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Original Research Article.

Evaluation of Functional Outcome of Laminectomy and Laminotomy for The Surgical Management of Lumber Spine Stenosis: An Institutional Based Study

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ABSTRACT

Background: Lumbar spinal stenosis (LSS) is commonly seen in the elderly especially owing to the aging of the spine. Growing in the facet joints, ligamentum flavum hypertrophy, disc degeneration, and osteophytes cause the spinal canal to constrict and accordingly result in spinal cord and nerve root compression. If conservative treatments fail, surgical intervention will be considered as the next treatment. Surgical decompression for LSS is indicated in a patient with intractable pain, neurogenic claudication, and motor weakness, accompanied by compromised spinal canal. Laminectomy for LSS is considered the standard surgical option to which other techniques are compared. Ascertaining superiority of a decompression technique necessitates establishing if any differences exist in the complication rates and the functional and symptomatic outcomes.

Aim of the Study: To evaluate functional outcome of laminectomy and laminotomy for the surgical management of lumber spine stenosis.

Materials and Methods: The present study was conducted in the Department of Orthopaedics, NIIMS Medical College, Jaipur, Rajasthan, India. For the study, patients with confirmed LSS (both lateral and/or central) on MR imaging who had failed conservative management, were considered for operative management. Patients with spondylolisthesis, or scoliosis and those who had undergone fusion, discectomies or further revisions were excluded from the study. Following exclusions, 50 patients were enrolled; 30 underwent a laminectomy without fusion and 20 underwent either a bilateral or unilateral laminotomy.

Results: We observed that VAS pain score decreased 6 weeks post operatively for patients who underwent laminectomy and laminotomy, however there was slight increase in the pain score at 1-year post operatively. The results on comparison were found to be statically significant.

Conclusion: Within the limitations of the present study, it can be concluded that both surgeries were equally effective in improving pain and disability.

Keywords: Lumbar Spinal Stenosis, Laminectomy, Laminotomy.

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INTRODUCTION

Lumbar spinal stenosis (LSS) is commonly seen in the elderly especially owing to the aging of the spine. Growing in the facet joints, ligamentum flavum hypertrophy, disc degeneration, and osteophytes cause the spinal canal to constrict and accordingly result in spinal cord and nerve root compression[1]. Chief symptoms are low back pain and leg pain worsened by walking and numbness in the legs[2]. Surgery must be pragmatic on patients who do not respond to conventional treatment.[3]

The cause of low back pain and neurogenic claudication which cause disability, especially in aged people. Nonsurgical conservative treatments including activity modification (core muscle strengthening exercise, posture change, and restriction of activity), medication, epidural steroid injections are helpful for patients with mild to moderate symptoms.[4] If conservative treatments fail, surgical intervention will be considered as the next treatment. Surgical decompression for LSS is indicated in a

patient with intractable pain, neurogenic claudication, and motor weakness, accompanied by compromised spinal canal. Laminectomy for LSS is considered the standard surgical option to which other techniques are compared. Ascertaining superiority of a decompression technique necessitates establishing if any differences exist in the complication rates and the functional and symptomatic outcomes.[5, 6] Hence, the present study was conducted to evaluate functional outcome of laminectomy and laminotomy for the surgical management of lumber spine stenosis.

