SPINE Volume 29, Number 9, pp 1049–1056

Lumbar Laminectomy for the Resection of Synovial Cysts and Coexisting Lumbar Spinal Stenosis or Degenerative Spondylolisthesis

An Outcome Study

Nancy E. Epstein, MD

Study Design. Surgeon- and patient-based (SF-36) outcome measures were used to assess the results of decompressive laminectomies for the excision of synovial cysts with coexistent lumbar spinal stenosis (45 patients) or for synovial cysts with coexistent lumbar stenosis and degenerative spondylolisthesis (35 patients).

Objectives. To evaluate the results following laminectomy and the excision of synovial cysts/stenosis with or without olisthy.

Summary of Background Data. SF-36 outcome studies evaluating these surgical results deserve further investigation.

Methods. Before surgery, patients with synovial cysts/stenosis (45 patients) or cysts/stenosis/degenerative spondylolisthesis (35 patients), respectively, exhibited low back pain (40 and 33 patients), radiculopathy (43 and 33 patients), and neurogenic claudication (41 and 26 patients). Surgery required average 3.8 and 3.5 level laminectomies, respectively, for patients with cysts/stenosis and cysts/stenosis and olisthy. Outcomes were assessed 2 years after surgery.

Results. Five of 45 patients undergoing laminectomy alone for cysts/stenosis developed postoperative olisthy. Of 35 patients with cysts/stenosis and preoperative Grade 1 degenerative spondylolisthesis, olisthy increased after surgery to Grade 2 in 11 patients. Good/excellent results (58% and 63%) and SF-36 improvement on the Physical Function Scale (+44 and +38 points) were, respectively, documented for these two groups.

Conclusions. Using both surgeon and SF-36 outcome measures, 2 years following laminectomy for synovial cysts/lumbar stenosis with or without olisthy, patients exhibited a moderate degree of improvement. As synovial cysts reflect disruption of the facet joint and some degree of instability, primary fusion should be considered to improve operative results for patients in both categories. [Key words: lumbar stenosis, olisthy, synovial cysts, outcome(s), SF-36] **Spine 2004;29:1049–1056**

From the Department of Neurological Surgery, Albert Einstein College of Medicine, Bronx, NY; the North Shore-Long Island Jewish Health System, Manhasset and New Hyde Park, NY; and Winthrop University Hospital, Mineola, NY.
Acknowledgment date: November 12, 2002. First revision date: February 13, 2003. Acceptance date: July 21, 2003.
Supported by the Joseph A. Epstein Neurosurgical Education Foundation.
The manuscript submitted does not contain information about medical device(s)/drug(s).
No funds were received in support of this work. No benefits in any form have been or will be received from a commercial party related directly or indirectly to the subject of this manuscript.
Address correspondence to Nancy E. Epstein, MD, Long Island Neurosurgical Assoc. P.C., 410 Lakeville Rd., Suite 204, New Hyde Park, NY 11042; E-mail: Nepstein@lineurosurg.com

Surgeon-based evaluations and various patient-based questionnaires have been used to report the outcome of lumbar laminectomy to treat spinal stenosis alone. Surgeon-based outcome data reveal a 56.6% to 75% incidence of good to excellent results.[1–5] Few studies have reported on the long-term outcomes using the patient-based Oswestry Disability Questionnaire.[2,6]

Lumbar spinal stenosis may be further complicated by the presence of coexisting synovial cysts.[7–14] Results following laminectomy for the management of combined lumbar spinal stenosis and synovial cysts have relied heavily on surgeon-based outcome measures alone, with a 66.7% to 100% reported incidence of good to excellent results.[8,10,13–17] Both surgeon-based and patient-based (Short Form-36 [SF-36])[18] measures were applied to analyze the outcomes of lumbar laminectomies performed to address synovial cysts and coexistent lumbar spinal stenosis in 45 patients and synovial cysts with degenerative spondylolisthesis in 35 patients. Surgical management strategies may be altered following a close analysis of the outcome data.

Materials and Methods

Lumbar laminectomies were performed to resect synovial cysts and to decompress spinal stenosis (45 patients) or resect synovial cysts, decompress spinal stenosis and Grade 1 degenerative spondylolisthesis (35 patients) (Table 1). Patients with cysts/spinal stenosis alone averaged 69 years of age and included more males than females. Those with cysts/olisthy averaged 67 years of age but included more females than males. Fourteen patients in the whole series exhibited significant cardiac comorbidities. Trauma contributed to the onset of symptoms in 11 patients, 6 with stenosis alone, and 5 with preoperative olisthy. Preoperative symptoms in patients with cysts/stenosis and cysts/olisthy, respectively, included low back pain (40 and 33 patients), radiculopathy (43 and 33 patients), neurogenic claudication (41 and 26 patients), and cauda equina syndromes/paraparesis (1 and 1 patient). Preoperative symptoms averaged 3.4 months in duration for the former and 2.6 months for the latter.

