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Surgical Outcome of Spinal Decompression by Unilateral Lamintomy for Bilateral Decompression: Case Series

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Abstract

Background: Recently, unilateral laminotomy for bilateral decompression (ULBD) has become an alternative toconventional decompression for symptomatic lumbar spinal stenosis (LSS), and this minimally invasive surgical technique has shown a satisfactory outcomes and low complications. Long term follow-up clarify the outcome and make the approach the golden standard technique.

Aim of Study: The aim of this study was to evaluate clinical and radiographic outcomes and complication rates after ULBD in elderly patients.

Patients and Methods: This study recorded retrospective analysis of 160 patients operated by unilateral laminotomy for bilateral decompression (ULBD). Data collected 2018-2023 in Banha University Hospital. Patients had undergone spinal decompression with follow-up period upto 5 years for clinical and radiological data.

Results: Male patients were 84 patients (52.2%) and female patients were 76 (47.5%), the age range from 35-67 years old with the mean (55.17 years). The most commonly affected level was L4-5 (61.8%). We operated single level in 121 patients (75.6%) however two level operated in 28 patients (17%) and three level in 11 patients (7%) and distribution of operated level is shown in Table (2). We operated 78 patients on right side and 82 patients on the left side. Discectomy were done in 94 patients, 60 in L4-5 level and 34 patients in L5-S1 level. Dural tear occur in 5 patients (3%) spinal instability in 5 patients (3%) who need fixation and stenosed level other than the operated level in 13 patients (7%) and recurrent disc herniation in 17 patients (10%) restonsis in the operated level in 8 patients (4%).

Conclusions: ULBD is a good alternative technique in elderly patients who usually affected by canal stenosis with little postoperative morbidity.

Key Words: *ULBD.*

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Introduction

THE traditional open laminectomy, medial facetectomy, and for aminotomy with wide muscle retraction. open decompressions have a variable success rate **[1].**

The corner stone is to reduce incidence ofoperative time, intra operative dural and radicular complications, intraoperative bleeding and, above all, postoperative instability to achieve better outcome and sufficient long-term functional results **[2].** Unilateral laminectomy for bilateral decompression (ULBD) is described recently as minimal invasive surgery (MIS) **[3].**

Patients and Methods

This study included 160 patients diagnosed to have lumbar canal stenosis either single or multiple levels depending on clinical presentation and MRI imaging of the LSS. Data collected retrospectively 2018-2023 in Banha university hospital. Those patients were indicated for surgical decompression after failure of non-surgical management. Patients with spinal instability, previous spinal surgeries were excluded from the study.

Patients were operated upon by unilateral laminectomy with removal of the medial part of the facet joint without exceeding the medial 1/3 of its which helped increasing the inter facet diameter and lateral recess decompression. Undermining the spinous process and contralateral lamina help accessing the other side in better way. With this technique the clover leaf appearance of the stenosed canal turned into a triangle with opened side. This technique attains efficient decompression even in congenital reduced spinal canal diameter with slight difficulty in transverse then vertical reduction **[4].**

Follow-up:

Immediate postoperative follow-up X-ray LSS anteroposterior, lateral, flexion and extension views.

All patients were assessed clinically for improvement of symptoms and all patients had routine postoperative CT for assessment of adequate decompression. Clinical and radiological were very helpful in correlation between postoperative pain improvement with adequate decompression in CT.

Patients were assessed as regards the period of hospital stay, clinical outcome over a follow-up period 5 years with periodic assessment at 6 months, 1 year, 2 years and 5 years. Post-operative, intraoperative complications and associated post-operative morbidities.

Case presentation:

44 years old female patient complained of low back pain and bilateral lower limb claudication with failed medical treatment. MRI showed marked lumbar canal stenosis Fig. (1) operated upon and postoperative CT was showed in Fig. (2). Postoperative showed marked improvement of lower limb and back pain.

Fig. (1): Showing pre-operative MRI axial (A&B), sagittal (C) with sever stenosis with hyper trophied facet.