MATERIALS AND METHODS

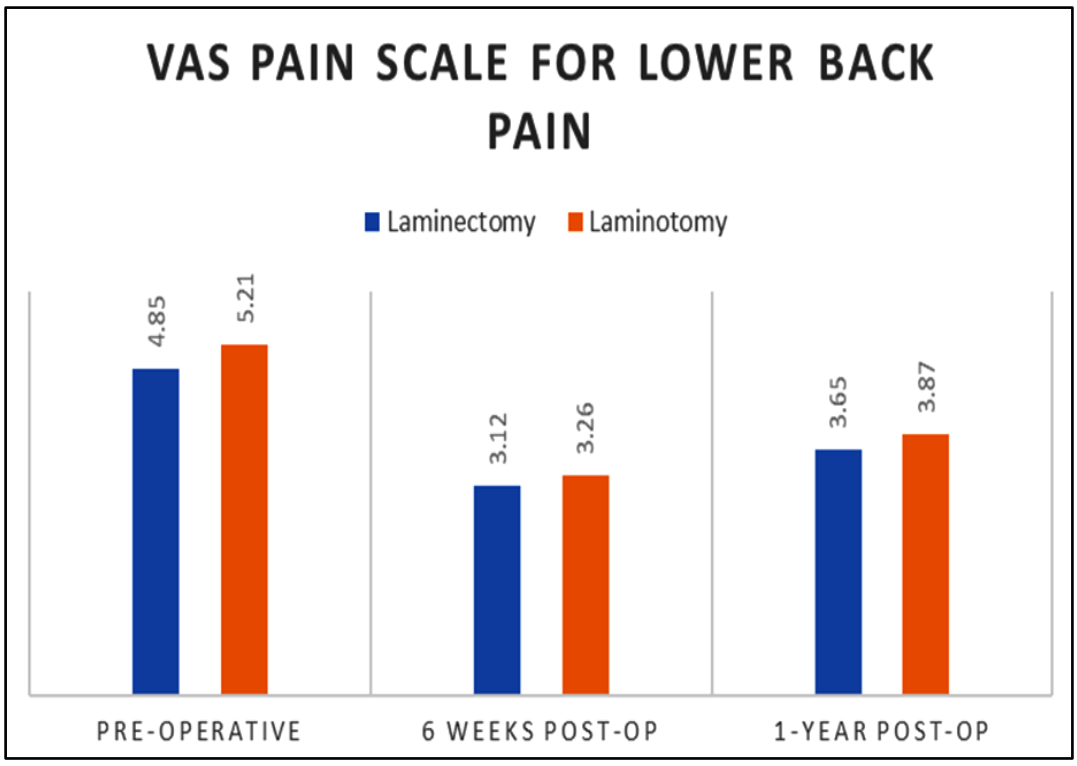
The present study was conducted in the Department of Orthopaedics, NIIMS Medical College, Jaipur, Rajasthan, India. The ethical clearance for the study was approved from the ethical committee of the hospital. For the study, patients with confirmed LSS (both lateral and/or central) on MR imaging who had failed conservative management, were considered for operative management. Patients with spondylolisthesis, or scoliosis and those who had undergone fusion, discectomies or further revisions were excluded from the study. Following exclusions, 50 patients were enrolled; 30 underwent a laminectomy without fusion and 20 underwent either a bilateral or unilateral laminotomy. All patients provided informed consent and completed an Oswestry Disability Index (ODI) and visual analogue scale (VAS) pre-operatively and in follow-up clinics at 6 weeks and 1 year. Prior to attendance questionnaires were distributed by mail and any issues resolved in the clinic. All questionnaires and forms were collected and checked for completeness by a lead researcher. For outstanding issues, patients were contacted directly. Patients who had not attended clinic were contacted with a letter and return form.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistical significant.

Table 1: Mean operative lower back pain level pre-operatively, at 6 weeks and 1 year using VAS scale

VAS for pain	Laminectomy	Laminotomy	p-value
Pre-operative	4.85	5.21	0.005
6 weeks post-op	3.12	3.26	0.02
1-year post-op	3.65	3.87	0.01

Fig 1: Mean operative lower back pain level pre-operatively, at 6 weeks and 1 year using VAS scale



RESULTS

Table 1 shows mean operative lower back pain level pre-operatively, at 6 weeks and 1 year using VAS scale. We observed that VAS pain score decreased 6 weeks post operatively for patients who underwent laminectomy and laminotomy, however there was slight increase in the pain score at 1-year post operatively. The results on comparison were found to be statically significant. (Fig 1)

DISCUSSION

In the present study, we observed that both the procedures had equal effect on the pain score at 6 weeks post op and 1-year post op. The results are found to be statistically significant. Results were compared with previous studies from the literature. Haddadi K et al conducted study to match the safety and the clinical consequences after a bilateral laminotomy, laminectomy and trumpet laminectomy in patients with lumbar spinal stenosis who

were randomized to one of three treatment groups. One hundred twenty consecutive patients with 227 levels of lumbar stenosis without significant herniated discs or instability were randomized to three treatment groups [bilateral laminotomy (Group 1), laminectomy (Group 2), and trumpet laminectomy (Group 3)]. Perioperative parameters and complications were documented. Symptoms and scores, such as a visual analog scale (VAS), Oswestry Disability Index, and patient satisfaction, were assessed preoperatively at 3, 6, and 12 months after surgery. Adequate decompression was achieved in all patients on the basis of surgeon satisfaction. The global complication rate was lowest in patients who had undertaken bilateral laminotomy (Group 1). The minimum follow-up of 12 months was achieved in 100% of patients. Matched with that experience in Group 1, but, with more remaining back and leg pain was found in respectively and 3.24 ± 0.22 and 2.44 ± 0.26 in Group 3, respectively compared with 1.84 ± 0.28 and 1.25 ± 0.12 (Group 1) at the 1-year follow-up assessment ($p < 0.05$). It was the same for the ODI scores, which reached $14 \pm 8\%$ (Group 1), $28 \pm 12\%$ (Group 2), and 26 ± 16 after 12 months of surgery (Group 3) (significant, $p < 0.01$ compared with preoperative scores). Patient satisfaction was higher in Group 1, with 7.5, 20, and 25% of patients displeased (in Groups 1, 2, and 3, respectively; $p < 0.01$). In conclusion, bilateral Laminotomy is certified acceptable and harmless in decompression of lumbar stenosis, causing a highly significant decrease of symptoms and disability.[7]

