

THE SURGICAL TREATMENT OF SPINAL STENOSIS

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It is defined as spinal stenosis that spinal canal, neural canal and foramina lose their normal width by bone, soft tissue or both; and surgical indication exists only, if neurologic deficit and its progression present. In vertebral degenerative cases, decompressive surgery does not prevent degenerative development and its aim is only to release. By continuation of stenosis factor, in the long period spinal canal or lateral stenosis repetition is possible.

In SSK İstanbul Hospital 2nd Orthopaedic and Traumatology Department between May 5, 1992, and August 3, 1993 in ten cases (9 female - 1 male), for treatment of their spinal stenosis's neurologic symptoms, posterior-posterolateral decompression + posterior instrumentation + posterior and posterolateral fusion have been performed. Preoperatively, all cases had had neurologic deficit and spinal stenosis was established by CT or/and MRI. Average patient age is 56.3 years (youngest 35, oldest 63). In all cases etiology is degenerative stenosis. Spondyloarthrotic patients were excluded from this study.

Seven cases which can be followed had been evaluated in May 1994. Average follow-up time is 13 months (between 9 and 24 months). Evaluation have been made according to Oswestry Katz, Frankel criteria and Denis painwork scale. By the end of follow-up, in three cases, all neurologic symptoms had been improved. In three cases had been improved according to preoperative symptoms but they have rarely nerve root irritation findings one case have been stating no difference in her complaints.

Some authors think that posterior decompression (laminectomy or laminectomy) is enough for spinal stenosis, but we consider that it is necessary to add posterior instrumentation and posterior fusion to this procedure for prevent posterior instability which may be developed in the end of this method.

Key Words: Spinal stenosis, surgical treatment.

Spinal canal, nerve root canal (lateral recessus) or foramina narrowing is defined as spinal stenosis. It is a 6th decade disease. The reason of spinal stenosis is the narrowing by bone and soft tissue or both (25,26). In Adult the spinal canal width in sagittal projection is 15 mm (Eisenstein 1977), between 10-13 mm is described as relative stenosis; smaller than 10 mm is absolute stenosis.

Spinal stenosis is mainly two groups (Arnold et al) (26).

- 1) Congenital; a: idiopathic, b: achondroplastic
- 2) Acquired; a: degenerative, b: congenital degenerative, c: iatrogenic, d: spondyloarthrotic, e: post-traumatic, f: miscellaneous

The first two level laminectomy for lumbar stenosis was performed by Sachs and Frankel in 1900 (25). Bailey and Casamajor in 1911, Eisberg in 1913 have performed the same method for the same symptom and signs. Until it was defined in 1949 like today's and published in 1954 by Verbiest, this disease was not considered important. Verbiest stated the congeni-

tal and developmental stenosis, and he added to his description the myelographic block, characteristic changes in discus, facet and ligaments. Furthermore, he reported the spinal canal measures with its measure during surgical procedure (25, 26).

The establishing of spinal canal with CT was made by Schonstrom, Bolender and Spengler in 1985, and by added the myelography, they did not find correlation between the spinal canal radiographic measures and spinal stenosis symptoms. This situation shows that spinal stenosis does not exist from bone tissue only (26).

MATERIAL AND METHOD

In SSK İstanbul Hospital the 2nd Orthopaedic and Traumatology department, dated between 25th May 1992 and 3rd August 1993, 10 cases (9 females, 1 male) have been performed the surgical procedure for treatment of their spinal stenosis's neurological symptoms and pain. Of them the oldest one 63, the youngest was 35 years old, average age was 56.3 one of them died by myocardial infarction postoperatively in 7th week, two cases have not come for evaluation, 7 cases who could be followed were evaluated in May 1994. The average follow-up period is 13 months (9-24).

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Preoperatively, all cases had neurological symptoms and established by CT or/and MRI or/and myelography.

All cases in our series are the degenerative type lumbar spinal stenosis. The spondylolisthetic cases was not included to this study, and these cases will be evaluated later. The stenosis is between L-4 and L-5 in 5 cases, L-5/S-1 in 2 cases.

