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Surgical versus Conservative Management of Lumbar Canal Stenosis in Elderly

Ahmed Mohamed Hassan Salem, Mostafa Elsayed Mohamed Elsayed, Mohamed Ahmed Mohamed Abdallah

Department of Neurosurgery, Faculty of Medicine, Azhar University

***Corresponding Author:** Mohamed Ahmed Mohamed Abdallah, **Phone No.:** (+20) 01068452520,

E-mail: dr.kali.555@gmail.com

ABSTRACT

Background: Degenerative lumbar spinal stenosis is one of the common diseases in elderly, also may occur in younger ages. Usually presents with back pain, lower limbs pain and claudication pain. Diagnosis is confirmed by radiological studies such as plain X rays LSS, CT. LSS or MRI LSS.

Objective: The aim of this prospective study was to evaluate the surgical versus conservative management of lumbar canal stenosis in old patient (age of 60 years old or more). **Methods:** A prospective comparative study was conducted on 100 old patients that were divide into two groups, each group 50 patients. The first 50 patients underwent surgical lumbar canal decompression and the other 50 patients underwent conservative management.

Results: This study showed that elderly patients with moderate to severe lumbar stenosis without spondylolisthesis got benefit from surgery. They showed reduction in pain reported in the lower limbs (VAS Leg with $p < 0.05$) and improved function (Oswestry with $p < 0.05$) whoever there was no significance change regarding visual analogue scale (VAS) between the two groups. In addition, there was no significant difference between the result between 6 month and one-year follow up. **Conclusion:** In patients with lumbar stenosis in old age, there was improvement in leg pain and function in patients underwent surgical posterior decompression but there was no difference in back pain compared to patients underwent conservative management.

Keywords: Surgical versus Management, Lumbar canal stenosis, Elderly.

INTRODUCTION

Lumbar canal stenosis is the narrowing of the spinal canal or the tunnels through which nerves and other structures communicate with that canal. Spinal stenosis was classified by Arnoldi in 1976 into congenital and acquired causes. Most commonly, lumbar canal stenosis is due to acquired degenerative or inflammatory changes (arthritis) of the intervertebral discs, ligaments and facet joints. These changes include cartilaginous hypertrophy of the articulations surrounding the canal, intervertebral disc herniations or annular bulges, hypertrophy of the ligamentum flavum and bone spur (osteophyte) formation [(1)].

Simple radiological investigations may reveal degenerative changes such as bone spurs, decreased disc space and facet hypertrophy in older patients. CT scan will show a more detailed picture of the bony anatomy. It is less accurate than MRI in estimating the degree of compromise of the soft tissue elements unless combined with a myeloghraphic effect. Thus the CT scan may underestimate the degree of stenosis. MRI is the preferred modality for evaluating and diagnosing lumbar stenosis. It allows visualization of soft tissues, including the neural elements, ligaments, epidural fat, subarachnoid space and intervertebral discs [(1)].

Surgical treatment for lumbar spinal stenosis is indicated in patients with progressive neurological deficits or those who fail an appropriate trial of non-operative management for a period of six months. All the proposed surgical interventions have a common primary goal of neural element decompression [(2)]. Wide decompressive laminectomy, often combined with medial facetectomy and foraminotomy, used to be the standard treatment. In recent years, however, a growing tendency toward less invasive decompressive surgery has emerged as a logical surgical alternative, sparing anatomical structures and decreasing the risk for post-operative instability [(3)]. Bilateral foraminotomy and decompression without laminectomy for lumbar spinal stenosis is a safe and gentle technique for decompressing the spinal canal with excellent possibilities [(4)].

Transpedicular fixation is used to increase the chance of bone fusion while diminishing the need for prolonged post-operative immobilization. Fixation may be on one or both sides [(5)].

Posterolateral fusion is recommended for patients with stenosis and associated degenerative spondylolisthesis who require decompression. Posterolateral and interbody fusion have been used successfully either alone or in combination together [(6)]. There has been a recent resurgence of interest in posterior lumbar interbody fusion (PLIF) as a biomechanically and possibly clinically superior fusion technique applicable to a variety of degenerative conditions. PLIF offers advantages such as total discectomy, neural decompression, restoration of disc space height and solid mechanical arthrodesis. The addition of segmental instrumentation using a pedicel screw and rod or plate construct adjunct to PLIF may offer stability and enhance fusion rates [(7)].

