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To study the outcome of micro decompression by unilateral laminotomy in lumbar canal stenosis

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Abstract
Introduction: Lumbar Canal Stenosis is developmental or congenital narrowing of the spinal canal that produces compression of the neural elements before their exit from the neural foramen. The narrowing may be limited to a single motion segment or it may be more diffuse spanning two motion segments or more. The spinal canal demonstrates narrowing, attributed most frequently to acquired degenerative or arthritic changes such as hypertrophy of the articulations surrounding the canal, intervertebral disc herniation or bulges, hypertrophy of the ligamentum flavum, osteophytes formation and degenerative spondylolisthesis. The classic presentation of Lumbar Canal Stenosis is neurogenic claudication.
Aims and Objectives: To study the outcome of microdecompression by unilateral laminotomy in lumbar canal stenosis
Methodology: This is institutional based prospective study of 36 patients, aged 20 to 80 years, with diagnosed lumbar canal stenosis treated with bilateral microdecompression of lumbar canal stenosis by unilateral laminotomy using microscope, surgical magnifying loops and microsurgery tools at Dr. Shankarrao Chavan Govt. Medical College Vishnupuri, Nanded. Statistical analysis done by chi-square test.
Result: There was an rapid decrease in the leg pain scores from 8.94 In the pre-operative period to 1.36(SD±1.13) one month after operation. At 1 month follow up patients with no pain (VAS + 0) were 9 (25.00%).
Conclusion: Unilateral laminotomy with bilateral micro decompression method is one of the excellent method for decompression of lumbar canal stenosis with early functional outcome as unilateral laminotomy preserves posterior midline structures with sparing of spinous process, opposite side lamina and paraspinal muscles.

Keywords: Lumbar canal stenosis, unilateral laminotomy

1. Introduction
The term "stenosis" comes from the Greek word meaning "choking" and lumbar stenosis is often the result of degenerative conditions such as osteoarthritis and degenerative spondylolisthesis. Spinal stenosis is most common in lumbar region, but cervical stenosis also occurs frequently, It is reported rarely in the thoracic spine. When the lumbar spinal nerves in the lower back are compressed due to decreased in lumbar cannal diameter, lumbar spinal stenosis occurs and most often leads to leg pain and neurogenic claudication. The spinal canal demonstrates narrowing, attributed most frequently to acquired degenerative or arthritic changes such as hypertrophy of the articulations surrounding the canal, intervertebral disc herniation or bulges1, hypertrophy of the ligamentum flavum, osteophytes formation and degenerative spondylolisthesis. The classic presentation of Lumbar Canal Stenosis is neurogenic claudication2.The diagnosis is based on clinical findings. The definitive diagnosis of Lumbar Canal Stenosis is best established by Magnetic Resonance Imaging scanning. Recently new surgical techniques that preserve posterior midline structures have been use. These are hemilaminectomy, bilateral laminotomy, unilateral laminotomy with bilateral micro-decompression, endoscopic unilateral laminotomy with decompression. These new surgical techniques use magnifying loupes, electron microscopes, endoscopes, other special instrumentations etc. In unilateral laminotomy with bilateral micro decompression (ULBD) 3, 4, 5 of lumbar canal and nerve roots under surgical magnification using surgical loupes and

magnifying glasses, Decompression is achieved by partial resection of the upper and lower parts of the laminar arch of the affected level for one or more levels or by hemilaminectomy by decompression of the two consecutive levels, partial medial resection of the ipsilateral facet joints and undercutting central part of the base of the spinous process using high speed electric burr to approach opposite side of canal for decompression of canal and never roots. This process allows visualization of the entire posterior surface of the dural sac, the contralateral nerve root, and the foramen. If necessary, discectomy and foraminotomy can be performed. It maintains the integrity and stability of the spine, with preservation of the spinous process, supra and interspinous ligaments complex, lamina and paraspinal muscles of opposite side, also preserve both facetal joint and neural arch. This procedure also minimizes peri operative blood loss, post operative pain, length of hospital stay.

2. Methodology

This is institutional based prospective study of 36 patients, aged 20 to 80 years, with diagnosed lumbar canal stenosis treated with bilateral microdecompression of lumbar canal stenosis by unilateral laminotomy using microscope, surgical magnifying loops and microsurgery tools at Dr. Shankarrao Chavan Govt. Medical College Vishnupuri, Nanded. Statistical analysis done by chi-square test.

All patients were examined and the severity of the back pain and the leg pain were evaluated with the help of visual analogue scale (VAS).

Patient disability determined with the help of Japanese Orthopaedics Association (JOA) Score All routine blood investigations required for purpose of anaesthetic fitness purpose were done in all patients.

Basic Principles of Decompression Technique 6,7,8,9,10,11,12

In patient positioning: the patient is given the prone position with the lumbar region in hyperflexion. Interlaminar distance opens up so decompression can be done safely. Position with abdomen hanging free minimizes bleeding. Facet capsules should be protected, Cautions in prevention of intraoperative dural injury with Usage of microscope, operating magnifying loupes and microsurgery tool. Thinning of the lamina and hypertrophic bone with high-speed drill was done. Use of a blunt dissector or nerve hook to seperate the adhesions. The incision was midline and extended over both sides, but is limited to, the underlying region of stenosis as documented on magnetic resonance imaging after localization under image intensifier. Using a Cobb elevator, multifidus is elevated gently off the laminae at the involved segments and is retracted to the medial border of the facet joint. A self-retaining microdiscectomy retractor then is used. Using Kerrison rongeurs or a high- speed burr, an ipsilateral laminotomy of the cephalad hemilamina is performed. It is extended cephalad until the insertion of the ligamentum flavum is reached. A similar but less extensive laminotomy then performed on the ipsilateral caudal lamina, which allows removal of the intervening ligamentum flavum and affords a midline hemidecompression. The microscope then is angulated into the ipsilateral subarticular zone and, moving cephalad to caudal, soft tissue and bony stenosing pathology is excised using Kerrison rongeurs. After complete ipsilateral micro decompression, the contralateral side is addressed. The wound is irrigated, and hemostasis obtained. The fascia, subcutaneous tissue, and skin then are closed standard fashion.

