A new approach to the surgical treatment of lumbar spondylosis

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The authors discuss routine removal of inferior articular processes and their facets during laminectomy, with wide visualization of the lumbar nerve roots, which has proven to be most successful in relief of the symptoms of lumbar spondylosis. No instance of postoperative vertebral instability has been found. In a consecutive series of 70 patients averaging 58.3 years of age, 91% of patients adequately followed did well. Of six patients who did poorly, three had apparent explanations and, presumably, such errors are avoidable. Despite the generally advanced age of this series (12 patients aged over 70 years) there was no mortality or undue morbidity. Patients previously operated on for disc herniation, as a group, were somewhat younger and the spondylosis tended to be more localized (to the area of previous surgery) than in patients operated on for the first time.

KEY WORDS · lumbar spondylosis · facetectomy · low back pain · intervertebral disc

The role of herniation of the lumbar intervertebral disc in low back and radicular syndromes and its surgical treatment has been widely documented over the past 40 years. Lumbar spondylosis is a well-recognized cause of low back pain (LBP), as well as radicular pain, particularly in elderly patients. The occurrence and treatment of patients with stenotic lumbar spinal canals by wide laminectomy has recently been reported by Ehni,6 who has adequately reviewed its history. Lumbar spondylosis is most apt to be symptomatic in an individual with a narrowed spinal canal.6,7,17 It seems reasonable to assume that advanced lumbar spondylosis, even in an individual with a lumbar canal of normal dimensions, may become symptomatic by compromise of the intervertebral canal.

The surgical treatment of lumbar spondylosis has not been frequently reported. Probably this is because it is such a common complaint in older sedentary people, and usually responds satisfactorily to a variety of treatments, consisting chiefly of rest. Furthermore the intractable cases often occur in individuals who are not attractive surgical candidates because of age or associated diseases. Finally, when surgery has been undertaken it has not been universally successful.7,8,16

Analysis of Cases

In recent years we have taken an increasingly aggressive approach to this problem and are presenting our experience with 70 consecutive patients operated on from January 1, 1968, through December 31, 1973,
Surgical treatment of lumbar spondylosis

Fig. 1. Drawing of posterior elements of lower spine. Lined areas are inferior articular processes and their facets removed for decompression. Cross-hatched areas are portions of facets of superior articular processes often removed for full visualization and decompression of nerve roots.

all of whom had been incapacitated with intractable pain and had not responded to other therapeutic measures. Our approach in this series has been wide laminectomy plus the thorough removal of inferior articular processes with their facets. No effort was made to remove arthritic spurs or ridges (Fig. 1). Nerve roots were thoroughly exposed in their canals, which often necessitated removal of an overriding rim of the superior facet of the vertebra below (Fig. 1). Patients who had soft disc herniations in addition to spondylosis were excluded from this series. The extent of the operative procedure was dictated by the myelographic and clinical findings and was not influenced by findings on the plain films. Spinal tomography was not done. If deformities seen in the myelogram were beyond what was expected from the clinical syndrome, decompression was then extended to include these deformities. In six of the earlier cases this principle was not followed. This earlier group includes two of the six patients in the entire series of 70 who did poorly; indeed, only one is asymptomatic postoperatively, and the remaining three continue to complain of backache, although they are relieved of sciatica.

Forty-nine patients had never had back surgery (Group 1), and 21 had been operated on previously (Group 2). The two groups will be considered separately. Results are classified as excellent when all pain has been relieved and the patient has resumed normal activities. A good result is when normal activities are resumed but there are still occasional complaints. All other results are considered poor even though the patient's condition may be improved. Tables 1 and 2 list the symptoms, myelographic defects found, and the operative results of the entire series.

Group 1 (Previously Unoperated Patients)

Group 1 consisted of 22 women and 27 men. They ranged in age from 45 to 84, averaging 59.4 years. Ten patients were aged over 70 years, and two were over 80. All patients were totally disabled by pain prior to operation. All patients prior to surgery spent most of the time in bed, and 10 were completely bedfast for 2 weeks to 4 months because of pain. Seven patients had LBP as their only complaint, 30 had LBP and radicular pain, and 12 had sciatica without LBP immediately preceding operation. The myelographic changes were not necessarily more extensive or differently located in patients with LBP only, than they were in patients who had radicular complaints only (Table 1, Figs. 2 and 3). The group as a whole had recurrent complaints of LBP and/or sciatica over a period of many years. Nineteen patients had had these complaints for 10 to 30 years, but 12 had pain for less than 1 year. We cannot add to the clinical picture presented by Epstein.

