

Guidelines for the performance of fusion procedures for degenerative disease of the lumbar spine.

Part 10: fusion following decompression in patients with stenosis without spondylolisthesis

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KEY WORDS • lumbar spine • stenosis • spondylolisthesis • fusion • practice guidelines

Recommendations

Standards. There is insufficient evidence to recommend a treatment standard.

Guidelines. There is insufficient evidence to recommend a treatment guideline.

Options. 1) In situ posterolateral lumbar fusion is not recommended as a treatment option in patients with lumbar stenosis in whom there is no evidence of preexisting spinal instability or likely iatrogenic instability due to facetectomy. 2) In situ lumbar PLF is recommended as a treatment option in addition to decompression in patients with lumbar stenosis without deformity in whom there is evidence of spinal instability. 3) The addition of pedicle screw instrumentation is not recommended in conjunction with PLF following decompression for lumbar stenosis in patients without spinal deformity or instability.

Rationale

The surgical management of patients with lumbar stenosis without spondylolisthesis has traditionally involved posterior decompressive procedures including laminecto-

my or laminotomy and judicious use of partial medial facetectomies and foraminotomies, with or without discectomy. In a subset of patients who have undergone lumbar laminectomy progressive vertebral displacement and slippage at or adjacent to the decompressed levels will be demonstrated. This has led some surgeons to recommend the routine use of PLF, with or without placement of instrumentation, to achieve an in situ arthrodesis following decompression. Given the additional blood loss and fusion-related risk, its use as an adjunct in patients with lumbar stenosis without deformity remains controversial. The purpose of this review is to examine the literature concerning the use of PLF after decompression in patients with lumbar stenosis without deformity. The following two key questions are examined. 1) Is there evidence that the addition of PLF improves outcome compared with decompression alone in patients with lumbar stenosis without deformity? If so, which patients with lumbar stenosis are likely to benefit from the use of adjunctive spinal fusion? 2) Is there evidence that the application of spinal instrumentation, in addition to PLF, improves outcome compared with fusion without instrumentation in this patient population?

Search Criteria

A computerized search of the database of the National

Abbreviations used in this paper: PLF = posterolateral fusion; RCT = randomized controlled trial.

Spinal stenosis without spondylolisthesis

Library of Medicine from 1966 to March 2003 was conducted using the search terms “lumbar stenosis and fusion and spinal surgery” or “lumbar stenosis and arthrodesis.” The search was restricted to the English language and yielded 204 references. The titles and abstracts of each reference were reviewed, and papers not concerned with decompression and fusion for lumbar stenosis were discarded. Thirty-two references were identified that provided either direct or supporting evidence relevant to the use of spinal fusion in the treatment of lumbar stenosis without spondylolisthesis. These papers were reviewed, and relevant references from their bibliographies were identified. All papers providing Class III medical evidence or better regarding the use of fusion and decompression for nondeformity-based lumbar stenosis are summarized in Table 1. Additional supportive data are provided by references listed in the bibliography.

Scientific Foundation

In the treatment of symptomatic lumbar stenosis lumbar decompression has been demonstrated to have a clinical efficacy of between 60 and 75% in RCTs.²⁹ In their meta-analysis of the available literature, Turner, et al.,²⁹ identified an overall 64% good outcome rate for all surgically treated patients with lumbar stenosis. The surgery-derived benefit decreased over time, however, with increased patient dissatisfaction with a longer follow-up duration.^{24,29} In the lumbar stenosis population, several subgroups have been consistently identified and subcategorized. These include patients with preexisting spondylolisthesis, scoliosis, prior destabilizing laminectomies, and the presence of segmental vertebral motion on flexion–extension radiographs.^{1,3,4,15–21} Longitudinal studies have identified a discreet proportion of patients with lumbar stenosis without deformity who have undergone decompression and in whom progressive lumbar spinal instability, deformity, and/or spondylolisthesis have developed. The reported incidence of this progressive slippage has ranged from as low as 9% in patients with no evidence of preoperative lumbar spinal instability¹⁵ to as high as 73% in those with preoperative evidence of spondylolisthesis.⁸

