THE RESULTS OF POSTERIOR INSTRUMENTATION AND PLIF IN PATIENTS WITH SPINAL STENOSIS*

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ABSTRACT:

In this study the results of posterior decompression, PLIF and posterior instrumentation in 10 spinal stenosis patients whom were operated at the 1st Department of Orthopaedics and Traumatology of Ankara Social Security Hospital were evaluated. Of these patients 1 had posteriorly localized osteoblastoma, 2 had sypondyloarthrosis and 7 of them had sypondylolisthesis. Six of the patients were female, 4 were male. Mean age was 48.1 and mean follow-up was 22.3 (12-48) months. All of the patients had severe back pain and their root or chord compression were demonstrated with radiological techniques. Eight of the patient had posterior instrumentation with Texas Scottish Rite Hospital System. Alıcı Spinal Instrumentation was performed in a patient and Compact Cotrel-Dubousset Instrumentation was also performed in a patient. Postoperatively all back pain complaints except one were diminished. In this patient a solid fusion mass was not observed and other patients had a solid fusion mass. Paresthesis complaints of 3 patients and incontinence complaint of one patient totaly improved postoperatively.

Key Words: *Spinal stenosis, fusion, posterior, spinal instrumentation.*

INTRODUCTION

Spinal stenosis is narrowing of the spinal canal, nerve root canals, or neural foramina. The narrowing may be caused by the bony or soft tissue elements of the spinal canal or by a combination of both. It is a relatively recently understood condition, having been brought to modern attention by Verbist in 1949. Verbist showed that myelographic blocks were due to characteristic degenerative changes in discs, foraminas and ligamentous structures (6, 22).

There is no alternative but surgical decompression for the patients that have radicular pain, motor and sensory deficit, and bladder disfunction (5, 8). Decompression can be done by direct or indirect methods. Laminectomy, facetectomy or anterior corpectomy is direct and laminar or interbody distraction is indirect method for distraction (4). For satisfactory clinical results extensive laminectomy is mandatory (1). But this usually causes vertebral instability (23). For stability, posterior or anterior fusion must be done (4). Posterolateral fusion rates are reported to vary from 44% to 100% (12, 15). These rates can be improved by transpedicular screw fixation (11, 13, 14).

In this study, we report the posterior decompression, PLIF and short segment instrumentation results of ten patients with spinal stenosis, whose disease was confirmed with radiographs and MRI and who had radicular pain and neurologic deficit.

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PATIENTS AND METHOD

Ten patients with spinal stenosis operated at the 1st Department of Orthopedics and Traumatology of Ankara Social Security Hospital between December 1991 and December 1994 were included in this study. Mean age was 48.1 (28-62) years. Six of the patients were female and 4 were male. Mean follow up period was 22.3 (12-48) months.

Patients admitted to our department with severe back pain and neurologic claudicatio which goes on at least 1 year. After clinical and neurological evaluation, conventional radiograms and MRI were done to search spinal stenosis. Narrowing of the spinal canal that exceeds 30% or a decreasening of the midsagittal diameter below 10 mm were considered as absolute stenosis criteria (20).

Anterior displacement of the vertebra was determined by calculating the ratio between the exceeding posterior portion of the end plate of lower vertebra, and the upper end plate of lower vertebra (Marique-Trillad Method) (21).

Motor strength loss in lower extremities and cauda equina syndrome were considered as absolute indication for surgical decompression. Also back or thigh

pain, radicular pain and neurological cladicatio in patients resistant to medical therapy or bed rest were evaluated with MRI and surgical care was taken after the diagnosis of spinal stenosis. Patients with spondylolisthesis between Grade 2 and Grade 5 were operated. Prerequisities for surgery were considered as presence of sufficient bone stock and a patient without a severe osteoporosis.

Posterior decompression was performed to all patients. A posterolateral tumor mass was totally excised in a patient with osteoblastoma. The posterolateral tumor mass was totally excised with bilateral facetectomy and wide decompression in the patient with osteoblastoma which involved both pedicles. After this procedure, intervertebral disc content was excised posteriorly and after curetage, posterior lumbar interbody fusion (PLIF) was performed with the bone block retriewed from the iliac wing of the patient. Only posterolateral fusion was performed in two patients with spondylopythosis. As these patients with spinal stenosis symptom had wide decompression and posterior instrumentation, were also added to our series. One patient had PLIF with a titanium cage which was filled up with cancellous bone graft. One patient with Osteoblastoma had Alıcı Spinal Instrumentation, the patients with spondolarthrosis had TSRH instrumentation. Also one patient with spondylolisthesis had Compact-Cotrel-Dubousset (CCD) instrumentation. The remaining patients with spondylolisthesis had Texas Scottish Rite Hospital (TSRH) instrumentation after performing posterior intertransversal fusion.

