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Original Research Article

Comparative study between functional outcome of lumbar canal stenosis treated with surgical decompression by laminectomy and unilateral partial hemi laminectomy approaches

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ABSTRACT

Background: Lumbar spinal canal stenosis may eventually cause signs of intermittent neurogenic claudication**.** The surgical options include procedures such as midline decompression by laminectomy and different kinds of unilateral and bilateral fenestrations and partial or full hemi laminectomies. The aim of the study is to unilateral decompressive approach provides the sufficient decompression; less invasive unilateral procedure, which preserves posterior musculoligamentous complex and bony structures reduce associated morbidity.
Methods: 41 patients underwent preoperative assessment of Japanese orthopaedic association score (JOA Score), Neurogenic claudication outcome scores (NCOS), visual analogy scale for back pain and neurogenic claudication. Patients were randomized to undergo either unilateral decompression by partial hemi laminectomy or CMD (CMD) by laminectomy. 20 patients was randomized into unilateral decompression by partial hemi laminectomy group and 21 patients into CMD (CMD) by laminectomy group.
Results: The mean JOA recovery rate was 50.61% for the unilateral decompression group and 52.12% for the CMD group. Notably, 62% of CMD group had good or excellent outcome while 70% of unilateral decompression group had a good or excellent outcome.
Conclusions: In our study, unilateral decompression by a partial hemi laminectomy provides minimal exposure for decompression in lumbar canal stenosis while preserving musculoligamentous attachments of the posterior elements of the spine and good postoperative results after one year with favorable outcomes of at least 70%.

Keywords: Lumbar canal stenosis, CMD, Degenerative lumbar spinal stenosis

INTRODUCTION

Lumbar spinal canal stenosis has been known for more than 100 years, but for a long time it was regarded as "the forgotten spinal disease." This neglect occurred because the association between herniated intervertebral discs and sciatica received most of the attention after it was discovered by Mixter and Barr in 1934.[1] However, the syndrome was not widely understood or diagnosed until Verbiest in 1954 described the classic finding of middle-aged and older adults with back and lower extremity pain precipitated by standing and walking and aggravated by hyperextension. The secondary development of degenerative changes that further narrow the lumbar spinal canal precipitated symptoms.[2] Lumbar spinal canal stenosis now is an accepted clinical entity. The symptoms and signs are due to narrow canal space. The degenerative lumbar spinal canal stenosis is due to thickening of interspinous dorsal ligament and facet joint hypertrophy. Lumbar spinal canal stenosis may

eventually cause signs of intermittent neurogenic claudication, and it can lead to loss of quality of life.[3] Conservative measures provide relief from symptoms for a short period only, but finally, surgical decompression of the neurovascular structures will be needed. At present, different surgical options are available. The surgical options include procedures such as midline decompression by laminectomy and different kinds of unilateral and bilateral fenestrations and partial or fullhemilaminectomies.[4] Now-a-days, it is not very clear which of the techniques is the most favorable and their long term results are inconclusive. Most of the patients suffering from degenerative lumbar spinal canal stenosis are elderly patients and its incidence increases considerably. Since elderly patients have associated co-morbid conditions compared to younger generation problems regarding various surgical procedures need to be addressed. Such choices are important because greater invasiveness is associated with greater use of health care resources, greater complications, higher mortality but generally similar clinical benefits.[5] so benefit & high risk must be carefully weighed in choosing the surgical procedure. Standard midline decompression by conventional laminectomy is the commonly performed surgical treatment for degenerative lumbar canal stenosis.[6] This method involves jeopardizing the integrity of posterior complex of spine and elevation of paraspinal muscles from the spinous processes and has been shown to result in paraspinal muscle atrophy, trunk extensor weakness, Iatrogenic instability of spine and possibly, ”Failed back syndrome. Unilateral decompression by partial hemi laminectomy method of decompression is thought to avoid one side of paraspinal muscle damage and extensor weakness by preserving the attachment of paraspinal muscle less and the posterior l, ligamentous attachments of spinous processes.[7] We present the prospective randomized control study comparing the outcome of a unilateral decompression by partial hemi laminectomy and conventional midline decompression (CMD) by laminectomy in 41 patients who underwent surgery for lumbar spinal canal stenosis.[8]

