

Lumbar Spinal Stenosis

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ABSTRACT: A total number of 100 patients with the diagnosis of lumbar spinal stenosis were treated surgically. Sixty-six per cent of the patients were female. More than eighty per cent were over 50 years old. The most common age group was between 61-70 years old. The most common stenosis was at L₄ - L₅ (38%). One level decompression was performed in 71 per cent, two levels decompression in 25 per cent and three levels decompression in 4 per cent. Extensive decompression of neural structures was performed when necessary. Significant herniation of disc was found in conjunction with other stenosis in 24 per cent. There were 18 cases with the diagnosis of degenerative spondylolisthesis. Posterolateral spinal fusion was instituted where extensive posterior decompression and total or almost total facetectomy were achieved. Excellent results were obtained in 69 per cent, good in 22 per cent, fair in 7 per cent and poor in 2 per cent of the cases. The follow up period was from 2-4 years with the average of 3 years. Further close follow is necessary in order to assess the long term result.

INTRODUCTION

Spinal stenosis is a condition caused by a relative decrease in the size of the spinal canal, nerve root canal or intervertebral foramen. The clinical syndrome of lumbar spinal stenosis is caused by a combination of the decrease in arterial supply to the neural structure in conjunction with pressure acting upon those structures. The clinical manifestation of lumbar spinal stenosis likely represents a wide spectrum of clinical presentations from the middle-aged patient with single nerve root involvement by lateral canal stenosis to the elderly patient with marked multilevel central and lateral stenosis.^{1,2} The histories obtained from patients with lumbar spinal stenosis are constantly inconsistent. Symptoms arise when stress is placed upon the muscles of the lower extremities. Motion of the

individual nerve root may produce some noxious substances causing root inflammation and pain. The condition frequently goes unrecognized and only on few occasions was a diagnosis made. Interest and knowledge of the subject was stimulated by the work of Verbiest of Holland.^{3,4} With the development of the CT scan, diagnoses have been facilitated remarkably, particularly in nerve root canals such as foraminal canal stenosis.⁵⁻⁹ However, the diagnosis of the lumbar spinal stenosis is based on the clinical assessment, the roentgenographic finding, myelogram and CT scanning.

There are many types of spinal disorder that can produce the clinical syndrome of spinal stenosis.¹⁰ In this study, lumbar spondylosis and degenerative spondylolisthesis producing this phenomenon are reported.

MATERIALS AND METHODS

A total of 100 patients of lumbar spinal stenosis were surgically treated at the Department of Orthopaedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University from January 1982 to June 1985. The period of follow up ranged from two to four years with an average of 3 years. 66 patients were female and 34 cases were male. The ages of the patients ranged from 38 years to 85 years old (Table 1). The majority of the patients were from 51 to 70 years of age. Most patients were light workers. Only six cases were farmers (Table 2).

Various types of clinical findings were obtained from these patients such as the following (Table 3): 98 per cent standing discomfort; 97 per cent intermittent claudication; 98 per cent leg pain; 82 per cent numbness of the leg; 25 per cent weakness of leg muscles. Of the cases studied, reference to one leg pain was found in 41 per cent, and 59 per cent had bilateral legs involvement. Whole limb involvement was found in 65 per cent and above knee involvement was found in 35 per cent. A

TABLE 1
Age Incidence

Age in Year	Cases (%)
30 - 40	1
41 - 50	11
51 - 60	39
61 - 70	41
71 - 80	6
81 - 90	2
Total	100

TABLE 2
Occupation

Type	Cases (%)
1. Homework	52
2. Business	30
3. Government employee	10
4. Farmer	6
5. Monk	2
Total	100

TABLE 3
Clinical Pictures

Type	Cases (%)
1. Standing discomfort	98
2. Pseudoclaudication	97
3. Descriptive complaint	
3.1 Leg pain	95
3.2 Numbness	82
3.3 Weakness	25
4. One leg involvement	41
5. Bilateral leg involvement	59
6. Site	
6.1 Whole limb	65
6.2 Above knee	35
7. Ankle reflex decrease	66
8. Knee reflex decrease	19
9. Objective weakness	23
10. Positive straight leg raising test	15

decrease in ankle jerk was found in 66 per cent and a decrease in knee jerk was found in 19 per cent. Objective weakness of the motor power of the lower extremities was documented in 23 per cent. A positive straight leg raising test was established

in 15 per cent of the cases.

Roentgenographic assessment of the lumbar spine was instituted in all cases, however a lumbar myelogram was accomplished in 78 cases, and the rest of the patients underwent CT scanning. An electromyographic study was not routinely performed on our patients.

Bed rest and physical therapy were employed with all patients for a period of at least 6 months and surgical intervention was decided only when they failed to respond to such regimen.