Low Back Pain. Of the seven patients with only back complaints at the time of operation, five proved to have excellent results, one good, and one poor, an average of 2.5 years postoperatively. The poor result was in an 82-year-old diabetic woman who had been bedfast for 3 months. She did well for 8 months only to have recurrent right anterior thigh pain. In her case we performed a cordotomy rather than further lower back surgery. A myelogram had revealed complete defects at the L3-4 and L4-5 interspaces and a laminectomy and facetectomy of L-3, L-4, and L-5 had been done. Perhaps if the L-2 lamina and its facets had been removed also, recurrence of the anterior thigh pain could have been avoided. The patient is reasonably comfortable now 4 years later and postoperative x-ray films showed good alignment of the lumbar spine. The good result was in a 67-
year-old woman, bedfast for 6 weeks prior to surgery; she has resumed an active career as an interior decorator and has remarried at the age of 70 but continues to complain of back pain, 6 years postoperatively.

Low Back and Radicular Pain. Thirty patients had both LBP and radicular pain. Of these, 18 complained principally of the LBP, in nine the pain of each was about equal, and in three the radicular pain was outstanding. The radicular pain was a unilateral sciatica in 21, a bilateral sciatica in seven, and anterior thigh pain in two. The myelographic abnormalities or their extent (Table 1) could not be correlated with these variations in the clinical picture except that defects which account for the radicular complaint were present in each patient. Of this group of 30 patients, 25 are completely relieved of their symptoms over a follow-up period which averages 2.6 years. Three are classified as good results and one patient has a poor result. We were unable to obtain an adequate follow-up on one patient.
Surgical treatment of lumbar spondylosis (beyond 2 months postoperatively). The patient who has done poorly is a 77-year-old man with a 20-year history of recurrent LBP and alternating sciaticas who had been bedridden for 2 months; a myelogram revealed multiple upper lumbar defects and a complete block at L4–5. Bilateral laminectomies and facetectomies of L-4 and L-5 were performed; he did well for 3 years but has been incapacitated for 2 years with recurrent LBP but no sciatica. An x-ray film of the lumbar spine disclosed no malalignment. It is possible that a more extensive decompression of upper lumbar laminae and their facets might have protected this man from recurrent back pain. He refuses to consider further surgery. The three patients classified as good results were 62, 55, and 48 years old at the time of operation and are now fully active and working 4 years, 3 years, and 1 year later, respectively, but report occasional back pain. The postoperative lumbar spine x-ray films show good alignment of vertebral bodies in each patient.

Sciatic Pain. There were 12 patients who complained only of radicular sciatic pain, with no upper lumbar symptoms. The two patients who complained of bilateral sciatica (aged 84 and 69 years) have done well, 1 and 3 years later. Six of the 10 patients with unilateral sciatica had excellent results, an average of 2½ years after surgery, one is a good result, one is a poor result, and two patients could not be followed beyond 2 months postoperatively, at which time they were doing well. All patients in this group had extensive myelographic defects despite complaining only of unilateral sciatica (Fig. 3). The surgery in these patients included the removal of inferior articular processes and their facets. The patient who has done poorly is a 45-year-old man who had a right sciatica of 1½ years duration and in whom myelography revealed a stenotic canal with a possible added L-4 and L-5 defect bilaterally. After L-4 and L-5 bilateral laminectomies and facetectomies had been performed, he did well for 6 months. He apparently had a recurrence of pain thereafter and is being treated elsewhere.

Group 2 (Previously Operated Patients)

Group 2 had an average age of 55.7 years which ranged from 33 to 75, and contained seven patients over 65 and two over 70. There

FIG. 2. Myelograms in an 81-year-old woman who was incapacitated for 6 months with low back pain and without radicular radiation. There is a complete interruption of oil column at L2–5 interspaces.

FIG. 3. Left: Myelogram in an 84-year-old woman who was bedridden for 3 months with bilateral sciatica and no back pain. There is a complete block at L4–5 interspace, interruption of oil column at L3–4 interspace, and narrowing of oil column at L2–3 interspace. Right: Myelogram in a 68-year-old man who was incapacitated for 6 months with right sciatica only. There is a bilateral indentation at L4–5 and L3–4 and indentation L2–3 left, confirmed on other films.
were 11 men and 10 women and as near as can be determined, all had lower lumbar herniated intervertebral discs removed at their original operation. Nine had been operated on in this clinic and 12 elsewhere. No recurrence of disc herniation was found at reoperation. Laminectomy and facetectomy were carried out on the presumption that compromise of the caudal sac and nerve roots had occurred from a spondylosis with or without evidence of lumbar spinal canal stenosis. All patients in this previously operated group complained of sciatica at the time of reoperation except for three who had incapacitating LBP as the only recurrent complaint. It is of interest that 13 patients reported a recurrence of their original complaint. Eight had a change in symptoms on recurrence: four shifted from LBP and sciatica to sciatica only, two with both sciatica and LBP had a recurrence of only LBP, and two with only sciatica originally returned with LBP and sciatica. 