As surgical procedure; posterior-posterolateral decompression + posterior segmental instrumentation + posterior - posterolateral fusion have been performed. Of all cases, two were performed laminectomy, three cases laminectomy + bilateral foraminotomy, two cases laminectomy + one side laminectomy.

The cases have been evaluated according to Oswestry (10), Katz (12), Frankel criterias and Denis work-pain scale (25).

According to Oswestry criterias there are 2 excellent, 3 good, 1 fair and 1 poor result (table 1).

According to Katz criterias; 1 case had had serious pain complain, 2 cases stated they will not be able to want operation as to at this moment's results 4 cases was satisfactoried from operative results, 1 case stated no difference. Finally, there are 4 expectable and 3 unexpectable results.

Preoperatively, 5 cases were Frankel grade E, 2 grade D and in the follow-up examination, 6 cases were grade E, 1 case grade D (table 2).

According to Denis work-pain scale is like following.

	preop.	postop		
P1	-	2	w1	-
P2	-	3	w2	4 cases
P3	1	1	w3	2 cases
P4	4	1	w4	1 case
P5	2	-	w5	-

According to all these evaluation criterias; in 3 cases all neurological symptoms were improved, 3 cases improved but occasionally there are some nerve root irritation findings. 1 case stated no change in the pain in our study, the neurological complication and instrument failure have not been developed, 1 case had had superficial skin infection (improved by antibiotherapy in 15th day).

DISCUSSION

The first attemption for spinal stenosis had been made by Sachs and Frankel in 1900, but there is still no common concept in treatment (26). Some authors recommend laminectomy only (Mc Caffee Rowe, Ep-

stein, Feffer, Garfin, Spengler). Some of them also added to laminectomy the spinal arthrodesis (Bohlman, Lachoix, Feffer, Hanley, Kaneda, Lombardi, Reynolds, Wiltse) (11).

There are the different groups to make spinal arthrodesis. Such as between intertransvers processus (Herkowitz, Kurz) (11), to use posterior instrumentation (Feffer, Lombardi) (10), and to make anteriorly (Kaneda) (25). But publications reported the long follow-up duration results (12) show that the results of cases who were made laminectomy alone are worse according to Katz, the laminectomy is a risk factor for poor results. However, the facet protection is also important after laminectomy. Shenkin and Mash have reported that spondylolisthesis is 6% after bilateral facetectomy and 15% after three or more facetectomy (25). White and Wiltse found the subluctation in 66% cases after decompression in degenerative stenosis and spondylolisthesis, and recommended fusion (26). Some authors consider that after complet facet resection there will be no instability. However some authors think to make multiple level decompression, and fusion if it is necessary. Koch who thinks the lateral fusion is difficult and recommends to make fusion anteriorly, if the facetectomy is made bilateral to same level and caused medulla or nerve root pressure (11).

We have been applied posterior segmental stabilitation and posterior - posterolateral fusion with autograft to prevent spinal instability after posterior decompression. We take care to graft no to touch the neural tissue during graft placement.

The decision of surgical attemption is not easy as spinal stenosis is a 6th decade disease and a quitely difficult procedure. In a publication which made by Onal et al (18), in 145 cases, all spinal stenosis findings have decreased with conservative treatment outwith reflex deficit. According to authors, the conservative treatment is alternative to surgical management. Benini et al think like this in elderly people (2, 18). However, Firooznia et al had stated that the paralysis may develop with minor trauma in spinal stenosis cases in their publications (6). This situation is caused by neurological findings to added minor trauma which made edema, although medulla spinalis and nerve root adapted to the developed stenosis by the time.

We consider quitely conservative to make decision of surgical attemption and think firstly the necessity of phsyotherapy application. However, we think which the phsyotherapy is not useful in abso-

lute stenosis made diagnosis (in our series, 3 cases among cases who could be followed-up).