Mobbs RJ compared outcomes following minimally invasive unilateral laminectomy for bilateral decompression (ULBD) to a standard "open" laminectomy for LSS. The authors conducted a prospective, 1:1 randomized trial comparing ULBD to open laminectomy for degenerative LSS. The study enrolled 79 patients between 2007 and 2009, and adequate data for analysis were available in 54 patients (27 in each arm of the study). Patient demographic characteristics and clinical characteristics were recorded and clinical outcomes were obtained using pre- and postoperative Oswestry Disability Index (ODI) scores, visual analog scale (VAS) scores for leg pain, patient satisfaction index scores, and postoperative 12-Item Short Form Health Survey (SF-12) scores. Significant improvements were observed in ODI and VAS scores for both open and ULBD interventions. In addition, the ULBD-treated patients had a significantly better mean improvement in the VAS scores but not the ODI scores ($p = 0.055$) compared with patients in the open-surgery group. ULBD-treated patients had a significantly shorter length of postoperative hospital stay (55.1 vs. 100.8 hours, $p = 0.0041$) and time to mobilization (15.6 vs. 33.3 hours, $p < 0.001$) and were more likely to not use opioids for postoperative pain (51.9% vs. 15.4%, $p = 0.046$). Based on short-term follow-up, microscopic ULBD is as effective as open decompression in improving function (ODI score), with the additional benefits of a significantly greater decrease in pain (VAS score), postoperative recovery time, time to mobilization, and opioid use.[8]

Thomé C et al compared the safety and outcome of unilateral and bilateral laminotomy with laminectomy. One hundred twenty consecutive patients with 207 levels of lumbar stenosis without herniated discs or instability were randomized to three treatment groups (bilateral laminotomy [Group 1], unilateral laminotomy [Group 2], and laminectomy [Group 3]). Perioperative parameters and complications were documented. Symptoms and scores, such as visual analog scale (VAS), Roland-Morris Scale, Short Form-36 (SF-36), and patient satisfaction were assessed preoperatively and at 3, 6, and 12 months after surgery. Adequate decompression was achieved in all patients. The overall complication rate was lowest in patients who had undergone bilateral laminotomy (Group 1). The minimum follow up of 12 months was obtained in 94% of patients. Residual pain was lowest in Group 1 (VAS score 2.3 +/- 2.4 and 4 +/- 1 in Group 3; $p < 0.05$ and 3.6 +/- 2.7 in Group 2; $p < 0.05$). The Roland-Morris Scale score improved from 17 +/- 4.3 before surgery to 8.1 +/- 7, 8.5 +/- 7.3, and 10.9 +/- 7.5 (Groups 1-3, respectively; $p < 0.001$ compared with preoperative) corresponding to a dramatic increase in walking distance. Examination of SF-36 scores demonstrated marked improvement, most pronounced in Group 1. The number of repeated operations did not differ among groups. Patient satisfaction was significantly superior in Group 1, with 3, 27, and 26% of patients unsatisfied (in Groups 1, 2, and 3, respectively; $p < 0.01$). Bilateral and unilateral laminotomy allowed adequate and safe decompression of lumbar stenosis, resulted in a highly significant reduction of symptoms and disability, and improved health-related quality of life. Outcome after unilateral laminotomy was comparable with that after laminectomy. In most outcome parameters, bilateral laminotomy was associated with a significant benefit and thus constitutes a promising treatment alternative.[9]

Pietrantonio A et al provided a description of the long-term clinical outcomes of patients who underwent bilateral laminotomy compared with total laminectomy for LSS. The authors retrospectively reviewed all the patients treated surgically by the senior author for LSS with total laminectomy and bilateral laminotomy with a minimum of 10 years of follow-up. Patients were divided into 2 treatment groups (total laminectomy, group 1; and bilateral laminotomy, group 2) according to the type of surgical decompression. Clinical outcomes measures included the visual analog scale (VAS), the 36-Item Short-Form Health Survey (SF-36) scores, and the Oswestry Disability Index (ODI). In addition, surgical parameters, reoperation rate, and complications were evaluated in both groups. Two hundred fourteen patients met the inclusion and exclusion criteria (. The mean age at surgery was 69.5 years (range 58-77 years). Comparing pre- and postoperative values, both groups showed improvement in ODI and SF-36 scores; at final follow-up, a slightly better improvement was noted in the laminotomy group (mean ODI value 22.8, mean SF-36 value 70.2), considering the worse preoperative scores in this group (mean ODI value 70, mean SF-36 value 38.4) with respect to the laminectomy group (mean ODI 68.7 vs mean SF-36 value 36.3), but there were no statistically significant differences between the 2 groups. Significantly, in group 2 there was a lower incidence of reoperations. Bilateral laminotomy allows adequate and safe decompression of the spinal canal in patients with LSS; this technique ensures a significant improvement in patients' symptoms, disability, and quality of life. Clinical outcomes are similar in both groups, but a lower incidence of complications and iatrogenic instability has been shown in the long term in the bilateral laminotomy group.[10]

CONCLUSION

Within the limitations of the present study, it can be concluded that both surgeries were equally effective in improving pain and disability.

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