Radiculopathy was present in the majority of patients with cysts/stenosis with or without olisthy. Patients with cysts/stenosis alone exhibited unilateral (8 patients) or bilateral (35 patients) radiculopathy, while those with cysts/olisthy demonstrated unilateral (16 patients) and bilateral radiculopathy (17 patients) (Table 1). Motor deficits were observed in 34 of 45 patients with cysts/stenosis, 3 unilaterally and 31 bilaterally, while 29 of 35 patients with degenerative spondylolisthesis had unilateral (7 patients) or bilateral (22 patients) motor deficits.

Table 1. Clinical Data for Patients With Synovial Cysts/Lumbar Stenosis and Synovial Cysts/Lumbar Stenosis With Grade 1 Degenerative Spondylolisthesis (Olisthy)

Clinical Parameters	Synovial Cysts	
	Spinal Stenosis Alone Without Olisthy (45 patients)	Spinal Stenosis With Olisthy (35 patients)
Average age (yr)	69	67
Age range (yr)	(45–78)	(43–81)
Sex ratio		
Males	27 (60%)	14 (40%)
Females	18 (40%)	21 (60%)
Average duration of symptoms (mo)	3.4	2.6
Low back pain	40 (89%)	33 (94%)
Radiculopathy	43 (96%)	33 (94%)
Unilateral	8 (18%)	16 (45.5%)
Bilateral	35 (78%)	17 (48.5%)
Neurogenic claudication	41 (1%)	26 (74%)
Paraparesis	1 (22%)	1 (2.8%)
Preoperative motor deficit	34 (97%)	29 (83%)
Unilateral	3 (8.5%)	7 (20%)
Bilateral	31 (88.5%)	22 (63%)
Preoperative sensory deficit	45 (100%)	35 (100%)
Unilateral	12 (27%)	13 (37%)
Bilateral	33 (73%)	22 (63%)
Preoperative sphincteric deficit	6 (13%)	7 (20%)
Trauma	6 (13%)	5 (14%)

Sensory dysfunction was present in all 45 patients with cysts/stenosis, unilaterally (14 patients) or bilaterally (31 patients), and among the 35 patients with cysts/olisthy, unilaterally (13 patients) or bilaterally (22 patients). Bowel and bladder dysfunction was present before surgery in 6 patients with cysts/stenosis alone and in 7 patients with cysts/olisthy. Both patient groups were followed a minimum of 2 postoperative years.

Neurodiagnostic Studies. Preoperative dynamic radiographs and MR and CT studies documented synovial cysts with lumbar stenosis alone (45 patients) involving an average of 3.8 levels (Table 2; Figures 1 and 2). Similarly, synovial cysts with spinal stenosis and Grade 1 degenerative spondylolisthesis (35 patients) were observed over an average of 3.5 levels.

On both MR- and CT-based studies, synovial cysts were readily identified emanating in continuity with the overlying facet joint.[19–23] Synovial cysts typically appeared hypointense to isointense on T1-weighted MR images and were often accompanied by peripheral hypointensity reflecting microcalcification and old hemorrhage within the cyst capsule.[23–25] On T2-weighted MR images, the central portion of synovial cysts were hyperintense, while on gadolinium-enhanced studies, peripheral capsular enhancement occurred (Figure 1). CT and myelo-CT examinations revealed hypodense to isodense cystic centers with hyperdense rims reflecting calcification of the cyst capsule (Figure 2). All synovial cysts were pathologically confirmed to contain a synovial lining accompanied by focal myxoid changes and occasionally a foreign body giant cell reaction.

Outcome Measurements. Patients' outcomes in this study were surgeon-graded, using the Friedberg *et al*[26] criteria: excellent (totally free of symptoms), good (symptomatic improvement, some pain, and minimal neurologic findings), fair (no improvement, pain, and moderate neurologic findings), and poor (same as before surgery or worse) (Table 3). The Medical Outcomes Trust Short-Form 36 (SF-36)[18] questionnaire was completed before surgery and 2 years after surgery in 66 (83%) patients (Table 4). These data were later compared with those obtained in other long-term patient-based studies.[2,6] The SF-36 results were converted as recommended by Ware[18] to a transformed scale of 0 to 100, the higher score (total point value) indicating better results.

■ Results

Synovial cyst excision utilizing laminectomies in 45 patients with cysts/stenosis alone resulted in total cyst removal in 21 patients and partial excision in 24 patients. For the 35 patients undergoing laminectomy with coexistent Grade 1 degenerative spondylolisthesis, total cyst excision was accomplished in 15 patients, while partial removal was effected in the remaining 20 patients.