Although our series is small, it is harmonious with literature knowledges according to age and sex. The thoracic stenosis was occasionally reported literature, and showed as reason some metabolic and rheumatismal factors (1, 9) (hypophosphatemic D vitamine resistance osteomalasia, Paget etc.). In the people with spinal stenosis which had this type etiology there are thickness of ligamentum flavum and posterior longitudinal ligament. For imaging of spinal stenosis, myelography and MRI is more useful than CT (1). However CT is one of the most important methods in imaging of spinal stenosis. But the sacroradiculography may show better root pressure and displacement than CT and MRI in the nerve root irritation cases (3).

All cases have been imaged with CT outwith clinic findings, but in 3 cases with added to this, MRI was used. This methods have been preferred as they were noninvasive (14), but in 2 cases, myelography was used.

The decompression in spinal stenosis has not been causing to degenerative changes in lumbar vertebrae (10). Postoperatively, the stenozan factor may continue and develop the stenosis of canal and lateral recessus in the late period. So, the case number which have been made 2nd operation was reported as 5-13% cases (12). We think that a stable instrumentation with large decompression and fusion is suitable. Our average follow-up time is 13 months and there are no cases who is made reoperation.

The other situation which it should not be forgotten is that, in scoliosis which was not ended bone maturation during instrumentation, the sublaminar wiring may cause not only to the longitudinal and transvers growing into the lamina but also spinal stenosis by the growing into the spinal canal (17). The extra foraminal pressure reasons should not be forgotten in the cases who had spinal stenosis findings and neurological symptoms. Kleiner et al., in one of their studies (13), in 12125 cases had lumbosacral radiculopathy have been found in 12 cases tumour, obturator artery aneurysm, hematoma, siatic nerve tumour as reason of lumbar radiculopathy (extra foraminal reason 12/12125). Although the ratio is 1/1000, the importance of diagnosis and its treatment is quite different.

Deya et al (5) have been reporting 18% as complication ratio in stenosis cases aged over 75 years, this high risk rate is concern to the high age as the risk about procedure in the same publication has been re-

ported as 0.12% and the mortality as 0.07%. In our series, the average age is 56.3, and there are no complication about the procedure.

RESULTS

1. The diagnosis was made by CT, MRI and myelography.
2. In the beginning, the conservative treatment and physiotherapy should be applied.
3. The surgical indication of spinal stenosis should not be given easily.
4. The surgical treatment should be applied for the pain which prevent the daily activities and neurological deficit which may be improved.
5. Decompression should be made enough in spinal stenosis.
6. The stable instrumentation is necessary and the posterior-posterolateral fusion should be performed.

Table 1. Results according to Oswestry criterias.

Excellent	2
Good	3
Fair	1
Poor	1

Table 2. The Frankel evaluation.

Frankel	Preop.	Postop.
A	-	-
C	-	-
D	(2)	(1)
E	(5)	(6)

REFERENCES:

1. Barnett G., Hardy R.W., Little J.R., Bay J.W., Sybert G.W.: Thoracic spinal canal stenosis.: J. Neurosurg.; 66 (3), p. 384-44, 1987.
2. Benini A., Sciermann B.: Rehabilitation following surgery of the lumbar spine: Herniated disk, spinal canal, stenosis, spondylolysis: Schweiz Rundsch Med Prax, 80 (41), p. 1092-5, 1991.
3. Deburge A., Garreau de Loubresse C., Barre E., Vaquin G., Lassale B.: Lateral stenosis of the lumbar canal.: Chirurgie.: 117 (5-6), p. 454-9, 1991.
4. Delamarter R.B., Bohlman H.H., Dodge L.D., Biro C.: Experimental lumbar stenosis.: J. Bone Joint Surg., 72-A (1), p. 110-120, 1990.
5. Deyo R.A., Cherkin D.C., Looser J.D., Bigos S.J., Ciol M.A.: Morbidity and motality in association with oper-

