 months**.**

2.7. Exclusion criteria

1**.** Non-randomized controlled trials (non-RCTs)**.**

2**.** Abstracts with non-available full text**.**

3**.** Case reports, comments, letters, guidelines, protocols, abstracts and review papers**.**

4**.** Studies with unclear reporting of methods or results**.**

5**.** Animal and cadaveric studies**.**

6. Adult spinal stenosis patients <65 years .

7. Patient with short follow up less than 6 months .

8. Studies conducted on patient's LSS who had other radiographic technique or incomplete physical activity measurements.

3. Results

A flow diagram of the detailed search process used is shown in Fig. 1. The literature search yielded 2741 unique articles. A further screening of titles and abstracts was conducted, and 62 studies were considered potentially relevant to our review. According to the inclusion criteria, 7 studies were identified in this study. Table 1 summarizes the characteristics of the 7 studies included in our analysis. All included studies reported the events of lumbar stenosis. The sample size ranged from 19 to 8033 patients. The age of patients was ≥ 65 years, ranging from 65 to > 83 years. Decompression only was the most reported intervention. Table 2 summarizes the studies included for analysis of clinical outcomes. Among studies that reported the fraction of patients who improved from surgical intervention a range of 67% to 97% of patients reported improvement from preoperative features of neurogenic claudication with a pooled estimate mean of 83%. Among studies that reported visual analog scale leg pain scores a range of 2.7 to 5.1-point improvement on the visual analog scale was reported with a pooled estimate mean of 4.4. Among studies that reported Oswestry Disability Index (ODI) scores a range of 19 to 29-point improvement on the ODI score was reported with a pooled estimate of 23.

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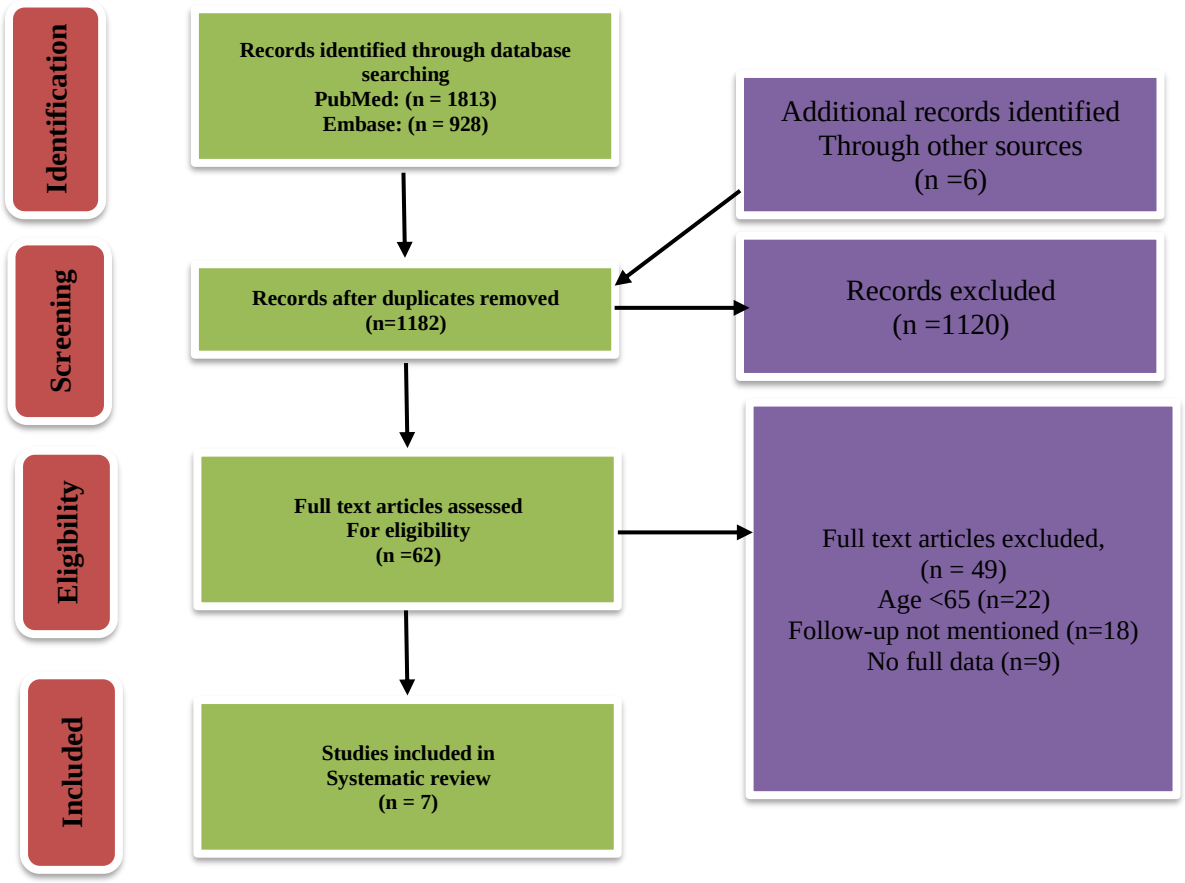