Lumbar decompressions performed for cysts/stenosis alone included the levels L2–S1 (11 patients), L3–L5 (9 patients), L4–L5 (8 patients), and L2–L5 (4 patients) (Table 2). For patients exhibiting cysts/olisthy, laminectomies included the levels L3–S1 (14 patients), L4–L5 (9 patient), L2–S1 (4 patients), and L3–L5 (4 patients). Laminectomies included medial facetectomy with foraminotomy in all patients except 4 who required complete unilateral facetectomy, 3 with cysts/stenosis, and 1 with cysts/olisthy. Spinal stabilization was not performed.

Addressing synovial cysts for 45 patients demonstrating stenosis alone, these were most often observed at L4–L5 (30 patients), L3–L4/L4–L5 (8 patients), and L3–L4 (5 patients) (Table 2). Synovial cysts occurred bilaterally (32 patients) and unilaterally (13 patients) in a 2.5:1 ratio. For the 5 patients who developed new post-

Table 2. Radiographic and Surgical Data for Synovial Cysts/Lumbar Stenosis and Synovial Cysts/Lumbar Stenosis and Degenerative Spondylolisthesis (Olisthy)

Data	Synovial Cysts	
	Spinal Stenosis Alone Without Olisthy (45 patients)	Spinal Stenosis With Olisthy (35 patients)
Synovial cyst location		
L1–L2	0	1
L2–L3	0	1
L3–L4	5	4
L3–L4/L4–L5	8	3
L4–L5	30	22
L5–S1	1	4
L3–L4/L5–S1	1	0
Bilateral synovial cysts		
L3–L4	1	4
L4–L5	21	9
L3–L4/L4–L5	6	2
L3–L4/L5–S1	1	0
Levels of stenosis		
L1–L3	0	1
L1–S1	1	0
L1–L5	1	0
L2–S1	11	4
L2–L5	8	1
L3–S1	6	14
L3–L5	9	4
L4–S1	1	2
L4–L5	8	9
Average no. of laminectomy levels	3.8	3.5
Second operations	7	5
Secondary fusions	2	2
Secondary laminectomy	5	3
Indications		
Postoperative scar	1	2
Recurrent disc	3	0
Recurrent synovial cyst	1	1
Instability	2	2
Increased or new postoperative olisthy	New	Increased
Synovial cyst location	5	11
Bilateral cysts	3	5
Unilateral cysts	2	6
Second surgery with increased or new slip	3	5
Fusion	2	3
Decompression	1	2

operative olisthy, 3 had unilateral and 2 had bilateral preoperative synovial cysts at the level of olisthy. Only 2 of these 5 patients required secondary laminectomies without fusion for recurrent stenosis. Before initial surgery, one showed unilateral, and the other, bilateral synovial cysts.

For 35 patients exhibiting preoperative degenerative spondylolisthesis, synovial cysts predominated at L4–L5 (22 patients), L3–L4 (4 patients), and L5–S1 (4 patients) (Table 2). Unlike patients with cysts/stenosis where bilateral synovial cysts predominated, synovial cysts in patients with cysts/olisthy occurred with nearly equal frequencies, being observed bilaterally in 16 patients and unilaterally in 19 patients. Interestingly, the level of olisthy coincided with the level of the synovial cysts in 29 patients; at these levels, 16 patients exhibited unilateral while 13 demonstrated bilateral cysts. In 6 patients, olisthy and synovial cysts occurred at different levels; 4 demonstrated unilateral and the other 2 demonstrated bilateral cysts. Eleven patients developed progression of olisthy after surgery from Grade 1 to Grade 2. Before surgery, 6 of these patients had unilateral while 5 showed bilateral cysts as the level of olisthy. Of note, only 5 of these 11 patients required secondary surgery consisting of decompression alone (2 unilateral, 1 bilateral cyst) or with fusion (2 unilateral cysts).

Seven of 45 patients undergoing laminectomy for cysts/stenosis required secondary surgery an average of 2.3 years following their original operations (range 2 months to 5 years) (Table 2). Procedures included fusions for instability (2 patients), neurolysis and durolysis-decompression of scar (1 patient), excision of a recurrent synovial cyst (1 patient), and herniated discs (3 patients).

Five of the 35 patients having laminectomy for cysts/olisthy warranted secondary surgery an average of 13 months following their first procedures (range 3 months to 3 years) (Table 2). Secondary surgery included fusions for instability (2 patients), resection of scar tissue (2 pa-

Figure 1. A T2-weighted right parasagittal MR study demonstrates a synovial cyst herniation at L4–L5 (arrow) in a patient with preoperative Grade 1 olisthy. Note the hyperintense signal within the cyst but the hypointensity of the surrounding capsule reflecting the capsular calcification (large arrows).

tients), and removal of a recurrent synovial cyst (1 patient).

