EDITOR’S CHOICE

Long Term Results of Decompressive Laminectomy in Treatment of Lumbar Spinal Canal Stenosis (A Thirty Years Retrospective Study)

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ABSTRACT

Background: New minimal invasive procedure is trying to replace the old classic decompressive laminectomy. Result of the decompressive laminectomy should be well documented to compare these new procedures with it. Objective: To evaluate the long term results of wide decompressive laminectomy in treatment of lumbar spinal canal stenosis (LSCS).

Patients and Methods: 384 cases having circumferential narrowing of their lumbar spinal canal with no evidence of spondylolisthesis or other bone pathology operated by open wide decompressive laminectomy through the period from 1976-2006, the results of surgery is evaluated first after one year then on a regular five years interval in a retrospective study to evaluate the results according to the JOA and POLO scales and to measure the recovery rate utilizing the Hirabayashi method.

Results: Follow up after one year revealed marked improvement in most cases (74.3) according to the JOA scale, 73% were grade 5 according to the POLO scale and the recovery rate was excellent 74.2% on utilizing the Hirabayashi method. This improvement was maintained throughout the period of follow up. The last follow up conducted on 123 patients revealed persistent excellent recovery rate in 72.1 of them according to Hirabayashi method.

Conclusion: In properly selected cases of LSCS open wide decompressive laminectomy has stood the test of time as a safe, simple, rapid procedure with much less incidence of complications and maintained long term patient improvement than other advocated minimally invasive surgical (MIS) techniques which still need evidence based evaluation of its results.

Key Words: lumbar spinal stenosis, wide decompressive laminectomy, minimally invasive procedures.

INTRODUCTION

Lumbar spinal stenosis is a well-known clinical, radiological, pathological and operative entity. Probably Portal of France was the first to describe that narrow lumbar spinal canals were associated with leg pain and atrophy in 1803.

One of the first descriptions of lumbar myelopathy may have been that of Sachs and Frankel in 1899, long before the introduction of myelography. Their patient had sacral and lumbar pain which necessitated walking bent forwards and was eventually relieved by two level laminectomy.

This date 1899 is important as it points to the very long history of laminectomy as a treatment for lumbar spinal canal stenosis. Since that time till now traditional surgical treatment of acquired lumbar canal stenosis has been wide laminectomy allowing decompression of the neural structures through unroofing the canal.

The criticism directed to laminectomy in treatment of lumbar spinal stenosis is based on:

1. Local tissue trauma.
2. Possible postoperative instability.

Accordingly, many new surgical procedures have been advocated aiming primarily at less local tissue trauma and avoidance of post-operative instability. Most of these surgeries are time consuming, may fail to achieve sufficient decompression and it may minimize but not alleviate back muscle atrophy, moreover the multiplicity of these surgical approaches each with its advocates trying to impress its superiority leads to a lot of perplexion among surgeons.

There are plenty of publications comparing traditional laminectomy and the more sophisticated new techniques in treatment of lumbar spine. Having all what have been published in literature regarding treatment of lumbar spinal stenosis recently in mind, and being one of those who practiced wide decompressive laminectomy in treatment of narrow lumbar spinal canal for more than 30 years, I decided to go through my cases to reevaluate the results according to the JOA and POLO scales and to measure the recovery rate utilizing the Hirabayashi method according to the following formula:

\[
\text{recovery rate} \% = \frac{\text{postoperative score} - \text{preoperative score}}{15 - \text{preoperative score}} \times 100
\]

Recovery rate was classified into one of four groups at the end of first year follow up:

- Excellent: more than 75%
- Good: 50–74%
- Fair: 25–49%
- Poor: 24% or less

Aiming at evaluating the long term results of wide decompressive laminectomy in treatment of lumbar spinal canal stenosis (LSCS)
MATERIAL & METHODS

384 cases; 253 males (65.9%) and 131 females (34.1%) were selected for this retrospective study. Their ages ranged from 45-72 years (median 58.6). All the cases were fulfilling the clinical and radiological criteria of lumbar spinal stenosis. All cases are having circumferential narrowing of the canal. Cases having other bone pathology or any degree of spondylolisthesis were excluded.