Decompression of the affected parts was instituted and the extent of decompression depended upon the severity of neural compression and the type of pathology found. Posterolateral fusion was accomplished on 17 patients in whom extensive decompression and wide facetectomy were achieved. One level decompression was performed in 71 cases, 38% at L₄ - L₅, 33% at L₅ - S₁. Two levels two decompression was performed in 25 cases, 8% at L₃ - L₄ - L₅, 17% at L₄ - L₅ - S₁. Three levels decompression was done in 4 cases at L₃ - L₄ - L₅ - S₁. (Table 4).

RESULT

The result of surgical decompression was assessed for all patients with 2-4 years of follow-up. The criterion for assessment was based on whether the patient had the clinical symptom of back or leg pain postoperatively. All cases (100) were divided into 7 groups according to the intraoperative findings and the surgery instituted (Table 5). There were:—

Group 1. Fifty two patients were found to have central, lateral canal and foraminal stenosis on whom decompression was performed.

Group 2. Thirteen patients were found to have disc herniation, lateral canal, foraminal steno-

TABLE 4
Extent of Decompression

Level	Cases (%)
1. One	
1.1 L ₄ - L ₅	38
1.2 L ₅ - S ₁	33
2. Two	
2.1 L ₃ - L ₄ L ₅	8
2.2 L ₄ - L ₅ - S ₁	17
3. Three	
L ₃ - L ₄ - L ₅ - S ₁	4
Total	100

TABLE 5
Operative Finding and Surgical Procedure

Finding	Operation	Cases (%)
1. Central, Lateral recess, Foraminal stenosis	Decompression	52
2. Disc herniation, Lateral recess, Foraminal stenosis	Discectomy + Decompression	13
3. Disc herniation, Central, Lateral recess, Foraminal stenosis	Discectomy + Decompression	10
4. Central, Lateral recess, Foraminal stenosis	Decompression + Posterolateral fusion	6
5. Disc herniation, Central, Lateral recess, Foraminal stenosis	Discectomy + Decompression	1
6. Degenerative, Spondylolisthesis	Decompression	8
7. Degenerative, Spondylolisthesis	Decompression + Posterolateral fusion	10
Total		100

sis on whom discectomy and decompression were carried out.

Group 3. Ten patients were found to have disc herniation, central, lateral canal and foraminal stenosis on whom discectomy and decompression were instituted.

Group 4. There were 6 cases in whom central, lateral canal, foraminal stenosis were documented and decompression as well as posterolateral fusion were performed.

Group 5. There was one patient in whom disc herniation, central, lateral canal and foraminal stenosis were found. Discectomy, decompression and posterolateral fusion were accomplished.

Group 6. Eight patients were found to have degenerative spondylolisthesis at L₄ – L₅ (grade I) in whom decompression was instituted.

Group 7. Ten cases were found to have degenerative spondylolisthesis at L₄ – L₅ level (grade I) and there were significant lateral canal and foraminal stenosis as well. Decompression and posterolateral fusion were performed.

The results of the operative intervention in each group were as following:

TABLE 6
Result of Operative Treatment
Group 1: Central, Lateral Recess, Foraminal Stenosis
(Decompression = 52 cases)

Pain	Cases (%)
None	35
Mild	10
Moderate	5
Severe	2
Total	52

Group 1. Thirty five patients were satisfied with the operative treatment. There was no clinical episode of back or leg pain. Ten cases had mild pain, four cases had moderate back pain, one had moderate back and leg pain, two cases had severe back pain. (Table 6)

Group 2. Nine patients denied any post-operative symptoms, three cases had mild back pain and one case had moderate back and leg pain. (Table 7)

TABLE 7
Result of Operative Treatment
Group 2: Disc herniation, Lateral Recess, Foraminal Stenosis. (Discectomy, Decompression = 13 cases)

Pain	Cases (%)
None	9
Mild	3
Moderate	1
Severe	—
Total	13

TABLE 8
Result of Operative Treatment
Group 3: Disc herniation, Central, Lateral Recess, Formainal Stenosis.
(Discectomy, Decompression = 10 cases)

Pain	Cases (%)
None	8
Mild	2
Moderate	—
Severe	—
Total	10

TABLE 9
Result of Operative Treatment
Group 4: Central, Lateral Recess, Foraminal Stenosis.
(Decompression, Posterolateral fusion = 6 cases)

Pain	Cases (%)
None	4
Mild	2
Moderate	—
Severe	—
Total	6

Group 3. Eight patients presented with no post-operative symptom, two had mild back pain. (Table 8)

Group 4. Four patients had no symptom postoperatively and two cases developed post-operative mild back pain. (Table 9)

Group 5. The one case presented no post-operative clinical complaint. (Table 10)

Group 6. Six patients denied any postoperative clinical manifestation and two cases had mild