The incidence of cerebrospinal fluid fistulae following first operations in both groups of patients was 3.8% (3 patients) and increased to 16.7% (2 of 12 patients) after second operations. Three additional patients required other surgical procedures unrelated to their lumbar surgery: thoracic surgery for a T3–T5 meningioma (1 patient) and anterior cervical corpectomies (2 patients).

Surgeon- and Patient-Based SF-36 Outcomes

Two years after surgery, surgeon-based data revealed moderate improvement following laminectomy for cysts/stenosis or cysts/olisthy (Table 3). Utilizing the Friedberg *et al*[26] criteria, outcomes for 45 patients with cysts/stenosis revealed 15 excellent, 11 good, 11 fair, and 8 poor results. Similarly, surgeon-based results for 35 patients with cysts/olisthy revealed 16 excellent, 6 good, 6 fair, and 7 poor outcomes. Combined good/excellent data in each group yielded a 58% incidence of good/excellent results for cysts/stenosis operations and 63% frequency following cysts/olisthy surgery.

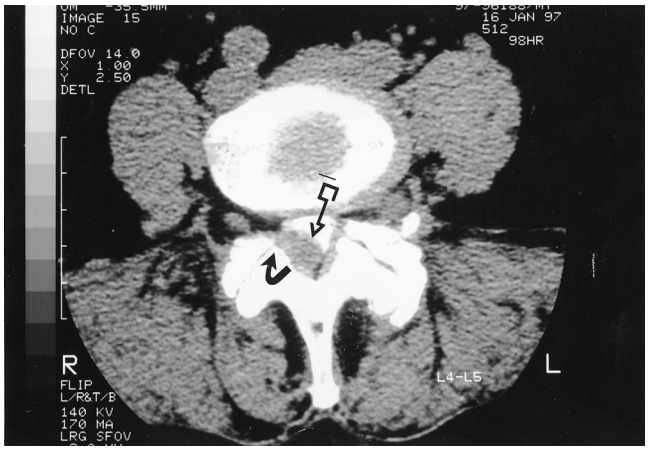

Figure 2. A transaxial myelo-CT study at L4–L5 reveals a right-sided extradural lesion originating from the facet joint (curved arrow) in a patient who also demonstrated Grade 1 olisthy. This extradural synovial cyst herniation contributed to marked thecal sac (straight arrow) and right L5 root compression.

Two years after surgery, patient-based SF-36[18] data also revealed moderate improvement following laminectomy for cysts/stenosis or cysts/olisthy (Table 4). The greatest postoperative improvement following laminectomy for cysts/stenosis or cysts/olisthy was demonstrated on 2 of the 8 SF-36 Health Scales: Physical Function (+44 and +38 points) and Role–Emotional (+39 and +33 points). Milder degrees of improvement were observed on 4 SF-36 Health Scales: General Health (+19 and +23 points), Vitality (+15 and +24 points), Role–Physical (+15 and +21 points), and Bodily Pain (+15 and +18 points), while minimal changes were seen on the Social Function (+9 and +3 points) and Mental Health (+2 and +3 points) Scales. Comorbidities for patients from both groups demonstrating fair to poor outcomes included multiple sclerosis (1 patient), thoracic tumor (1 patient), prior lumbar surgery (2 patients), depression (1 patient), spasticity related to prior cervical disease (1 patient), and a recurrent far lateral disc (1 patient). Postoperative instability occurred in 4 patients.

■ Discussion

Conservative treatment for lumbar stenosis typically includes pain-center management and the use of epidural

Table 3. Surgeon-Based Outcome Data 2 Years Following Lumbar Laminectomy for Synovial Cysts/Stenosis and Synovial Cysts/Olisthy

	Synovial Cysts	
Surgeon-Based Outcomes	Spinal Stenosis Alone Without Olisthy (45 patients)	Spinal Stenosis With Olisthy (35 patients)
Excellent	15	16
Good	11	6
Fair	11	6
Poor	8	7

Table 4. SF-36 Outcome Data for 45 Patients With Synovial Cysts and Lumbar Spinal Stenosis Alone and for 35 Patients With Synovial Cysts, Lumbar Spinal Stenosis, and Degenerative Spondylolisthesis (Olisthy)