In an analysis of 100 laminectomy-treated patients, Caputy and Luessenhop⁴ found that the main risk factor for 5-year clinical and radiographic failure was preoperative spondylolisthesis. In topic reviews and metaanalyses of the literature, several authors have stressed the importance of identifying spondylolisthesis and scoliosis as significant risk factors for delayed clinical and radiographic failure after lumbar decompressive procedures.^{8,25,27,29} Multilevel laminectomies and extensive (wide) decompression have also been shown to have a positive correlation with an increased incidence of progressive spondylolisthesis.^{13,26} Whereas spondylolisthesis and scoliosis are easily identified on radiography as potential risks for postdecompression instability, several techniques have been advocated as a means by which to identify more subtle forms of preoperative spinal hypermobility or deformity. The most popular of these methods are criteria based on dynamic lateral flexion–extension images.^{10,11,31,32} In general, PLF at the time of lumbar decompression has been reserved for patients with lumbar stenosis and preoperative radiographic evidence of hypermobility or deformity in an attempt to

minimize the chance of delayed symptomatic spondylolisthesis or deformity.^{3,7,28,30} Jolles, et al.,¹⁵ reported that only in 9% of 155 decompression-treated patients without preoperative evidence of instability did delayed slippage eventually develop. Hopp and Tsou¹³ as well as others^{3,8} have reported that aggressive wide decompression and facetectomy performed at the time of the decompression result in iatrogenic destabilization in certain patients and may account for delayed deformity in those with stenosis and normal preoperative alignment.

At the time of lumbar decompression in patients without instability PLF has been performed to prevent late-onset instability and potentially to improve outcome. Cornefjord, et al.,⁶ retrospectively reviewed 124 patients of whom 96 were available for follow up. Three treatment groups were described: 59 patients underwent lumbar spinal fusion with or without placement of supplemental instrumentation, in addition to decompression. In all surgical patients statistically significant benefits were demonstrated for walking tolerance, leg pain, and back pain ($p < 0.001$), with an overall 65% satisfaction rate at 7 years. No significant differences in outcome were identified between those who underwent fusion and those who did not. This paper provides Class III medical evidence suggesting that the addition of fusion does not improve long-term outcomes in patients with stenosis and no evidence of preoperative spinal instability. Grob, et al.,¹⁰ randomized 45 patients with stenosis but no evidence of preoperative spondylolisthesis or instability into three treatment groups: decompression alone (Group 1), decompression and single-segment fusion (Group 2), and decompression and multi-segment fusion (Group 3). In all three treatment groups patients reported significant improvement in ambulatory status and pain ($p < 0.001$). Blood loss and operative duration were, however, higher in the lumbar fusion groups. No differences among the three groups were noted on a patient satisfaction survey administered at the last follow-up evaluation. This paper provides Class III medical evidence (due to the small sample size and nonvalidated outcome measure) suggesting that the addition of PLF does not improve outcome following decompression in patients with lumbar stenosis and no preoperative deformity or instability.

Herron and Mangelsdorf¹² reported their experience with a retrospective cohort study of 140 patients treated for symptomatic lumbar stenosis. Nine patients underwent fusion in addition to decompression. Because of this extremely small sample, the authors were unable to demonstrate a significant benefit to fusion. Rompe, et al.,²⁴ reviewed their results with 117 consecutive patients in whom they performed surgery for lumbar stenosis: 90 patients underwent decompression only and 27 underwent decompression and fusion. Both groups of patients reported improved walking endurance and pain scores ($p < 0.01$). There were no statistical differences in outcome between the fusion and nonfusion groups. Nasca²¹ first reported a retrospective series of 80 patients, and 2 years later he described 114 patients treated with lumbar stenosis.²² He classified patients based on the anatomical location of stenosis, either in the lateral recess, central canal, or both, and noted the presence of associated scoliosis or deformity. In addition to decompression, fusion was performed in 51 patients and decompression alone was per-