TABLE 10
Result of Operative Treatment
Group 5: Disc herniation, Central, Lateral Recess, Foraminal Stenosis.
(Discectomy, Decompression, Posterolateral fusion = 1 case)

Pain	Cases (%)
None	1
Mild	—
Moderate	—
Severe	—
Total	1

TABLE 11
Result of Operative Treatment
Group 6: Degenerative Spondylolisthesis
(Decompression = 10 cases)

Pain	Cases (%)
None	6
Mild	2
Moderate	—
Severe	—
Total	8

TABLE 12
Result of Operative Treatment
Group 7: Degenerative Spondylolisthesis
(Decompression, Posterolateral fusion = 10 cases)

Pain	Cases (%)
None	6
Mild	3
Moderate	1
Severe	—
Total	10

back pain and leg pain. (Table 11)

Group 7. It was found that six cases had no postoperative complaint, whereas three patients had mild back pain, and one had moderate back and leg pain. (Table 12)

The result of posterolateral fusion was found to be solid roetgenographically in all cases.

Four out of six farmers could resume their work on the farm and the other two had to discontinue their jobs and did only home work. The rest

of the patients continued their duties as they did in their preoperative status.

Three cases were complicated by wound infection, one case developed skin slough on the back. The skin slough area was in between two skin incisions where one incision was to explore the spine and the other one was to obtain graft for spinal fusion. However, the lesions healed well after deslough had taken place and healing was completed by secondary intention. All infection wounds healed well following proper treatment.

DISCUSSION

The surgical treatment of spinal stenosis presented a difficult problem since patients were elderly and had suffered severe pain for many years. Only those who did not respond to conservative measures were subjected to surgical intervention. Previously, diagnosis of disc herniation and central spinal stenosis were made by means of clinical assessment and myelography. Lateral canal stenosis occurring with either of those two lesions were detected during operation. The preoperative diagnosis of isolated lateral canal stenosis was rare and usually diagnosed on a vague clinical picture and a plain radiogram. Its diagnosis was presumptive and not confirmed until operative exploration. However, with the aid of CT scanning it has become possible to determine the presence, degree and site of the stenosis before operation.

CT scanning can be beneficial in detecting the presence of disc herniation, compression of cauda equina, spinal nerve, extradural fat and fibrous tissue. The diagnosis of spinal stenosis in our cases was made through clinical assessment and confirmed by myelogram or CT scanning. CT scanning evaluation was instituted on those patients who did not undergo myelographic assessment.¹¹ CT scanning evaluation was not utilized in every case since some patients could not financially afford this investigation.

It is interesting to note that females were preponderant in our series which might be due to the spinal anatomy of the female individual being in favour of enhancing this problem. Since the life span of the population in Thailand is longer, the continuation of higher incidence of this condition is anticipated. The condition is not truly related to the occupation, it is certainly a disease of the constitution and is a degenerative process of the spine. Over 80 per cent of our cases were more

than 50 years old and only 6 cases were hard workers. Lateral canal stenosis and foraminal stenosis are generally occurring to the spine at the level of L₃ - L₄, L₄ - L₅, and L₅ - S₁. It is probably due to the maximal obliquity of the course of the nerve root is at these levels.^{12,13} Narrowing of the central canal, lateral canal and intervertebral foramen was caused by degenerated disc herniation, osteophyte projecting from the posterior vertebral body, the facet joint, with hypertrophic change and the wrinkled hypertrophy of ligamentum flavum which was also noted.

The surgery of spinal stenosis presents some unique conceptual and technical challenges. When properly performed, however, the more extensive procedures necessitated by the pathophysiology of spinal stenosis should yield the same excellent results as simple disc surgery, even though the symptoms may be of greater longevity and the patients of significantly greater age. In order to achieve successful surgical treatment one has to consider these essential principles, namely:— correct operative positioning of the patient, knowing how to do adequate decompression and judgement in performing spinal fusion.^{2,14,15} A decompressive procedure that is unsuccessful is often the result of poor control of hemostasis, loss of intraoperative orientation, incomplete understanding of the surgical pathology or inadequate decompression and stabilization and eventually creating back failure and pain problems for which there may be no resolution.

Posterolateral fusion will be instituted when extensive decompression of the posterior spinal element is achieved particularly when bilateral total facetectomy is performed. However, spinal fusion is advisable when gross spinal instability is documented at the field of operation following extensive posterior decompression.

We classified our result as excellent when the patient had no clinical symptom post operatively, good with mild pain, fair with moderate pain and poor or failure with severe pain. We then had 69 per cent excellent, 22 per cent good, 7 per cent fair and 2 per cent poor results at the average period of follow up of 3 years. It would be necessary to follow these patient for longer period of time for further final results. We could not find any explanation why neurological recovery was not established following surgical intervention. It could be due to long standing neural compression from stenosis or lack of vascular nutrition to the neural structure which make neurological recovery unlikely.

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