Timing of SF-36	Physical Function	Role–Physical	Bodily Pain	General Health	Vitality	Social Function	Role–Emotional	Mental Health
45 patients with synovial cysts and lumbar spinal stenosis alone								
Preoperative	23 ± 17	10 ± 27	32 ± 22	19 ± 14	41 ± 15	40 ± 21	29 ± 22	64 ± 18
2 years postoperative	69 ± 12	25 ± 18	47 ± 9	38 ± 13	56 ± 12	49 ± 12	68 ± 11	66 ± 12
Net change	+44	+15	+15	+19	+15	+9	+39	+2
35 patients with synovial cysts, lumbar spinal stenosis, and degenerative spondylolisthesis (olisthy)								
Preoperative	27 ± 21	8 ± 25	29 ± 19	16 ± 12	38 ± 16	43 ± 18	32 ± 25	61 ± 15
2 years postoperative	65 ± 15	29 ± 15	47 ± 11	39 ± 10	62 ± 14	46 ± 16	65 ± 15	64 ± 9
Net change	+38	+21	+18	+23	+24	+3	+33	+3

or facet joint injections or rhizolysis. In the Hsu *et al* series, 11 of 19 patients with lumbar synovial cyst herniations were conservatively managed without surgery, with 75% of patients receiving epidural steroid injections.[10] Parlier-Cuau *et al* also conservatively managed 14 of 30 similar patients with synovial cysts, and one third responded favorably to facet joint injections.[13] Combining the 45 patients with cysts/stenosis and 35 patients with cysts/olisthy in this series, 52 (65%) patients received epidural steroid injections in conjunction with pain-center management without sustained relief or improvement before surgery.

Historically, patients who fail conservative management and present for surgical resection of synovial cysts associated with lumbar stenosis or degenerative spondylolisthesis vary in age from 38 to 79 years with a 2:1 male-to-female ratio.[10,27] Patients present with back pain (25%), radiculopathy (57%-85%), and neurogenic claudication (25%), accompanied by motor (26.3%) and sensory deficits (18%), but rarely paraparesis.[10,14,28] Eighty-eight percent to 99% of all synovial cysts occur in the lumbar spine.[8,9,11] Hsu *et al* found that lumbar synovial cysts were prevalent at the most mobile L4–L5 level (68.4%), compared with L5–S1 (21.1%), L1–L2 (5.2%), and L2–L3 (5.2%).[10]

Synovial cysts occur in a juxta-articular, posterolateral, and epidural location within the lumbar spinal canal in 0.6% to 8% of MR and CT examinations.[10,12,19,21,27] Pathologically, they exhibit an epithelial lining, which can be differentiated from cystic degeneration of the yellow ligament.[22,29,30] Although facet degeneration accompanies 75% of the synovial cyst cases cited, few studies separately quantitate the presence of degenerative spondylolisthesis or uncomplicated olisthy.[10,27] In this study, preoperative olisthy was present in 35 patients, increasing after surgery to an additional 5 patients.

Partial/subtotal or total removal of lumbar synovial cysts during laminectomy provides adequate neural decompression.[7,8,10] In the Artico *et al* series, 18 synovial cysts were totally excised, while 5 were subtotally removed.[7] Where the cyst capsule is adherent to the dura, a partial/subtotal removal may avoid cerebrospinal fluid fistulae. The large number of partial excisions attributed to adhesions to the dura in this series (24 of 45 with cysts/stenosis and 20 of 35 with cysts/olisthy) indicates that partial/subtotal resection is more often required to avert cerebrospinal fluid fistula than previously documented.

Outcomes

Both surgeon-based and patient-based outcome data may be used to evaluate the results of laminectomy performed for lumbar spinal stenosis without olisthy. Using surgeon-based data, a 56.6% to 75% incidence of good to excellent outcomes was documented.[1–5] Using surgeon-based data, Turner *et al* documented a 64% incidence of good to excellent results in a meta-analysis of the literature where the majority of procedures were laminectomies.[3] Silvers *et al*[4] (258 patients) and Herron *et al*[5] (127 patients) similarly analyzed surgeon-based outcomes following laminectomy for stenosis and determined a respective 75% and 72% incidence of good to excellent outcomes. Fischgrund *et al* analyzed surgeon-based outcomes in 67 patients with spinal stenosis and degenerative spondylolisthesis following laminectomy performed with accompanying noninstrumented *versus* instrumented fusion at the level of the olisthy.[31] Good/excellent clinical outcomes were assessed for 85% of those patients undergoing the noninstrumented as compared with a 76% incidence of good to excellent outcomes for those having instrumented fusions despite vastly different respective fusion rates of 45% for the former and 82% for the latter.[31] Airaksinen *et al* employed both surgeon-based and patient-based (Oswestry) outcome measures to analyze the results of laminectomy for stenosis in 438 patients.[2] A 62% incidence of good to excellent results was documented using a surgeon-based outcome measure, while the Oswestry Disability Score improved +36 points for women and +32.3 points for men an average of 4.3 years after surgery.[2] Also employing the Oswestry questionnaire, Herno *et al* (108 patients) documented a +34.5 point improvement an average of 6.8 years following average l.6 level laminectomies for stenosis alone.[6] This figure showed minimal deterioration to +30.2 points 12.8 years following surgery and was also associated with a low 9.3% (10 patients) reoperation rate.