METHODS

This prospective randomized control study was approved by the medical ethics committee of the institutional review board of our hospital. The study was conducted at Tirunelveli Medical College Hospital, Tirunelveli, from 2011 to 2013. Patients meeting the following inclusion criteria were enrolled for the study after obtaining written informed consent.

Inclusion criteria

Inclusion criteria were degenerative lumbar canal stenosis affecting 1 or 2 levels with central and lateral recess stenosis only, with neurogenic claudication symptoms with or without radicular component, progressive neurological weakness or cauda equine syndrome. preoperative MRI with axial cuts at right angles to the affected anatomic segment demonstrating good clinic radiological correlation with significant canal stenosis (<8 mm) failure of conservative methods of treatment with a progressive decrease in walking distance, patients with the following factors were excluded.

Exclusion criteria

Primary stenosis, traumatic lumbar canal stenosis, stenosis due to tumors and infections, spondylolisthesis/ far lateral stenosis, foraminal stenosis. Instability at the involved level as defined by >3 mm anterior translation or >10-degree angular change in flexion and extension lateral radiographs. Patient has undergone previous lumbar spine surgery, concomitant symptomatic cervical or thoracicstenosisco morbidities like cardiopulmonary insufficiency, peripheral neuropathy, peripheral vascular disease, every hip or knee disease. 41 patients met the inclusion criteria and were willing to participate in the study. Enrolled patients underwent preoperative assessment of Japanese orthopedic association score (JOA score), neurogenic claudication outcome score (NCOs), visual analog scale for back pain and neurogenic claudication. Patients were randomized to undergo either unilateral decompression by partial hemi laminectomy or CMD by laminectomy. 20 patients were randomized into unilateral decompression by partial hemi laminectomy group and 21 patients into CMD by laminectomy group, for either procedure, under general anesthesia, the patient was placed prone knee-chest position and the surgical level was confirmed by fluoroscopic image prior to incision. Appropriate tables and graphical representations were used to display the data. Chi-square test was used. A “p” value <0.05 was taken as significant.

RESULTS

In the unilateral decompression group, JOA score improved from preop mean 4.35 to 10.20 at the last follow up. In the CMD, the last follow up. The mean JOA recovery rate was 50.61% for the unilateral decompression group and 52.12% for the CMD group. There was no statistically significant difference between the two groups

Notably, 62% of CMD group had good or excellent outcome while 70% of unilateral decompression group had a good or excellent outcome.

NCOS score improved from a mean preoperative score of 26.90 to 61.15 at last follow up in the unilateral decompression group, and from 27.57 to 62.43 in the CMD group. Statistical analysis did not reveal any significant difference between groups.

At the last follow up the mean BPVAS score for the unilateral decompression group was 2.95 and for CMD group it was 3.61.

Table 1: Japanese orthopaedic association score (JOA score).

Parameter	Unilateral decompression (UD)	Conventional (CMD)	Significance
Preop JOA score	4.35	3.95	p<0.05
JOA score at last, follow up	10.20	9.52	p<0.05
Change in JOA score	5.85	5.57	p<0.05
JOA recovery rate (%)	50.61	52.12	p<0.05
N=	20	21	

Table 2: Outcome of JOA score.

Outcome (JOA score recovery rate) at final follow up	Unilateral decompression (UD)	Conventional midline decompression (CMD)
Excellent (≥75%)	4	4
Good (50-74%)	10	9
Fair (25-49%)	5	6
Poor (≤24%)	1	2
N=	20	21

Table 3: Neurogenic claudication outcome score (NCOS).