The preoperative evaluation included radiological assessment and evaluation of the symptoms and signs according to the JOA scale. Surgery was performed to all patients under general anaesthesia and the patients were put in the prone position. Levels affected were confirmed by fluoroscopy. Care was taken during the subperiosteal muscle separation in an attempt to minimize muscle damage and to lessen blood loss. Wide decompressive laminectomy, removing the hypertrophied ligamentum flavum together with undercutting of the hypertrophied articular facets without disturbing the integrity of the facet joints and foraminotomy was done in all cases. The decompressive procedure is continued till a nicely decompressed pulsating dura is seen. Post operative early ambulation same day of surgery was routinely encouraged.

RESULTS

Two levels of the spine needed decompression in 230 cases (60%), while one level needed decompression in 98 cases (25.5%), and three levels were decompressed in 56 cases (14.5%). The commonest level affected was L4-L5 it was affected in 315 cases (82%) while the least was L1-L2 which was affected in 11 cases (2.9%) operative and early post operative complications included: dural tears managed by direct suture or covered by oxyccell and a piece of crushed muscle if inaccessible in 17 cases (4.4%), and superficial wound infection managed by repeated dressing and antibiotics in 23 cases (6%) .

Follow up evaluation of all cases after one year when applied to the JOA scale assessment revealed varying degrees of improvement being marked in most cases, (74.2%).

Rating according to the polo scale

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<th>Rating</th>
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<tr>
<td>73%</td>
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<td>18%</td>
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On measuring the recovery rate utilizing the Hirabayashi method, the recovery rate was found to be:

- Excellent: 74.2%
- Good: 16.7%
- Fair: 8.3%
- Poor: 0.8%

The follow-up evaluation was repeated every five years, of course on a diminishing number of cases due to death of some or lost tracking of others.

123 operated patients (32.0%) were included in the last follow up.

Results of last evaluation according to Hirabayashi method were:

- Excellent: 72.1%
- Good: 15.4%
- Fair: 12.5%

Not a single case of post operative instability was detected in this series till the last follow-up.

DISCUSSION

Lumbar spinal stenosis refers to a diversity of conditions that decrease the total area of the spinal canal, lateral recess, or neural foramina. Lumbar stenosis is a common disorder that may present in isolation, with or without disc bulge or herniation, or can be associated with degenerative spondylolisthesis or scoliosis. Symptomatic lumbar spinal stenosis is characterized by neurogenic claudication and/or lumbar or sacral radiculopathy. 60% to 80% of properly selected patients have a satisfactory symptomatic improvement with surgical treatment (Binder et al.)

Though portal of France 1803 was probably the first to describe the relation between narrowing of the canal and leg pain and atrophy, and the work of Sachs and Frankel 1899 who performed two level laminectomy to relieve the leg pain of a patient which necessitated him to walk bent forward, it was Verbiest 1954 who fully described the pathology, radiology, clinical picture and treatment of lumbar spinal canal stenosis.

Arnoldi 1976 classified lumbar spinal canal stenosis etiologically into: degenerative, developmental, combined spondylotic & spondylolisthetic, iatrogenic and post traumatic. Wide laminectomy allowing decompression of the neural structures through unroofing of the canal, remained the main milestone of surgical treatment of Iscs, however criticism directed to this technique is largely based on local tissue trauma and possible post operative instability.

Gerald et al. 1994 mentioned that outcome after laminectomy for lumbar spinal canal stenosis was found less favorable than previously reported and that controlled trials are needed to determine efficiency of lumbar fusion as an adjunct to decompressive laminectomy.

On the other hand turner et.al 1997 found that for several low bac disorders no advantages has been demonstrated for fusion over surgery without fusion and complications of fusion are common. Nancy e. Epestien 1997 found that 90-95% of congenital or
acquired variants may be adequately managed by means of decompression without fusion.

In a more recent study son s et.al , 2013 comparing decompression alone and with fixation in a 5 years retrospective comparative study concluded that decompressive laminectomy alone achieves good outcomes in patients with two level or more lscs, associated with advanced age, poor general condition or osteoporosis.