The use of a tubular retractor system for lumbar surgery was popularized by **Foley and Smith [(8)].** As experience has grown with this surgical approach, surgeons are treating patients with lumbar stenosis using a combination of a tubular retractor system and an operative microscope. This approach requires less soft tissue destruction compared to an

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open lumbar decompression. As a result, the surgeon can expect less bleeding, less post-operative pain, and a reduced risk of iatrogenic instability

Interspinous process decompression (IPD) is a minimally invasive spinal surgery (MISS) in which an implant is placed between the adjacent spinal processes of the symptomatic disc level. The interspinal process decompression system was developed for patients who have LSS with disabling neurogenic intermittent claudication and who are able to relieve their symptoms when they bend forward or flex their spine. The IPD is designed to limit pathological extension of the spinal segments and to maintain them in a neutral or slightly flexed position, which may allow patients to resume their normal posture rather than flex the entire spine to gain symptomatic relief [(9)].

AIM OF THE WORK

The aim of this work is to study the surgical versus conservative management of lumbar canal stenosis at the age of 60 years old or more with early or long term follow up outcome.

PATIENTS AND METHODS

A prospective study was done between March 2015 to May 2018, including 100 patients with degenerative lumbar canal stenosis divided into 2 groups:

Group A: It consisted of 50 patients with degenerative lumbar canal stenosis treated by laminectomy (removal of the whole lamina with or without fusion)

Group B: It consisted of 50 patients with degenerative lumbar canal stenosis treated by conservative management.

The follow up period of these cases continued to 12 months.

The study was approved by the Ethics Board of Al-Azhar University and an informed written consent was taken from each participant in the study.

Assessment methods:

This included:

- Assessment of the Oswestry Disability Index (ODI) for the patients after 6 to 12 months.
- Assessment of the Visual Analogue Scale (VAS) for low back pain (LBP) after 6 to 12 months.
- Assessment the Visual Analogue Scale for Leg pain and claudication pain after 6 to 12 months.

Methodology

Includes:

1- Patient selection.

2- Patient counseling.

3- Patient evaluation.

4- Pre-operative preparation of the patient who will undergo surgery.

1-Patient Selection: Old patients 60 years old or more with moderate to severe degenerative lumbar canal stenosis with low back pain and leg pain.

2-Patient Counseling and consent:

The patient was informed about the investigations necessary for the surgery and conservative management, the operative details, the post-operative period and need of rehabilitation and the average time of rehabilitation in full details. Also possible complications of the operation were discussed. This counseling was essential to have the maximum cooperation of the patient as well as to decrease the patient anxiety. In addition, a detailed consent was assigned by the patient pre-operative.

3-Patient evaluation:

A careful detailed clinical history, general, local for back and neurological examination was done for each patient.

- **Clinical history:**

A complete history was taken from all patients. The quality, and severity of low back pain and lower extremity complaints was documented also bowel and bladder control was questioned. The degree of pain and patient disability was assessed through using the **Visual Analogue Scale (VAS)** and the **Oswestry Disability Index questionnaire (ODI)**. An Arabic translation of the ODI was made to be answered easily by all patients.

Also in the history any past medical or surgical history was documented.

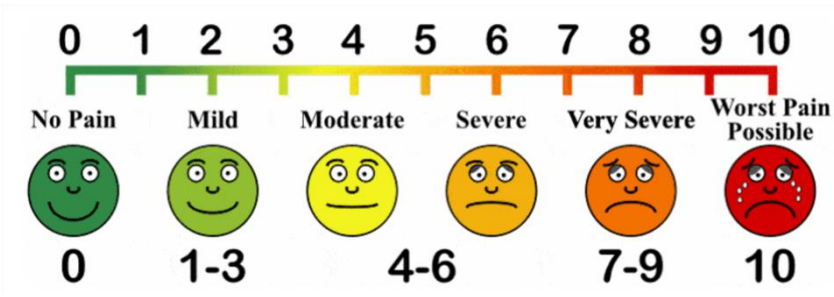


Figure (1): Visual analogue scale [(10)].