	UD	Conventional (CMD)	Significance
Preop NCOS score	26.90	27.57	(p<0.05)
NCOS score at last follow up	61.15	62.43	(p<0.05)
Change in NCOS score	34.25	34.86	(p<0.05)
N=	20	21	(p<0.05)

Table 4: Visual analog scales for back pain (BPVAS).

Parameter	UD	Conventional (CMD)	Significance
Preop BPVAS	7.6	8.1	(p<0.05)
BPVAS score, at last, follow up	2.95	3.67	(p<0.05)
Change in BPVAS	4.65	4.43	(p<0.05)
N=	20	21	(p<0.05)

DISCUSSION

The average intraoperative blood loss incurred in the unilateral decompression group (66.25 ml) is less than that in the CMD by laminectomy group (91.67 mol). Moreover, considering the fact that CMD by laminectomy is expected to have more bleeding, but with wider exposure an advantage. In our study, the complications were few and were comparable between groups. Postoperative radiological evaluation to assess the instability was not routinely performed and when the clinical symptoms and signs of back pain and claudication persist, X-rays of a lateral view, flexion and extension view was taken to rule out postoperative instability. Only one patient developed instability in the last follow up in CMD group, later posterior fusion and pedicle screw instrumentation were done. The complications are in the expected frequency. No case of new neurological deficit was observed following surgery in both the groups. Hence unilateral decompression appears to have safety profile comparable with CMD. Decompression group was marginally more symptomatic than the unilateral decompression group preoperatively, at the final follow up, the CMD group fared better in terms of absolute values of JOA score and JOA recovery rate which is statistically insignificant. CMD group had good or excellent outcome while the unilateral decompression group fared better with 70% patients experiencing good or excellent outcome. Notably, only 5% (1 out of 20 patients) had a poor outcome in the Unilateral Decompression group while 9.5% (2 out of 21 patients) fared poorly at the last follow up in the unilateral decompression group. These findings demonstrate a marginally better outcome for the unilateral decompression group. Decompression groups in the visual analogy score for neurogenic claudication (NCVAS) at the last follow up. This signifies that both techniques have a comparable outcome with regard to leg pain. There was no statistically significant difference between the 2 different surgical techniques regarding the postoperative results. Kalbarczyk et al from there analysis of complications like dural tear (two patient 9.5%), wound dehiscence (two patient 9.5%) also were observed in CMD by laminectomy group, as also the postoperative

morbidity like UTI, LRI (14.3%).[9] Katz et al in their study the two (UD and CMD) groups were comparable in terms of the preoperative JOA scores (4.25 and 3.95). The postoperative JOA scores, at last, follow up (10.25 and 9.75 respectively) and change in JOA score (6.0 and 5.8 respectively) did not show any statistically significant difference.[10] Stucki et al stated that Major improvement was noted regarding the increase in the postoperative walking distance. However long-term follow up is required to substantiate this assumption.[11] Macnab et al stated that the main advantages of the unilateral surgical decompression by partial hemi laminectomy are the preservation of posterior musculoligamentous complex and bony structure which prevents surgically induced instability. Only the hypertrophied and compressive medial parts of the facet joints are resected. Midline ligamentous structures are completely preserved.[12]

CONCLUSION

In our study, unilateral decompression by a partial hemi laminectomy provides minimal exposure for decompression in lumbar canal stenosis while preserving musculoligamentous attachments of the posterior elements of the spine and good postoperative results after one year with favorable outcomes of at least 70% on the Japanese orthopedic association score and Neurogenic claudication outcome score. With both these surgical techniques, a significant improvement in the outcome after surgical decompression could be demonstrated. There was no significant difference between the unilateral decompression by partial hemi laminectomy and Midline decompression by laminectomy techniques regarding the later outcome.

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Ethical approval: The study was approved by the institutional ethics committee

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