Low Back Pain. Three patients with recurrence of LBP only were reoperated 15 years, 4 years, and 1 year after their original surgery. One had been free of symptoms for 13 years before recurrence of the LBP. The other two had continuing low back pain which grew to be incapacitating although their sciatica had been relieved. All three patients did well after reoperation, extended to correct all myelographic defects in the lumbar canal, now 6, 4, and 2 years postoperatively.

Low Back and Radicular Pain. One patient complained of recurrent bilateral sciatica and back pain. In addition to disc removal he had had a previous lumbosacral fusion, but had no improvement following surgery. Myelography revealed a complete block at the L4–5 interspace; laminectomy and facetectomy of L-4 and L-5 disclosed a ridge trapping the roots under the facets. This patient has done very well after a follow-up period of several years.

There were two patients who complained of LBP in addition to their recurrent unilateral sciatica; one did poorly. A 48-year-old laborer, the only patient in the series who received compensation, had restriction of back movements, impaired straight-leg raising, and multiple bilateral defects revealed by myelogram. The third to fifth lumbar laminae and their facets were removed bilaterally. Multiple arthritic spurs and ridges were demonstrated. This patient still complains of low back pain and sciatica, now 1 year after operation, although he is objectively intact and follow-up lumbar spine x-ray films offer no explanation for his continuing symptoms. The second patient with recurrent unilateral sciatica and low back pain had been operated on elsewhere in 1956; he did well until 1968, and was reoperated in 1971 after a stenotic caudal sac was demonstrated by myelography. The fourth and fifth lumbar laminae and their facets were removed and the patient has done well since with only occasional mild backache. It is probable that decompression should have been extended to include the L-3 lamina for a better result.

Sciatic Pain. One patient with bilateral sciatica and no back pain had a disc removed after previous lumbosacral fusion. After surgery, myelography revealed a complete block at the L4–5 interspace; laminectomy and facetectomy disclosed a ridge trapping the roots under the facets. This patient is doing well after several years of follow-up.

Fourteen patients with recurrent unilateral sciatica had no back pain at all, or so little that it had to be elicited from them and was in no way a real feature of their complaint. Two are classified as poor results. One patient had been free of symptoms for 7 years following disc removal, refused a second myelogram, was decompressed unilaterally, did well for 3 months, and then had recurrent sciatica. He still is unwilling to have a myelogram 1 year later. The second poor result was in a 66-year-old woman relieved of sciatica for 12 years after disc removal. She was then re-explored twice elsewhere for recurrent sciatica without success and a repeat myelogram by us showed a narrowing of the caudal sac at L4–5. Bilateral decompression gave relief for 4 months but the sciatica recurred and she subsequently underwent coradotomy. Of the 12 patients of this group who did well (eight were classified as excellent results) in a follow-up period of more than 3 years, six had unilateral defects limited to one level corresponding to their unilateral sciatica and only unilateral decompression was done. However, both the lumbar fourth and fifth hemilaminae and inferior articular processes and facets were removed in each patient. In all of these cases an arthritic spur trapping a root under the facet was disclosed as the source of the recurrent pain and myelo-
Surgical treatment of lumbar spondylosis

graphic defect. Two of this group had negative myelograms, but underwent surgery because of intractable pain. They, too, were found to have arthritic spurs, far lateral, compressing a nerve root against the overlying facet.

Discussion

It is agreed that lumbar spondylosis by hypertrophy of the zygapophyseal joints and the posterior neural arch as well as development of osteophytic spurs and ridges causes a stenosis of the lumbar canal.6,7 The development of a spur or ridge on the posterior surface of the vertebral body can easily trap a nerve root in its course against an articular facet. When this condition causes intractable symptoms, wide laminar decompression and, as has been tentatively suggested by others and clearly demonstrated by our present series, removal of the inferior articular facet are necessary consistently to accomplish root decompression. In most instances, as indicated by the myelographic findings, it is necessary to do this bilaterally at several levels to relieve all nerve roots of compression and be certain of permanent relief from pain. Fortunately this has yielded no instances of lower back instability. Lack of permanent relief from pain in several of the poor results reported in this series is believed to have been caused by failure to extend decompression to include all myelographic defects regardless of their clinical localization at the time of surgery.