During the past four decades with the introduction and progress of minimally invasive surgery (mis) many new surgical techniques have been advocated aiming at decreasing local tissue trauma and avoiding post operative instability, among these techniques are the following: open door laminotomy, partial undercutting facetectomy, microdecompression, unilateral laminectomy for bilateral decompression, distraction laminoplasty, port hole laminotomy, spinous process implantation and lumbar spinous process split.

Kreiner ds, et.al 2013 published results of a study designed as an evidence- based review of the available data to determine if the literature supports use of minimally invasive lumbar decompression (mild ®) procedures to reduce pain and improve function in patients with symptomatic degenerative lscs; he came to the conclusion that the current body of evidence addressing mild® is of low quality. High quality studies that are independent of industry funding and provide categorical data are needed to clarify the properties of patients who benefit from mild ® and the degree to which these patients benefit. Additional data at up to two years are needed to determine the overall utility of the procedure.

Another comparative study done by Anget.al 2013 came to the conclusion that, compared with an open approach, mis lumbar laminectomy gave no clear advantages in longer term functional or pain scores. The mis group also had patients with an inadvertent durotomy and reoperation within two years in any lumbar decompressive surgery. The purposed advantages of mis is an open approach remain a safe and straightforward operation.

Mayer hm.2001 mentioned that a vast number of minimally invasive or so called semi-invasive procedures have been published in the last three decades but evidence based data on efficiency and benefit of most of these techniques is still lacking.

Ivanov 2007 demonstrated considerable increase in stresses at both the pars interarticularis and the inferior facet after limited decompressions, especially in extension and rotation to the contralateral side.

So besides the fact that most of these surgeries are time consuming, may fail to achieve sufficient decompression and the fact that it may minimize but not alleviate back muscle atrophy especially if multiple levels are affected, another important issue is the radiation hazard to both the patient and medical team.


In this retrospective study based on follow up of 384 cases of clinically and radiologically proven lscs, all of them having circumferential narrowing of the canal, cases having other bone pathology or any degree of spondylolisthesis were excluded. These cases were operated upon over 30 years 1976-2006 and were timely followed up one year after surgery then every 5 years till the time of this publication. The results were evaluated according to the JOA and polo scales and the recovery rate was measured utilizing the Hirabayashi method.

The procedure done for all cases is wide decompressive laminectomy with under cutting of the articular facets without disturbing the integrity of the articular facet joints, in addition to foraminoectomy. The decompression is carried out till a nicely decompressed pulsating dura is seen, to achieve this, laminectomy may sometimes be extended beyond what appears radiologically as the affected segment(s), doing so definitely lessens the possibility of late recurrence of symptoms which mostly happens due to progressive narrowing of the missed potentially narrow adjacent segment(s).

The safety of this technique is reflected by the few number of operative and postoperative complications, there were 7 cases of dural tears (1.8%) and 23 cases of superficial wound infection (6%), no nerve root injuries, post operative neurological deterioration or instability was encountered in this series.

Patient improvement after one year when applied to the JOA scale assessment revealed marked improvement in most cases (74.3%), while according to the polo scale 73% of patients are rated grade 5, and the recovery rate measured by the Hirabayashi method in 74.2% of patients is excellent.

This early improvement was maintained throughout the regular follow up done every 5 years. The last follow up done on 123 patients (32%) having their surgeries done 5-30 years ago revealed excellent recovery rate in 72.1% according to Hirabayashimethod.

The results achieved in this long term study supports the view that open wide decompressive laminectomy is a safe rapid method in treatment of properly selected cases of lscs allowing dealing with all elements sharing in the narrowing of the canal with
CONCLUSION

Open wide decompressive laminectomy in treatment of lumbar spinal canal stenosis is ideal as it is safe, simple, rapid procedure that stood the test of time. It allows the surgeon to nicely decompress all the neural elements inside the stenosed canal effectively and safely with a low incidence of complications and a long term good maintained recovery.

Other advocated minimally invasive surgical techniques are more time consuming, its ability to deal fully with all the stenosing elements inside the canal is questionable, the local tissue trauma is not eliminated especially in two or more level stenosis, over and above the radiation hazard to the patient and the medical team has to be assessed. The long term results are lacking and more evidence based studies are needed.

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