The majority of the studies concerning lumbar stenosis accompanied by synovial cysts rely on patient-based measures alone to assess outcome.[7–10,13,14] The reported

incidence of good to excellent results varies from 66.7% to 100%.[8,10,13–15,17] Parlier-Ciau *et al* noted that 20 of 30 patients (66.7%) demonstrated good to excellent responses.[13] Outcomes for 72 patients undergoing lumbar laminectomy for synovial cysts using surgeon-based measurements revealed that 55 (76.4%) patients exhibited good to excellent results.[7,8,10,14] Three authors reported good to excellent responses in 85% to 87.5% of patients.[8,10,14] Lyons *et al* recorded a 91% incidence of pain relief (147 patients).[16] Salmon *et al*[15] (28 patients) and Trummer *et al*[17] (19 patients) both observed a 100% frequency of good to excellent results.

Following lumbar laminectomy for decompression of cysts/stenosis and cysts/olisthy in our series, surgeon-based analysis of outcome revealed a 58% incidence and 63% frequency of good to excellent responses, respectively (Table 3). The 58% figure for patients with cysts/stenosis most closely correlates with the 64% incidence of good to excellent results cited by Turner *et al*[3] and the 62% noted by Airaksinen *et al*[2] following laminectomy for stenosis alone. The 63% incidence of good to excellent outcome following laminectomy for cysts/olisthy should similarly reflect data reported after surgery addressing stenosis combined with degenerative spondylolisthesis. However, substantially better results were reported following laminectomy with fusion for patients with preoperative stenosis and olisthy. Specifically, Fischgrund *et al*[31] documented a higher 75% to 86% incidence of good to excellent results for patients with lumbar stenosis and degenerative spondylolisthesis undergoing laminectomy with instrumented and noninstrumented fusions.

Although none of our patients with cysts/olisthy was fused primarily, the future results of simultaneous laminectomy with fusion might meet with greater success, the type of fusion being dictated by the age of the patient and the presence of comorbidities. The presence of olisthy already indicates disruption of the facet joints at the level of the slip, instability being augmented by the unilateral (16 patients) or bilateral (19 patients) synovial cysts, which further disrupted the facet joints. However, 6 of the 11 patients who developed postoperative progression of slip from Grade 1 to Grade 2 had unilateral cysts (6 patients), while 5 were bilateral, indicating that the presence of a synovial cyst, and not necessarily its unilateral or bilateral location, substantially increased the risk and degree of instability.

Primary fusion might afford improved outcomes for patients with cysts/stenosis alone. Synovial cysts, located either unilaterally (13 patients) or bilaterally (32 patients), reflect disruption of the facet joint and increased risk of instability. Although patients undergoing laminectomy for bilateral cysts/stenosis are presumed to be more likely to develop instability, 3 of 5 patients with new postoperative olisthy had only unilateral cysts, while the remaining 2 were bilateral.

Our best 2-year postoperative SF-36 outcomes were observed on the Physical Function (+44 and +38 points) and Role–Emotional (+39 and +33 points) Health Scales for both the cysts/stenosis and cysts/olisthy groups (Table 4). These data are comparable with the outcome data obtained with the Oswestry Disability Questionnaire in the Airaksinen *et al*[2] and Herno *et al*[6] studies dealing with stenosis alone where they observed a +30.2 to +34.5 point improvement over an average of 4.3 to 12.8 postoperative years. Longer periods of follow-up beyond our minimum of 2 years and further patient-based data need to be collected following laminectomy for stenosis and coexisting synovial cysts with or without olisthy to better assess outcomes. The need for initial fusion must be seriously considered.

■ Conclusion

Lumbar laminectomies were performed to excise synovial cysts and decompress stenosis alone in 45 patients or for the excision of synovial cysts with stenosis and Grade 1 degenerative spondylolisthesis in 35 patients. Five of the 45 patients with preoperative stenosis alone developed new postoperative Grade 1 olisthy. After surgery, 11 of 35 patients with preoperative cysts/stenosis and Grade 1 degenerative spondylolisthesis developed a progression of olisthy to Grade 2. Surgeon-based outcome assessments revealed a moderate 58% to 63% incidence of good/excellent results following laminectomy alone for the decompression of synovial cysts with stenosis or for cysts/stenosis with Grade 1 degenerative spondylolisthesis. In addition, patient-based SF-36 data revealed moderate postoperative improvement on 2 of 8 Health Scales, Physical Function (+44 and +38 points) and Role–Emotional (+39 and +33 points) following laminectomy for cysts/stenosis and cysts/stenosis/olisthy, respectively. As a result of this review, primary fusion for patients with synovial cysts, lumbar stenosis, and Grade 1 degenerative spondylolisthesis as well as those with bilateral synovial cysts and spinal stenosis alone could have more success. Even patients with unilateral cysts and stenosis may be candidates for fusion.