Surgeons have assumed that destruction of the zygapophyseal joint in the course of laminectomy would produce instability of the spinal column. As recently as 1970, Raaf14 cautioned: "Bone should be removed well laterally, but it is advisable to destroy the joint between the inferior and superior articular processes." If the facet should be resected he recommended spinal fusion, as do others.4,10,12 On the other hand, a search of the literature reveals that it has been recognized by a number of surgeons that facets must be removed to decompress adequately nerve roots in arthritis, to explore for discs herniated far laterally, or to completely decompress a stenotic lumbar canal.2,3,5,16,18 A number of these authors recommend fusion after facetectomy. The continued well-being of the majority of patients in this series and the lack of evidence of vertebral instability in postoperative x-ray films of those patients who did poorly support the thesis that the preservation of the zygapophyseal joint is not necessary in the adult patient. Gill and White9 and others have found that removal of the posterior elements in patients with spondylothesis does not increase the vertebral displacement. Indeed there are many reports11,19 that spondylothesis (with spondylosis) does not increase after the age of 20 years.

We have facilitated the removal of inferior articular processes and their facets with judicious use of the hammer and chisel to disrupt the neck of the articular process after the lamina has been cut away with a rongeur. The nerve root is then easily seen and if it is not completely decompressed, a thin, angled Cloward rongeur can be used to remove the overhanging edge of the superior facet of the vertebra below. This approach has been so satisfactory in nerve root exposure that we have been applying it more locally for removal of herniated and ruptured intervertebral discs even in young patients, thereby avoiding unnecessary displacement of the root and dural sac when approaching the intervertebral space. Adequate root decompression is thus guaranteed and, hopefully, recurrent symptoms, as manifested in many of our Group 2 previously operated patients, will be avoided. Wider decompression for this purpose at the time of discectomy has recently been advocated for all patients by others.13

Several large series of elderly patients who have undergone surgery for low back syndromes have been previously reported.8,15 It is clear that age alone is not a contraindication to this type of surgery; indeed, even with surgical procedures generally more extensive than in younger individuals we encountered no undue morbidity or mortality. We can reiterate the conclusion of others: that surgery should not be withheld in these patients, and suffering prolonged, on the basis of age alone.

In our series, patients with LBP with or without radicular symptoms responded as well to surgery as patients with only radicular symptoms. Indeed, the worst record was in patients previously operated on who had recurrent sciatica without LBP (Table 2). Two of 14 patients in this category did poorly. This difference in result, however, because of

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the small numbers in each category, is not statistically significant.

Overall, the previously unoperated group did somewhat better than the previously operated patients (Table 3). The excellent and good results in the previously operated group totaled 88% as compared with 93% of patients doing well in the previously unoperated group, with the three patients not adequately followed in the latter group omitted. While these results are most satisfactory and exceeded our expectations, nevertheless there are three patients, all of whom are believed to have had thorough decompression, whose sciaticas are unrelieved. Although only three patients, they represent the most serious unresolved problem of the entire series.

It should be reiterated that the myelographic defects found were generally more extensive than what would be expected from the clinical picture. There was little correlation between the varying clinical pictures and the myelographic patterns (Figs. 2 and 3). Even patients without LBP had extensive myelographic changes, although they always included levels consonant with the radicular reference. Rarely, low back pain was the only complaint in a patient with a myelogram only showing constriction at the L4-5 interspace (Fig. 4). Another interesting exception to the generally extensive myelographic changes found was in Group 2 (previously operated) patients who returned with only recurrent unilateral sciatica. Six of 14 such patients had myelographic defects limited to the area of previous surgery and two had normal myelograms. At operation, arthritic spurs were found to cause the myelographic defects and the recurrent symptoms in all of these cases. In patients with negative myelograms the spur was far lateral, trapping the root between it and the overriding facet. It appears that these Group 2 patients differ from the others insofar as the degenerative arthritic process was a limited one, apparently stimulated by the previous disc herniation and surgery in the specific area. Furthermore, although the offending pathological lesion in each patient in Group 2 was a spondylitic one, it generally occurred earlier than in the widespread process seen in the previously unoperated Group 1 patients.

![Fig. 4. Myelograms in a 66-year-old woman who complained of back pain only. Bilateral constriction of dural sac at L4-5 interspace is the principal finding. Narrowing of oil column at L3-4 and L2-3 is questionable, though arthritic ridging was identified at these levels at operation.](image)

References

6. Ehni G: Significance of the small lumbar spinal canal: cauda equina compression syn-

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Surgical treatment of lumbar spondylosis


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