Figure (1): Flow diagram of eligible Studies.

Table (1): Summary of the 7 studies included in pooled data for presenting features of lumbar stenosis.

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First Author	Year of publication	Patients (n)	Study Design	Mean Age	Intervention	Grade of Evidence
Rihn et al (1)	2015	58	Retrospective	80	D (39) D + F (19)	Very Low
Imajo et al (2)	2017	8033	Retrospective	77	D (5213) D + F (2820)	Moderate
Meghan et al (3)	2017	4573	Retrospective	72	D (4573)	Low
Saleh et al (4)	2017	2320	Retrospective	83	D (1906) D + F (414)	Moderate
Salem et al (5)	2019	100	Prospective	71	D (50) Conservative (50)	High
Lim et al (6)	2019	450	Retrospective	67	percutaneous stenoscopic lumbar decompression (PSLD) (450)	Moderate
Li et al (7)	2020	136	Retrospective	69	percutaneous endoscopic lumbar discectomy (PELD) (136)	Moderate

D, decompression only; D 1 F, decompression and fusion. Grade: quality of evidence is stated and in parentheses is stated the initial quality assessment and any modifiers.

Table (2): Summary of the Studies outcome.

First Author	Year of publication	Patients (n)	Outcomes
Rihn et al (1)	2015	58	ΔODI—19
Imajo et al (2)	2017	8033	
Meghan et al (3)	2017	4573	Improved 3873
Saleh et al (4)	2017	2320	No change (379) Worse (10) Readmission (86)
Salem et al (5)	2019	100	VAS Leg in surgery group (4.02 ± 0.56) compared to conservative one (7.58 ± 1.06).
Lim et al (6)	2019	450	VAS showed a statistically significant improvement from 6.24 to 2.36 Mean ODI value improved from 60.6 to 26.3
Li et al (7)	2020	136	Improvement (93%)

VAS = visual analog scale; ODI = Oswestry Disability Index.

Table 3 illustrated that, some studies showed perioperative death studies 1-4 and some patients had recurrent stenosis studies 1,3,4,6. Table 4 summarizes the studies included for analysis of perioperative morbidity and mortality. Among patients

represented in these studies, the most common reported complication was inadvertent durotomy. A similar fraction of patients also exhibited perioperative urinary retention. Wound infections occurred in 2.4% of patients (range, 0%-5%). Cardiovascular morbidity was observed in 0.8% of patients (range, 0%-2%), most frequently including perioperative arrhythmia or myocardial infarction. From Table .5 decompression only, studies groups have less complications than decompression with fusion studies.

Table (3): Summary of the Studies death and recurrence.

First Author	Patients (n)	Death	Recurrent Stenosis
Rihn et al (1)	58	1	4 reoperations
Imajo et al (2)	8033	6	0
Meghan et al (3)	4573	17	364
Saleh et al (4)	2320	10	86 readmissions
Salem et al (5)	100	0	NA
Lim et al (6)	450	0	6
Li et al (7)	136	0	0

Table (4): Complications among the Studies.