Patients were led to walk in the postoperative 2nd day and were braced for two months in order to courage the patients. Patients were discharged from the hospial averagely in the postoperative 10th day. They were followed up in the 1st, 3rd, 6th months, and later every 6 months postoperatively. Pain and functional status of the patients were evaluated with Pain and Functional Assessment (PFA) Scale (14) (Table 1). Fusion and spinal canal narrowing were evaluated with conventional radiograms and MRI and correction or correction loss of listhesis rates were recorded.

RESULTS

Osteoblastoma which causes spinal stenosis was noted at L 3-4 level in one patient. In this patient decompression was done with excision of the tumor mass. Two patients had foraminal narrowing due to spondyloarthrosis and they also had osteophyte formation that protrudes to the spinal canal. Six patients had spondylolisthesis and 1 had spondylopythosis.

Table 1. Pain assessment involves frequency and severity evaluated on anolog scales from 0 to 5, as shown. Functional capacity assessments are also evaluated on analog scales from 0 to 5, as shown. Pain and functional capacity assessment are completed preoperatively, as well as at each postoperative visit.

PAIN AND FUNCTIONAL ASSESSMENT (PFA) SCALES

I. PAIN FREQUENCY (0-5)
0 - No pain rare pain
1 - Occasional pain about 1-2 episodes per year or so
2 - Recurrent pain, a few days every few mos. or more often
3 - Frequent pain, every month or more often that lasts longer
4 - Very frequent pain, every week or more often
5 - Pain every day, constant (yes, no)
II. PAIN SEVERITY (0-5)
0 - No pain
1 - Dull pain
2 - Harder pain
3 - More severe pain
4 - Very severe pain
5 - Extremely severe pain
III. WORK CAPACITIES
0 - No limitation
1 - Few limitation
2 - Able with modifications
3 - Must stop and limit, but mostly able
4 - Frequently unable for long periods (days)
5 - Unable, totaly disable
IV. SOCIAL LIMITATION
0 - No limitation
1 - Few limitation
2 - Able to do all with pain
3 - Able to do most with pain
4 - Unable to do most things
5 - Unable to do anything

Table 2. Distribution of patients according to clinical findings and diagnosis

No	Name	Sex	Age	Diagnosis	Level	Clinical Features		
						Pain	Neural Claudation	Neurologic Deficit
1	SY	M	47	Osteoblastom	L2-4	+	+	—
2	PY	F	62	Spondyloartrosis	L4-5	+	+	Paresthesia
3	HE	F	61	Spondyloartrosis	L5-S1	+	+	—
4	SE	F	52	Spondylolisthesis	L4-5	+	+	—
5	FR	F	32	Spondyloartrosis	L4-5	+	+	Paresthesia
6	ZÇ	F	51	Spondyloartrosis	L5-S1	+	+	—
7	NB	F	43	Spondyloartrosis	L4-5	+	+	—
8	ME	F	54	Spondyloartrosis	L4-5	+	+	—
9	NA	F	32	Spondyloartrosis	L5-S1	+	+	Urinary incontinance
10	SK	F	32	"	L4-5	+	+	—

Table 3. Preoperative (PR) and postoperative (PO) olisthesis (OL) rates and their correction percentages (% COR) in spondylolisthesis patients.

No	Name	Grade	PR OL	PO OL	% COR
4	SE	II	% 25	% 20	20
5	FR	II	% 25	% 0	100
6	ZÇ	IV	% 75	% 50	33.3
7	NS	II	% 37.5	% 0	100
8	ME	II	% 28	% 0	100
9	NA	V	% 100	% 100	0
10	SD	II	% 26.1	% 0	100

Preoperative and postoperative slipping percentages are seen in Table 2. There were 5 patients with Grade II (25-50%), 1 patient with Grade IV (75-100%) spondylopythosis. There was not any Grade III (50-75%) patients. One patient had spondylopythosis (Grade V). In Grade II patients average slipping percentage which has 28.3±5.3% was brought to 4±8.9% and 84±35.8% of correction was obtained. This correction rate was statistically significant ($p < 0.05$, t: 5.24). One patient with 75% slipping percentage (Grade IV) was brought to 50% and 33.3% of correction was noted. In the spondylopthotic patient only institu fusion and instrumentation was performed without any correction attempt. For an overall assessment, preoperative slipping which was 45.2±30.1% was carried to 24.3±38.2% and 64.8±45.0% of correction was obtained.

Preoperative severe thigh and back pain, radicular pain and neural claudicatio of the patients disappeared in all patients except one. Three patient had paresthesis and one had urinary incontinance preoperatively (Table 2). One patient with urinary dificulties had Grade 5 spondylopythosis. Neurological impairments healed in all patients postoperatively.