3. Result

In our study patient data was recorded pre-operatively, at one month, at three month and after six months. The patients VAS assessment for leg pain and back pain was also noted preoperatively, at one month, at three month and after six months. The Macnab's score was evaluated at preoperatively 1 month, 3 months and 6 months after the surgical procedure.

3.1 Vas Score: Visual analog scale was used to quantify leg pain and back pain. The mean VAS score in the pre-operative period was 8.94 (SD = ± 1.04) with 4 (11.11%) patients having a minimum value of 7 and 14 (38.88%) patients had maximum value of 10. At post-operative 0ne month the mean VAS score was reduced to 1.36 (SD=±1.13).

Table 1: VAS scores

	VAS	P-value*
Pre operative	8.94 ± 1.04	--
At 1st month	1.36 ± 1.13	0.6261
At 3rd month	0.36 ± 0.76	0.067
At 6th month	0.11±0.66	0.008

* Students paired t test as compared to preoperative values.

Table 2: Frequency and Percentage of Vas Score In Pre-Operative Period

PREOP Vas	Frequency	Percentages
7	4	11.1
8	8	22.2
9	10	27.8
10	14	38.9
Total	36	100

Table 3: Vas Score at 1 Month

Vas At 1 Month	Frequency	Percentages
0	9	25
1	11	30.6
2	12	33.3
3	3	8.3
5	1	2.8
Total	36	100

Table 4: Vas Score at 3 Month

Vas At 3 Month	Frequency	Pecentages
0	26	72.2
1	8	22.2
4	1	2.8
10	1	2.8
Total	36	100

Table 5: Vas Score at 6 Month

Vas At Six Month	Frequency	Pecentages
0	35	97.2
4	1	2.8
Total	36	36

3.2 Macnab's criteria

We used Macnab's criteria pre-operatively and at 1 month and at 3 months and 6 month post-operatively follow ups to evaluate the functional outcome of patients. The pre-operative Macnab's score was as: Fair (5) and Poor (31). The Macnab's score at 1st month follow up was as: Good (31) and Fair (4) and poor (1) and at 3rd month follow up was as: Excellent (32) and good (3) and fair (1) At 6th month follow up was as: Excellent (34) and Good (2) At 1st month follow up 3 patients had postoperative back muscle spasms and were treated with physical therapy and muscle relaxants.

4. Discussion

The severity of the leg pain and back pain was noted by the VAS scores. Pre-operative leg pain and back pain VAS score was mean VAS= 8.94. (SD±1.04). There was an rapid decrease in the leg pain scores from 8.94 in the pre-operative period to 1.36(SD±1.13) one month after operation. At 1 month follow up patients with no pain (VAS + 0) were 9 (25.00%) On follow up at 3 month the mean leg pain VAS score 0.36 (SD =±0.76) with no pain in 25 (69.44%) patients (VAS= 0). However at six month follow up, the mean leg pain VAS score was 0.11 (SD=±0.66) and the difference in leg pain score was significant (p<0.008) and at six months follow up almost all patients reported no leg pain (VAS=0) or some slight pain (VAS= 1) with the exception of only one patients who complained of moderate leg pain (VAS=4). The mean leg pain VAS score was 0.11 (SD=±0.66) at six months follow up and the score was statistically significant (p<0.008). By using student paired t-test, pre-operatively, 24th hr post–operative, at 1st week, 1st month and 3rd month, we conclude that there is statistically significant difference between the mean VAS score for leg pain pre-operatively, 24hrs post-operatively, at 1st week, at 1st month and at 3rd month follow-up. Similarly in the study done by Thome *et al*. 2005 [13], the mean VAS scores for leg and back pain showed significant improvement in postoperative values.

We used Macnab's criteria pre-operatively, at 1 month and 3 months and 6 month post-operatively follow ups to evaluate the functional outcome of patients. The preoperative Macnab's score was fair in 13.89% and poor in 86.11%. The Macnab's criteria on 1 month postoperative follow up was poor in 2.27%, fair in 11.11% and good in 86.33%, on 3 month of follow up was fair 2.27%, good in 8.33%, excellent in 88.88%, with no patients reported poor results and on 6 month of follow up good in 5.55% and excellent in 94.44%, with no patients reported fair or poor. By the end of follow up all patients had favourable outcome and had returned to their original job.

Similarly in the study done by Hoogland *et al.* [14], which showed significant improvement in the functional ability of the patients according to the Macnab's criteria. Also in 2002, Yeung *et al.* [15], reported favourable outcome in the functional ability of almost all patients. Almost all patients were able to return to previous occupation by the end of the follow ups.

5. Conclusion

In our study of Evolution of Bilateral Micro Decompression For Lumbar Canal Stenosis By Unilateral Laminotomy we conclude that Unilateral laminotomy with bilateral micro decompression method is one of the excellent method for decompression of lumbar canal stenosis with early functional outcome as unilateral laminotomy preserves posterior midline structures with sparing of spinous process, opposite side lamina and paraspinal muscles. Unilateral laminotomy approach for bilateral decompression provides an adequate and safe bilateral decompression for patients with degenerative spinal stenosis at multiple levels. In our study we also conclude that this procedure has smaller incision, minimal peri operative blood loss, post operative posterior scarring and post operative back pain, less length of hospital stay and it promotes early mobilization with early return to normal routine life.

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