First Author	Wound Infection	Dural Tear	Acute Spine Neurological Deterioration	CVE	CVA	DVT/ PE	UTI/ retention
Rihn et al (11)	2	8	4 reoperations	0	0	0	2
Imajo et al (12)	216	505	196	57	34	34	208
Meghan et al (3)	140	23	20	39	12	43	99
Saleh et al (4)	33	0	4	12	8	26	72
Lim et al (5)	1	7	5	0	0	0	0
Li et al (6)	1	0	0	0	0	0	2

AFIB, atrial fibrillation; CVE, cardiovascular event; CVA, cerebrovascular accident; DVT/PE, deep venous thrombosis/pulmonary embolism; MI, myocardial infarction.

Table (5): Summary of the Studies total complications

First Author	Complications	Prevalence of complications (%)	95% confidence interval	
			Upper level	Lower level
Rihn et al (11)	16	27.58621	25.00	30.50
Imajo et al (12)	1250	15.56081	14.70	20.50
Meghan et al (3)	376	8.222174	7.60	9.30
Saleh et al (13)	155	6.681034	6.00	8.50
Lim et al (5)	13	13	12.00	14.70
Li et al (6)	3	0.666667	0.00	2.40

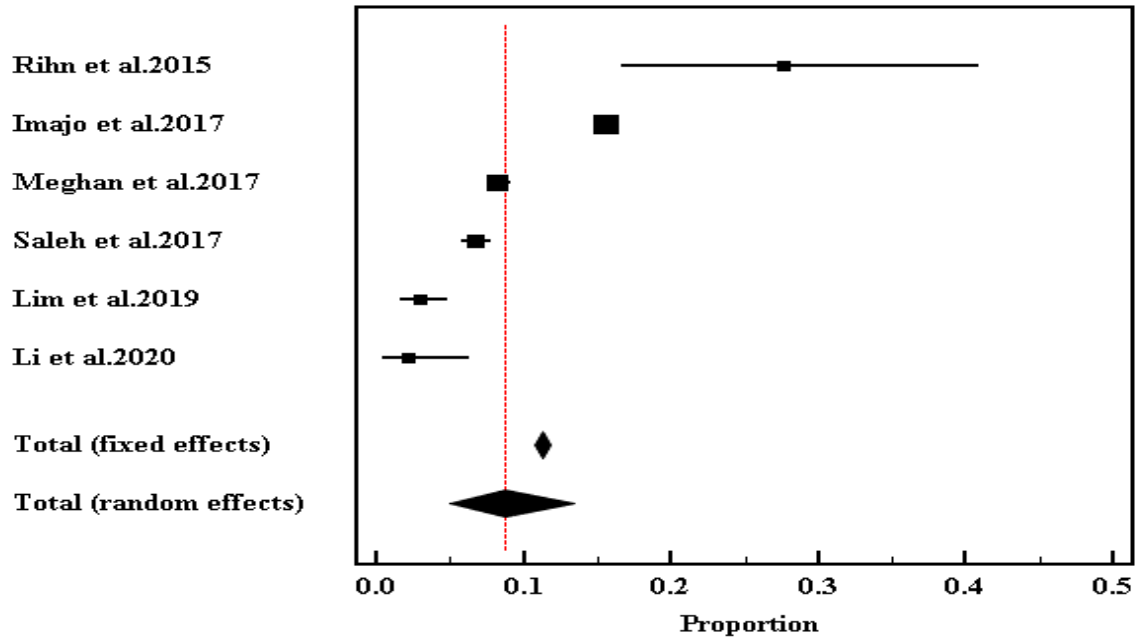

Figure (2): Forest plot for the complications.