■ Key Points

- Laminectomy addressed synovial cysts and coexisting lumbar stenosis (45 patients) and Grade 1 degenerative spondylolisthesis (35 patients).
- Five of 45 patients with stenosis alone developed postoperative olisthy.
- Olisthy increased after surgery in 11 of 35 patients with degenerative spondylolisthesis.
- Two years after surgery, a 58% to 63% incidence of good/excellent results and +38 to +42 point improvement on the SF-36 Physical Function Scale were observed, respectively, for patients with coexisting cysts/stenosis or cysts/stenosis/olisthy.

• As lumbar synovial cysts reflect disruption of the facet joint and inherent instability, laminectomy with primary fusion should be considered for patients with cysts/stenosis/olisthy as well as those with unilateral or bilateral cysts/stenosis.

Acknowledgments

The author thanks Dr. Joseph A. Epstein and Ms. Sherry Lynn Grimm for editorial assistance.

References

1. Iguchi T, Kurihara A, Nakayama J, et al. Minimum 10-year outcome of decompressive laminectomy for degenerative lumbar spinal stenosis. *Spine*. 2000;25:1754–1759.
2. Airaksinen O, Herno A, Turunen V, et al. Surgical outcomes of 438 patients treated surgically for lumbar spinal stenosis. *Spine*. 1997;22:2278–2282.
3. Turner JA, Ersek M, Herron L, et al. Surgery for lumbar stenosis: attempted meta-analysis of the literature. *Spine*. 1992;17:1–8.
4. Silvers HR, Lewis PJ, Asch HL. Decompressive lumbar laminectomy for spinal stenosis. *J Neurosurg*. 1993;78:695–701.
5. Herron L, Turner JA, Ersek M, et al. Does the Million Behavioral Health Inventory (MBHI) predict lumbar laminectomy outcome? A comparison with the Minnesota Multiphasic Personality Inventory (MMPI). *J Spinal Disord*. 1992;5:188–192.
6. Herno A, Airaksinen O, Saari T. Long-term results of surgical treatment of lumbar spinal stenosis. *Spine*. 1993;18:1471–1474.
7. Artico M, Cervoni L, Carloia S, et al. Synovial cysts: clinical and neuroradiological aspects. *Acta Neurochir*. 1997;139:176–178.
8. Friedberg SR, Fellows T, Thomas CB, et al. Experience with symptomatic spinal epidural cysts. *Neurosurgery*. 1994;43:989–993.
9. Howington JU, Connolly ES, Voorhies RM. Intraspinal synovial cysts: 10-year experience at the Ochsner Clinic. *J Neurosurg*. 1999;91(suppl 2): 193–199.
10. Hsu KY, Zucherman JF, Shea WJ, et al. Lumbar intraspinal synovial and ganglion cysts (facet cysts): ten-year experience in evaluation and treatment. *Spine*. 1995;20:80–89.
11. Epstein NE, Hollingsworth R. Synovial cyst of the cervical spine. *J Spinal Disord*. 1993;6:182–185.
12. Eyster EF, Scott WR. Lumbar synovial cysts: report of eleven cases. *Neurosurgery*. 1989;24:112–115.
13. Parlier-Cuau C, Wybler M, Nizard R, et al. Symptomatic lumbar facet joint synovial cysts: clinical assessment of facet joint steroid injection after 1 and 6 months and long term follow-up in 30 patients. *Radiology*. 1999;210: 509–513.
14. Yarde WL, Arnold PM, Kepes JJ, et al. Synovial cysts of the lumbar spine: diagnosis, surgical management, and pathogenesis: report of 8 cases. *Surg Neurol*. 1995;43:459–464.
15. Salmon B, Martin D, Lenelle J, et al. Juxtafacet cyst of the lumbar spine: clinical, radiological, and therapeutic aspects in 28 cases. *Acta Neurochir (Wien)*. 2001;143:129–134.
16. Lyons MK, Atkinson JA, Wharen RE, et al. Surgical evaluation and management of lumbar synovial cysts: the Mayo Clinic experience. *J Neurosurg*. 2000;93(suppl):53–57.
17. Trummer M, Flaschka G, Tillich M, et al. Diagnosis and surgical management of intraspinal synovial cysts: report of 19 cases. *J Neurol Neurosurg Psychiatry*. 2001;70:74–77.
18. Ware JE. *SF-36 Health Survey: Manual and Interpretation Guide*, 1st ed. Boston: Health Institute, New England Medical Center, 1993.
19. Jackson DE Jr, Atlas SW, Mani JR, et al. Intraspinal synovial cysts: MR imaging. *Radiology*. 1989;170:527–530.
20. Liu SS, Williams KD, Drayer BP, et al. Synovial cysts of the lumbosacral spine: diagnosis by MR imaging. *Am J Neuroradiol*. 1989;10:1239–1242.
21. Modic MT, Ross JS, Obuchowski N, et al. Contrast-enhanced MR imaging in acute lumbar radiculopathy: a pilot study of the natural history. *Radiology*. 1995;195:429–435.
22. Xu GL, Haughton VM, Carrera GH. Lumbar facet joint capsule: appearance at MR imaging and CT. *Radiology*. 1990;177:15–20.
23. Yuh WT, Drew JM, Weinstein JN, et al. Intraspinal synovial cysts: magnetic resonance evaluation. *Spine*. 1991;16:740–745.
24. Fritz RC, Kaiser JA, White AH, et al. Magnetic resonance imaging of a thoracic intraspinal synovial cyst. *Spine*. 1994;19:487–490.
25. Lin RM, Wey KL, Tzeng CC. Gas-containing cysts of lumbar posterior longitudinal ligament at L3: case report. *Spine*. 1993;18:2528–2532.
26. Friedberg SR, Fellows T, Thomas CB, et al. Experience with symptomatic spinal epidural cysts. *Neurosurgery*. 1994;34:989–993.
27. Onofrio BM, Mih AD. Synovial cysts of the spine. *Neurosurgery*. 1988;22: 642–647.
28. Tatter SB, Cosgrove GR. Hemorrhage into a lumbar synovial cyst causing an acute cauda equina syndrome: case report. *J Neurosurg*. 1994;81:449–452.
29. Vernet O, Fankhauser H, Schnyder P, et al. Cyst of the ligamentum flavum: report of 6 cases. *Neurosurgery*. 1991;29:277–283.
30. Weyens F, Van Calenburgh F, Goffin J, et al. Intraspinal juxta-facet cysts: a case of bilateral ganglion cysts. *Clin Neurol Neurosurg*. 1992;94:55–59.
31. Fischgrund JS, Mackay M, Herkowitz HN, et al. Volvo Award Winner in Clinical Studies. Degenerative lumbar spondylolisthesis with spinal stenosis: a prospective, randomized study comparing decompressive laminectomy and arthrodesis with and without spinal instrumentation. *Spine*. 1997;22: 2807–2812.