Patient examination:

General assessment: Generally, this was done to assess the patient general fitness for such a major surgery stressing on the cardiopulmonary, hepatic and renal functions.

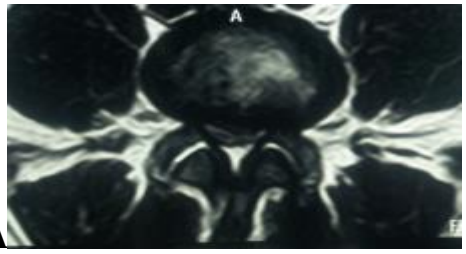
Local Examination: A routine lumbar spine examination with stress on the range of motion, deformities, exact site of tenderness or scars of previous operations. A complete neurologic examination of lower extremity motor strength, sensory abnormalities, and knee and ankle reflexes were performed. Special stress was made to the extensor hallucislongus (L5) and Tibialis anterior (L4-L5) strength.

Radiological Evaluation:

Plain X rays lumbo-sacral spine antero-posterior and lateral views were performed. Also flexion-extension lateral radiographs taken in the standing position were also done to discover translatory instability in the main segment as well as in adjacent segments. Computed Tomography (CT) was done for some patients to provide more precise information about the nature of neural compression.

Figure (2): Sagittal cuts of lumbar CT scan showing foraminal stenosis of the L4 foramen. (This patient was in group A).

A fixed investigation was the magnetic resonance imaging (MRI), done for all patients to demonstrate any impingement of the central spinal canal, lateral recess, degenerative spondylosis, ligamentum flavum hypertrophy and facetal joint hypertrophy. Doppler ultra sound of lower limbs of all patients was done to exclude vascular diseases.



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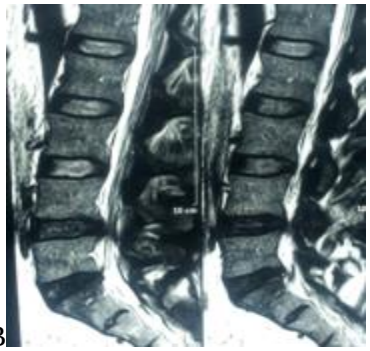

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Figure (3): MRI lumbosacral spine showing degenerative stenosis, (A) axial and (B) sagittal. (This patient was in group A).

Figure (4): MRI lumbar spine showing lateral recess stenosis. (This patient was in group B).

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean ± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

- Independent-samples t-test of significance was used when comparing between two means.
- Paired sample t-test of significance was used when comparing between related samples.
- Chi-square (x^2) test of significance was used in order to compare proportions between qualitative parameters.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

- Probability (P-value)
  - P-value < 0.05 was considered significant.
  - P-value < 0.001 was considered as highly significant.
  - P-value > 0.05 was considered insignificant.

RESULTS

Table (1): Comparison between group A surgical and group B conservative according to demographic data.

Demographic Data	Group A: Surgical *(n=50)*	Group B: Conservative *(n=50)*	t/x2#	p-value
Age (years) Range Mean ± SD	 60-80 71.25 ± 6.41	 60-80 71.20 ± 6.50	0.039	0.969
Sex Male Female	 15 (30%) 35 (70%)	 18 (36%) 32 (64%)	0.181#	0.671

t-Independent Sample t-test; #x^2: Chi-square test
p-value>0.05 NS

This table showed no statistically significant difference between group A surgical and group B conservative according to demographic data. Regarding age the range of age of both groups, it ranged from 60 to 80 years old and the mean was 71.25 ± 6.41 in group A and 71.20 ± 6.50 in group B and the p-value was 0.96 (p-value > 0.05). Concerning sex, the males were 15 (30%) and the females were 35 (70%) in group A. In group B, the males were 18 (36%) and the females were 32 (64%). There was no significant difference also between the two groups as the p-value was 0.67 (p-value > 0.05).

Table (2): Comparison between group A surgical and group B conservative according to Oswestry.