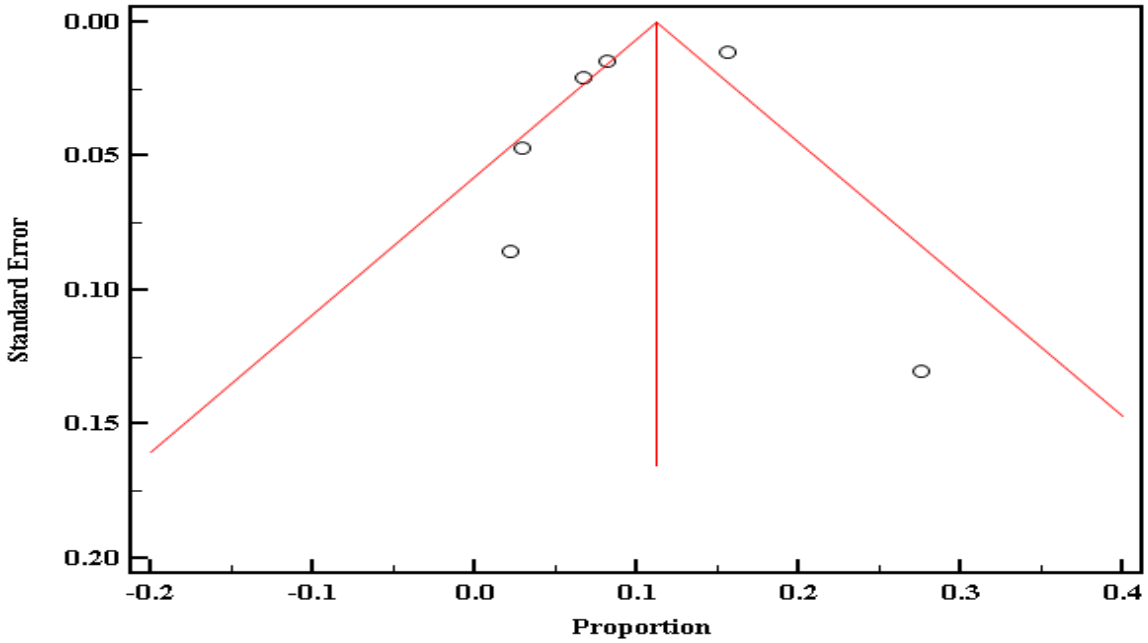

Figure (3): Funnel plot for the complications.

4. Discussion

As the ageing of the population and improved access to medical aid and imaging scans that can confirm the problem, degenerative lumbar stenosis is becoming more widely recognized. Despite this significant rise in frequency, the true effectiveness of surgical decompression therapy for this population is unclear. [12] This study found that older individuals with moderate to severe lumbar stenosis without spondylolisthesis whose diagnosis was verified by magnetic resonance benefited

from surgery, with discomfort in the lower limbs reduced (VAS Leg, p 0.05) and function improved (Oswestry, p 0.05). However, there was no significant change in back VAS between the two groups, nor was there any difference between after 6 months and after a year. Atlas et al. [13] found that after 8-10 years of follow-up, both groups had similar levels of lower back pain and satisfaction with their respective treatments, but the operated group had greater function and reported less pain in the lower limbs, similar to the findings of this study. Lumbar decompression surgery is clearly beneficial to people with severe LSS and considerable symptoms. However, it is unclear if people with mild LSS who have less severe symptoms should also have surgery. [14] Katz and colleagues. [15] studied 194 patients who had a decompressive laminectomy and found that 78 percent of them were satisfied with the results after six months. The Finnish Lumbar Spine Research Group described 94 patients who were randomised to nonoperative therapy against laminectomy with or without instrumented fusion of the stenotic segments. Patients who underwent surgery improved their leg pain, back pain, and overall impairment at one year and two years. [16] A trial of individuals with lumbar spinal stenosis without spondylolisthesis who were randomized to decompression surgery without fusion or normal non-operative treatment was also included in the SPORT group. This study enrolled 289 patients from 13 different locations around the United States. It found that surgery improved all primary outcomes and that this improvement lasted for two years. [17] Fixation became a popular operation following laminectomy and decompression for LSS because these reasons and the introduction of pedicle screws and cages lumbar fusions with instrumentation. [18] Only one sort of surgery should be used, according to our protocol seminar at Al-Azhar University's Neurosurgery Department. As a result, we used posterior decompression with or without fusion, as well as a conservative management strategy. To be more exact and specific, we used medical treatment and physiotherapy in the trial, as well as moderate to severe lumbar stenosis. To compare the two groups, we employed an MRI of the lumbar spine to confirm the diagnosis, as well as the Visual Analogue Score of the back and leg and the Oswestry Disability Index. In comparison to the conservative group, the surgery group exhibited improvement in leg discomfort (VAS Leg with p 0.05) and function (Oswestry with p 0.05). After 6 and 12 months, however, there was no significant difference in back discomfort between the two groups. [19]

5 .Conclusion

Based on largely low-quality, retrospective evidence, we recommend that elderly patients should not be excluded from surgical intervention for symptomatic lumbar spinal stenosis.

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