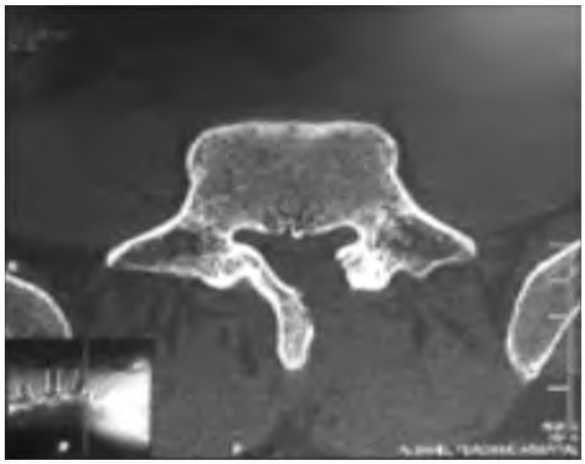

Fig. (2): Post-operative CT showed sufficient decompression bilaterally.

Table (1): Preoperative clinical symptoms.

Symptoms (n=160)	No. of patients (%)	Percentage of patients
Radicular limb pain	110	68.75%
Neurogenic claudication	92	57.5%
Motor dysfunction	25	15.63%
Sensory dysfunction:	22	13.75%
Hypethesis	15	9.38%
Dysesthia or parathesia	7	4.38%
Low back pain	44	27.50%
Lasègue's sign	48	29.69%
Pseudoradicular	15	9.38%
Gait disturbance	5	3.13%
Sphincters dysfunction	2	1.56%
Reflexes	6	3.75%

Results

Male patients were 84 patients (52.2%)and female patients were 76 (47.5%), the age range from 35-67 years old with the mean (55.17years). Preoperative presentation is distributed in Table (1) where the most common presenting symptoms was sciatica (68.8%) followed by claudication. The patients have mean duration of symptoms (19.97 months).

In our study we found that the most commonly affected level was L4-5 (61.8%). We operated single level in 121 patients (75.6%) however two level operated in 28 patients (17%) and three level in 11 patients (7%) and distribution of operated level is shown in Table (2). We operated 78 patients on right side and 83 patients on the left side.

Table (2): Distribution of spinal levels of symptomatic lumbar spinal stenosis and surgical intervention.

Level	No. of laminotomies	% of laminotomies
L1-2	1	0.31%
L2-3	1	0.94%
L3-4	2	0.94%
L4-5	99	61.88%
Lumbosacral	58	35.94%

Discectomy were done in 94 patients, 60 in L4-5 level and 34 patients in L5-S1 level. Postoperative outcome and assessment of improvement was shown in Table (3) with significant improvement in gait and ambulatory distance. We have found significant improvement of the mean preoperative ambulatory distance from 180 yard to become 1150 yard.

Table (3): Outcome was assessed by Finneson and Cooper *[9]*. The patients classified into excellent, good, fair, marginal and poor grading.

Rating	Definition	No. of patients (%)
Excellent	Pain free and able to function well	94 (58.8%)
Good	Pain improved and able to function well	38 (23.75%)
Fair	Pain improved, but occasional medication and time off from activities	14 (8.75%)
Marginal	Pain improved, but considerable discomfort that require frequent medication and time off from activities	11 (7.19%)
Poor	Pain unimproved or worse	3 (1.56%)

Hospital stay was 32-48 hours with mean (37.21±6.13). Mean Time for mobilization was 13.4 hours. The mean for Blood loss was (198.75 ±129.60ml).

Patients developed spinal instability in 6 patients (3.7%), one patient operated with two levels ULBD and 5 patients operated with three levels.

Complication:

5 patients (3%) developed dural tear Without development of collection or pseudomeningocele in follow-up. Only one patient developed left foot drop and postoperative image was free and improved with conservative treatment and physiotherapy. Only one patient developed wound infection treated with antibiotics according to culture and sensitivity. we have 3 patients with sphincteric symptoms one patient improved in follow-up however 1 patient remain unchanged. Spinal instability in 5 patients (3%) who need fixation and stenosed level other than the operated level in 13 patients (7%) and recurrent disc herniation in 17 patients (10%) restenosis in the operated level in 7 patients (4%).

Discussion

Minimally invasive surgery (MIS) has a golden role is to achieve good spinal decompression with minimal tissue trauma and spinal instability *[5]* Algarni et al., reported that laminotomy has favourable outcome more than laminectomy *[4]*. Hafez et al., reported that spinal instability is more frequent in laminectomy more than lamintotomy *[6]*. We reported only 5 patients (3%) who need spinal fixationour study involved large number of patients compared to other studies *[7]*.