Oswestry	Group A: Surgical *(n=50)*	Group B: Conservative *(n=50)*	t-test	p-value
After 6 months	36.38 ± 5.46	56.18 ± 8.43	13.940	<0.001**
After 1 year	37.90 ± 5.68	58.53 ± 8.78	12.598	<0.001**

*t-Independent Sample t-test; **p-value <0.001HS*

This table showed highly statistically significant difference between group A surgical and group B conservative according to Oswestry as in group A the Oswestry was 36.38 after 6 months and was 56.18 in group B while the Oswestry was 37.90 in Group A and 58.53 after 1 year as p-value was < 0.001** .

Table (3): Comparison between after 6 months and after 1 year according to Oswestry in each group.

Oswestry	Group A: Surgical *(n=50)*	Group B: Conservative *(n=50)*
After 6 months	36.38 ± 5.46	56.18 ± 8.43
After 1 year	37.90 ± 5.68	58.53 ± 8.78
Mean Diff.	1.52	2.35
Paired Sample t-test	1.364	1.365
p-value	0.176	0.175

t-Paired Sample t-test; p-value >0.05 NS

This table showed no statistically significant difference occurred between After 6 months and After 1 year according to Oswestry as in group A, the Oswestry was 36.38 ± 5.46 after 6 months and was 56.18 ± 8.43 in group B. While, the Oswestry was 37.90 ± 5.68 in group A and was 58.53 ± 8.78 in group B with P-value was 0.176 in group A and was 0.175 in group B (p-value > 0.05).

Table (4): Comparison between group A surgical and group B conservative according to lumbar VAS scale.

Lumbar VAS scale	Group A: Surgical *(n=50)*	Group B: Conservative *(n=50)*	t-test	p-value
After 6 months	5.97 ± 0.75	6.63 ± 0.96	2.812	0.079
After 1 year	6.80 ± 0.78	7.12 ± 1.00	1.784	0.078

t-Independent Sample t-test; p-value >0.05 NS

This table showed that there was no statistically significant difference between group A surgical and group B conservative regarding lumbar VAS scale as the lumbar VAS scale was 5.97 ± 0.75 in group A and was 6.63 ± 0.96 in group B after 6 months (P-value 0.079). While the lumbar VAS scale was 6.80 ± 0.78 in group A and 7.12 ± 1.00 in group B after 1 year (p-value >0.05).

Table (5): Comparison between after 6 months and after 1 year according to lumbar VAS scale in each group.

Lumbar VAS scale	Group A: Surgical *(n=50)*	Group B: Conservative *(n=50)*
After 6 months	5.37 ± 0.75	6.83 ± 0.96
After 1 year	5.60 ± 0.78	7.12 ± 1.00
Mean Diff.	0.23	0.29
Paired Sample t-test	1.503	1.479
p-value	0.136	0.142

t-Paired Sample t-test; p-value >0.05 NS

This table showed that there was no statistically significant difference between After 6 months and After 1 year according to lumbar VAS scale in each group. The lumbar VAS scale in group A was 5.37 ± 0.75 and 5.60 ± 0.78 after 6 months and 1 year successively (p value = 0.136). In group B, the lumbar VAS scale was 6.83 ± 0.96 and 7.12 ± 1.00 after 6 months and 1 year successively (p value = 0.142).

Table (6): Comparison between group A surgical and group B conservative according to leg VAS scale.

Leg VAS scale	Group A: Surgical *(n=50)*	Group B: Conservative *(n=50)*	t-test	p-value
After 6 months	3.86 ± 0.54	7.28 ± 1.02	8.194	0.019*
After 1 year	4.02 ± 0.56	7.58 ± 1.06	6.174	0.027*

*t-Independent Sample t-test; *p-value <0.05 S*

This table showed that there was statistically significant difference between group A surgical and group B conservative according to leg VAS scale. The leg VAS scale was 3.86 ± 0.54 in group A and was 7.28 ± 1.02 in group B after 6 months (P-value was 0.019). While the leg VAS was 4.02 ± 0.56 in group A and was 7.58 ± 1.06 in group B after 1 year as (P-value = 0.027).

Table (7): Comparison between after 6 months and after 1 year according to leg VAS scale in each group.