Clinical differences of the patients preoperatively and at the last controls were evaluated with PFA, PFA values are seen in Table 3. Preoperative PFA score which was 11.0±3.4 was brought to 1.8±1.5 postoperatively. The PFA score was the same at the last controls. This correction rate was statistically significant ($p < 0.05$, t: 7.78).

In the MRI evaluation of the patients at the last controls, canal clearence was observed at the stenosis region in all patients. A solid fusion mass was observed in all patients except one (90%). Any implant failure or late complication was not observed.

DISCUSSION

Instability after limited decompression is uncommon. In the largest reported series undergoing wide and extensive decompression for spinal stenosis, 2-30% of the patients developed instability significant to

require spinal fusion (6, 22). Also posterolateral fusion rates ranges between 10-44% (4). Although anterior interbody fusion (AIF) provides wide decompression and fusion possibility, is performed less because major vascular damage risk at the distal lumbar region, high complication rates and pseudoarthrosis (4, 5, 22).

Posterior lumbar interbody fusion (PLIF) was pioneered Dr. Ralp Cloward in the 1940's (22). In 1985, Cloward claimed 87-92% clinical success and 92% fusion success in his 40 years of PLIF surgery (3).

Lin has reported 82% clinical success and 88% fusion success (17). Ma has reported 83% clinical success and 85% fusion success (18). In this study wide decompression intertransversal fusion and PLIF was performed in 10 spinal stenosis patients. A solid fusion mass was observed in 90% of the patients. Pain and neurological complaints of the patients improved except in one patient. PFA score of the patients was lowered from 11 to 1.8.

Spondylolisthesis is the progressive anterior translation of a superior vertebra on its neighbour due to various causes. Istmic and degenerative types are seen frequently (5, 7, 22). In this study 7 spondylolisthesis cases were evaluated. Three of them were degenerative type and 4 were isthmic type.

According to Herkowitz indications for surgical intervention are: 1. Persistant or recurrent leg pain despite a reasonable trial of nonoperative management; 2. Progressive neurologic deficit; 3. Significant reduction in the quality of life; 4. Confirmatory imaging study consistent with the clinical findings (7).

In 1985 Johnson et al reported on 45 patients who had undergone decompressive laminectomy alone for spinal stenosis. Twenty of these patients had degenerative spondylolisthesis. The surgical results in those patients who had further slippage were poor, with only a 52% improvement rate (10). Bross evaluated 50 patients with spondylolisthesis and obtained 92% satisfactory results and 96% solid fusion rate. 11 of 12 patients had neurological improvement in other study (2). Alıcı et al reported that they obtained complete reduction in 22 patients over 42 spondilolisthesis patients with Alıcı Spinal Instrumentation (ASI) (1). Kutluay et al has observed satisfactory results in 16 spondylolisthesis patients with ASI (16).

In our study, preoperative average slipping percentage of 5 Grade II patients over 7 spondilolisthesis patients which was 28.3% was decreased to 4% with correction rate of 84%. When all the patients are included 64.8% of reduction was observed. All of the patients improved neurologically. Reduction was not tried in spondylopythosis patient. A solid fusion was obtained by wide decompression, PLIF and TSRH instrumentation in this patient. Urinary incontinence and pain complaint of this patient diminished totally.

Table 4. Preoperative (PR) and postoperative (PO) distrubution of patients according to PFA scale.

No	Name	PR	PO	Follow-up
1	SY	10	2	2
2	PY	11	2	2
3	HE	8	0	0
4	SE	14	3	3
5	FR	7	0	0
6	ZÇ	16	4	4
7	NB	12	3	3
8	ME	7	0	0
9	NA	16	3	3
10	SD	9	1	1
Mean		11±3.4	1.8±1.5	1.8±1.5

$p<0.05$ t : 7.78

Neustadt et al. reported that rigid fixation has advantages of early rehabilitation and immobilization of the spine untill fusion mass consolidates (19) Zdeblic compared noninstrumental fusion to semirigid and rigid instrumented fusions in 124 patients, of which 56 had a diagnosis of degenerative or isthmic spondylolisthesis. This series demonstrated better fusion rates in rigidly instrumented group (24).

In this study TSRH and CCD instrumentations were used for reduction of spondylolisthesis, to provide a safe fusion and early mobilization. Titanium cage was used in one patient. Alıcı Spinal Instrumentation was used in the patient osteoblastoma. It is thought that a high solid fusion rate such 90% as can be related to posterior instrumentation application in these patients. In light of these findings it is suggested that with wide decompression, PLIF and posterior instrumentation, satisfactory clinical results and high correction rates can be obtained in spinal stenosis patients.

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