Compared to previous study we reported long follow-up durationSingle surgeon experience.

Horanet al reported that most favorable outcome is obtained by least invasive intervention and decompression without fusion *[8]*.

Finneran et al., reported shorter hospital stay of and less time for mobilizationthan traditional surgery *[9]*.

Our study reported long term follow-up and advantages for ULBD compared to other studies that were limited for short term follow-up for better assessment of outcome that may worsen in long term *[10]*. Inadequate decompression may lead to bony regrowth *[11]*.

We reported shorter time for immobilization with mean of 13.4hrs. compared to Mobbs et al., who reported 15.6hrs *[12]*.

We reported mean time for shorter hospital stay (37.21±6.13 hours) compared to other literatures that give values of 42-80 hours *[12]*.

Costa et al., reported significant improvement in clinical outcome in unilateral laminectomy for bilateral decompression *[7]*.

Regarding the follow-up period many authors reported different outcome, Khanna et al., described in multilevel open lumbar laminotomies a good outcome of 79% to 85% at 2-year follow-up *[13]*. Yüce, et al., described improvement at shorter follow-up period (9 months) 80-95% *[14]*.

We reported long follow-up periods that extend to 5 years in comparison with other study that reported longer follow-up.

Longer follow-up periods in different studies highlighted the benefits of ULBD over traditional laminectomies i.e regarding the extensive muscle separation where Aly, described atrophy and decreased muscle strength *[15]* and this was confirmed by EMG abnormalities in paraspinal muscle that reported by Eldien, et al., *[16]*.

Kim et al. *[17]* described that iatrogenic paraspinal muscle injury is related to increased incidence

of failed back surgery and increased dead space that filled by blood to give higher risk for bacterial culture and infection and to be filled with scar tissue that lead to second surgery. This raised the benefits of ULBD as less muscle separation and less dead space thus decrease incidence of failed back surgery. Although we have no significant difference improvement of leg and low back pain between open laminctomies and ULBD [18], but previous benefits increase the need for ULBD to be a standard technique. Dural tear in our study of 3% is lower than other study of average (0-18%) [19].

Regarding the spinal instability, we reported only 3% of patients who need fixation during follow-up. Incidence of spinal instability in laminectomy and bilateral laminotomy is higher [20,21].

Tavola et al., reported that no increase in postoperative instability for the preoperative fixed spondylolithesis in patient had undergone ULBD. So, there is no need for fixation for spondylolithesis on it self. Bone regrowth and spinal restenosis occur in 22 to 94% after posterior decompression [22] better preservation of spinal integrity in ULBD with minimal postoperative bone regrowth lower the incidence of restenosis and reoperation. We operated restenosed the same operated level only in 4%.

ULBD is a good alternative technique in elderly patients who usually affected by canal stenosis with little postoperative morbidity.

Conclusion:

Microscopic ULBD is highly effective in spinal canal decompression and improvement of leg pain. ULBD may be stanadard technique for spinal decompression as it gives shorter hospital stay and shorter time for immobilization and significant low postoperative pain.

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النتيجة الجراحية لتخفيف الضغط على العمود الفقرى عن طريق قطع الصفيحة الفقرية من جانب واحد لتخفيف الضغط الثنائى

يعد ضيق القناة العصبية القطنية من أكثر الإضطرابات شيوعاً وأن الجراحة تكون مطلوبة للمرضى الذين لا يستجيبون للعلاج التحفظى.

تشمل أعراض ضيق القناة العصبية واختناق جذور الأعصاب الام فى الطرفين السفليين مع تنميل و تيبس فى العضلات أو ضعف العضلات.

يعد التدخل الجراحى لتوسيع ضيق القناة العصبية من الحلول المتاحة للحالات التى لا تستجيب للعلاج التحفظى.

يتم إجراء عملية إستئصال الصفيحة من جانب واحد لتخفيف الضغط على جذور الأعصاب على الجانبين.

يعد الركن الأساسى من هذه الجراحة هو تقليل وقت الجراحة ومضاعفات الجراحة مثل نزيف الدم والالتصاقات حول جذور الأعصاب وحدوث خلل فى ثبات الفقرات القطنية بعد الإجراء الجراحى ولذلك تم وصف عملية استئصال الصفيحة الفقرية من جانب واحد لتخفيف الضغط على جذور الأعصاب من الجانبين على أنها تخل جراحى محدود.