Leg VAS scale	Group A: Surgical *(n=50)*	Group B: Conservative *(n=50)*
After 6 months	3.86 ± 0.54	7.28 ± 1.02
After 1 year	4.02 ± 0.56	7.58 ± 1.06
Mean Diff.	0.16	0.30
Paired Sample t-test	1.454	1.442
p-value	0.149	0.153

t-Paired Sample t-test; p-value >0.05 NS

This table showed that there was no statistically significant difference between after 6 months and after 1 year according to leg VAS scale in each group. The leg VAS scale in group A was 3.86 ± 0.54 and 4.02 ± 0.56 after 6 months and 1 year successively (p-value = 0.149). In Group B, the leg VAS scale was 7.28 ± 1.02 and 7.58 ± 1.06 after 6 months and 1 year successively (P-value = 0.153).

DISCUSSION

Degenerative lumbar stenosis is a disease that is increasingly identified in the population, due both to the aging of the population and easier access to medical assistance and imaging exams that can confirm the condition. Despite this real increase in incidence, the real benefit of surgical decompression treatment for this population is not clear [(11)].

This study showed that elderly patients with moderate to severe lumbar stenosis without spondylolisthesis who their diagnosis was confirmed by magnetic resonance got benefit from surgery with a reduction in pain reported in the lower limbs (VAS Leg with $p < 0.05$) and improved function (Oswestry with $p < 0.05$). However, there was no significant difference between back VAS between the tow groups and also there was no significant difference between after 6 month and one year.

Similar to the findings of this study, **Atlas *et al.* [(11)],** in an analysis of patients who either underwent surgery or were treated clinically, concluded that after 8-10 years of follow-up, both groups presented similar levels of lower back pain and satisfaction with their respective treatments, but the operated group had better function and reported less pain in the lower limbs.

It is clear that patients with severe LSS with significant symptoms can benefit from lumbar decompressive surgery. However, whether patients with moderate LSS with less severe symptoms should also have surgery is unclear. A randomized,

controlled study of 94 patients with moderate LSS who underwent either surgical or non-surgical treatment suggested that decompressive surgery of moderate lumbar spinal stenosis can provide slight, but consistent, functional ability improvement, especially compared to non-operative measures. The results were based on a 6-year follow-up [(12)].

Katz and colleagues [(13)] prospectively followed 194 patients who had a decompressive laminectomy and found that at 6-month follow-up, 78% of patients were satisfied with the outcome.

The Finnish Lumbar Spine Research Group described 94 patients who were randomized to non-operative treatment versus laminectomy of the stenotic segments, with or without instrumented fusion. At both 1 year and 2 years later, patients treated with surgery had greater improvement in leg pain, back pain, and overall disability [(14)].

The SPORT group also included a trial of patients with lumbar spinal stenosis in absence of spondylolisthesis who were randomized to decompression surgery without fusion or standard non-operative care. This trial included 289 patients were enrolled from 13 centers across the United States. It showed a benefit to surgery in all primary outcomes that was sustained at 2 years [(15)].

Instability may be a result of radical decompressive procedures and might lead to poor outcome [(16)].

Therefore, because of those reasons and with the introduction of pedicle screws and cages lumbar fusions with instrumentations, fixation became a common procedure after laminectomy and decompression for LSS [(17)].

According to our seminar of protocol in Al-Azhar University Neurosurgery Department, It was recommended to use only one type of surgery. Therefore, we used posterior decompression with or without fusion and one type of conservative management. So, we used medical treatment and physiotherapy and moderate to severe lumbar stenosis in the study to be more accurate and specific. We used MRI lumbar spine to confirm the diagnosis and Visual Analogue Score of back and leg and Oswestry Disability Index to compare between two groups.

The results showed improvement of leg pain (VAS Leg with $p < 0.05$) and function (Oswestry with $p < 0.05$) in surgery group compared to conservative one. However, there was no significant difference between both groups in back pain after 6 months and 12 months.

CONCLUSION

In patients with lumbar stenosis in old age, there was improvement in leg pain and function in patients underwent surgical posterior decompression but there was no difference in back pain compared to patients subjected to conservative management. However long term follow up of these patients is essential.

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