- ations on the lumbar spine.: *J. Bone Joint Surg.*, 74-A (4), p. 536-43, 1992.
6. Firooznia H., Ahn J.H., Rafii M., Ragnarsson K.T.: Sudden quadriplegia after a minor trauma. The role of preexisting spinal stenosis.: *Surg Neurol.*, 23 (2), p: 165-8, 1985.
 7. Graf H.: Lumbosacral instrumentation and fusion in degenerative disease.: 4th proceeding of international congress on cotrel-dubouset instrumentation. Sauramps Medical. p: 151-6, 1987.
 8. Grobler L.J., Robertson P.A., Novotny J.E.: Decompression for degenerative spondylolisthesis and spinal stenosis at L4-L5.: *Spine*, 18: 1475-82, 1993.
 9. Hadjipaulo A., Lander P.: Paget disease of the spine.: *J. Bone Joint Surg.*: 73-A (9): 1376-81, 1991.
 10. Herno A., Airaksinen O., Saari T.: Long-term results of surgical treatment of lumbar spine stenosis. *Spine*. 18: 1471-4, 1993.
 11. Herkowitz H.N., Kurz L.T.: Degenerative lumbar spondylolisthesis with spinalstenosis, *J. Bone Joint Surg.*: 73-A (6): 802-8, 1991.
 12. Katz J.N., Lipson S.J., Larson M.G., Mc Innes J.M., et. al.: The outcome of decompressive laminectomy for degenerative lumbar stenosis. *J. Bone Joint Surg.* 73-A (6): 809-16, 1991.
 13. Kleiner J.B., Donaldson W.F., Curd J.G., Thome R.P.: Extraspinal causes of lumbosacral radiculopathy. *J. Bone Joint Surg.* 73-A: 817-21, 1991.
 14. Kolin J.: Spinal stenosis.: *Cesk Radiol.*: 43 (1), p: 26-34, 1989.
 15. Lange M., Hamburger C., Waidhauser E., Beck O.J.: Surgical treatment and results in patients suffering from lumbar spinal stenosis. *Neurosurg Rev.*: 16 (1), p. 27-33, 1993.
 16. Nakai O., Ookawa A., Yamaura I.: Long-term roentgenographic and functional changes in patient who were treated with wide fenestration for central lumbar stenosis. *J. Bone Joint Surg.* 73-A (8), 1184-91, 1991.
 17. Nixon J.E.: Does sublaminar wiring produce spinal stenosis: *J. Bone Joint Surg.* 71-B (1): 92-3, 1989.
 18. Önel D., Sari H., Dönmez C.: Lumbar spinal stenosis: Clinical/radiologic therapeutic evaluation in 145 patients. Conservative treatment of surgical intervention. *Spine* 18 (2) p: 291-8, 1993.
 19. Passuti N., Allieux J.J., Rogez J.M., Baineul J.V.: CD after lumbar decompression for stenosis. 4th proceeding of international congress on cotrel-dubouset instrumentation. Sauramps Medical. p: 151-6, 1987.
 20. Postacchini F., Cinotti G.: Bone regrowth after surgical decompression for lumbar spinal stenosis. *J. Bone Joint Surg.* 74-B (6): 862-9, 1992.
 21. Sanderson P.L., Wood P.L.R.: Surgery for lumbar spinal stenosis in old people. *J. Bone Joint Surg.* 75-B (3): 393-7, 1993.
 22. Scoles V.P., Linton A.E., Latimer B., et. al.: Vertebral body and posterior element morphology in the normal adult spine. 4th proceeding of international congress on cotrel-dubouset instrumentation. Sauramps Medical. p: 151-6, 1987.
 23. Silvers H.R., Lewis P.J., Asch H.L.: Decompressive lumbar laminectomy for spinal stenosis. *J. Neurosurg.* 78 (5), p: 695-701, 1993.
 24. Spengler D.M.: Current concept review, degenerative stenosis of the lumbar spine. *J. Bone Joint Surg.* 69-A (2): 305-8, 1987.
 25. Whiffer J.R., Neuwirth M.G.: Spinal Stenosis. The textbook of spinal surgery. Vol. 2, Chapter: 25, p. 637-56, J.B. Lippincott company Philadelphia, 1991.
 26. Wood G.W.: Spinal stenosis. Campbell's operative orthopaedics Vol: 4, chapter: 75, p. 3347-53, The C.V. Mosby Company, 1987.