Point of View

David L. Spencer, MD

This paper analyzes the outcome of laminectomy surgery for symptoms of spinal stenosis with or without spondylolisthesis associated with an intraspinal synovial cyst. They concluded that, 2 years following laminectomy surgery, the patients exhibited a moderate degree of improvement (58% moderately good to excellent results without spondylolisthesis and 63% moderate to good results with spondylolisthesis). Consideration should be given to spinal fusion to an attempt to improve the results.

I think it is helpful, when treating these patients, to recognize that an individual with degenerative spondylolisthesis and spinal stenosis should be treated the same with or without a synovial cyst. In other words, the condition of degenerative spondylolisthesis and spinal stenosis is the primary diagnosis regardless of the coincidental presence of a synovial cyst and should be treated as such. On the other hand, a unilateral synovial cyst with sciatica resulting from nerve root compression is a stand-alone diagnosis. These patients, in my experience, can, if necessary, be treated with a unilateral hemilaminectomy and cyst excision on an outpatient basis with much the same success rate as microdiscectomy surgery. The use of the operating microscope reduces the risks of dural tears from the adhesions of the cyst to the dura.

In conclusion, the surgical treatment for degenerative spondylolisthesis and neurogenic claudication should be treated exactly the same regardless of the presence or absence of an incidental synovial cyst. The surgical procedure generally accepted to be appropriate for this class of patients would be a complete laminectomy and posterior lateral fusion with or without instrumentation. Unilateral sciatic pain resulting from a synovial cyst should be treated with an outpatient microhemilaminotomy and cyst excision. Neurogenic claudication resulting from spinal stenosis without degenerative spondylolisthesis but with a synovial cyst should be treated with a complete laminectomy and cystectomy without fusion.

From the Lutheran General Spine Center, Park Ridge, IL.
The manuscript submitted does not contain information about medical device(s)/drug(s).
No funds were received in support of this work. No benefits in any form have been or will be received from a commercial party related directly or indirectly to the subject of this manuscript.
Address correspondence to David L. Spencer, MD, Lutheran General Spine Center, 1875 W. Dempster, Suite 425, Park Ridge, IL 60068-1145; E-mail: