

Guidelines for the performance of fusion procedures for degenerative disease of the lumbar spine. Part 8: lumbar fusion for disc herniation and radiculopathy

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Recommendations

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

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

Options. 1) Lumbar spinal fusion is not recommended as routine treatment following primary disc excision in patients with a herniated lumbar disc causing radiculopathy. 2) Lumbar spinal fusion is recommended as a potential surgical adjunct in patients with a herniated disc in whom there is evidence of preoperative lumbar spinal deformity or instability. 3) Lumbar spinal fusion is recommended as a potential surgical adjunct in patients with significant chronic axial low-back pain associated with radiculopathy due to a herniated lumbar disc. 4) Reoperative discectomy is recommended as a treatment option in patients with a recurrent lumbar disc herniation. 5) Reoperative discectomy combined with fusion is recommended as a treatment option in patients with a recurrent disc herniation associated with lumbar instability, deformity, or chronic axial low-back pain.

Rationale

Spinal fusion is a commonly performed procedure, often

Abbreviation used in this paper: PLF = posterolateral fusion.

conducted following a decompressive procedure. In cases of lumbar disc herniation, the primary problem is usually limited to radicular pain due to nerve compression. Typically, patients with a symptomatic herniated disc refractory to medical management undergo discectomy without fusion. Spinal fusion has, however, been used as a treatment for patients with primary and recurrent disc herniations. The purpose of this review is to examine the medical evidence concerning the role of lumbar fusion in the operative treatment of patients with radiculopathy and back pain caused by a herniated lumbar intervertebral disc.

Search Criteria

A computerized search of the database of the National Library of Medicine from 1966 to November 2003 was conducted using the search terms “spinal fusion and disc herniation,” “lumbar disc herniation and surgery and outcome,” and “lumbar disc herniation and fusion.” The search was restricted to the English language. This yielded a total of 389 references. The titles and abstracts of each of these references were reviewed, and papers not concerned with the use of fusion with lumbar disc herniations were discarded. References were identified that provided either direct or supporting evidence relevant to the use of fusion as a treatment for lumbar disc herniations. These papers were pulled and reviewed, and relevant references from their bibliographies were identified. Rele-

vant papers providing Class III or better evidence are summarized in Table 1. Significant supportive data are provided by other references listed in the bibliography.

Scientific Foundation

Patients with a primary disc herniation typically report radicular pain as their main symptom. In these patients, surgical treatment typically involves a partial discectomy and decompression of the nerve root without the addition of a fusion. The intervertebral disc is a primary stabilizer of the functional spinal unit and decreases the biomechanical forces transmitted to the adjacent vertebral endplates. Injury to the intervertebral disc can, potentially, lead to segmental spinal instability, which may result in chronic low-back pain. Yorimitsu and colleagues²⁵ reported that 74.6% of patients followed for 10 years after discectomy suffered from residual low-back pain. Thirteen percent of their patients reported severe low-back pain. Similarly, Loupasis, et al.,¹⁸ reported that 28% of patients who they treated with discectomy continued to complain of significant back or leg pain 7 to 10 years after surgery. Dvorak and associates⁶ found that 23% of patients complained of "constant heavy" back pain between 4 and 17 years following discectomy. Several authors have evaluated the addition of fusion at the time of initial discectomy as a means to improve patient outcome.

Takeshima, et al.,²³ performed a prospective study of 95 patients they treated with surgery for a primary disc herniation. Forty-four patients underwent discectomy alone; 51 underwent discectomy and fusion. Clinical outcomes were assessed approximately 7 years following surgery using the Japanese Orthopaedic Association system. Patients with a greater than 50% improvement in symptoms were considered to have an excellent or good outcome. In 73% of the discectomy-only group an excellent or good score was achieved, compared with 82% of the discectomy plus fusion group. This difference was not statistically significant ($p = 0.31$). The patients who underwent fusion had longer surgical times, greater blood loss, longer hospital stays, and an increased overall treatment cost. There was, however, a lower disc recurrence rate among patients who had undergone discectomy plus fusion (0% compared with 11%).²³ This study provides Class III medical evidence (small sample size) that the routine addition of a noninstrumented PLF does not improve functional outcome in patients treated surgically for a lumbar disc herniation.

Donceel and Du Bois⁵ described a series of 3956 patients treated for a lumbar disc herniation with either discectomy alone (3670 patients) or discectomy and fusion (286 patients). The authors used return to work 1 year following surgery as an outcome measure. They found that 70% of the discectomy-only group were able to resume their preoperative work level at the 1-year follow up compared with only 40% of the discectomy/fusion group. They noted that the fusion group tended to have more significant symptoms and more complex preoperative histories. This retrospective review provides Class III medical evidence suggesting that discectomy combined with fusion does not improve outcomes in patients compared with discectomy alone when treating lumbar disc herniation.

Young²⁶ performed a retrospective review of a large series of patients who underwent surgery for a lumbar disc herniation at the Mayo clinic. During a 40-year period, 450 patients underwent discectomy and noninstrumented PLF and 555 underwent discectomy alone. Patients were followed for a mean of 8 years. Young observed that the fusion group had superior long-term relief of sciatica (73%) and lumbago (68%) compared with the discectomy-alone group (48% relief of sciatica and 52% relief of lumbago). He reported a 95% patient satisfaction rate in the fusion group and an 84% satisfaction rate in the discectomy-alone group. Selection criteria cited for the combined operation included patients with spondylolisthesis, spondylolysis, localized degenerative arthritis, partial sacralization, scoliosis, fractures, facet joint degeneration, six lumbar vertebrae, congenital anomalies, and recurrent disc herniation.²⁶ The medical evidence provided by this report is considered Class III because of the retrospective nature of the review, dissimilar patient groups, the use of nonvalidated outcome measures, and high patient dropout.

One proposed rationale for the addition of fusion to a primary discectomy is the prevention of late-onset instability and associated chronic low-back pain. Kotilainen and Valtonen¹⁷ found that 22% of their patients developed clinical and radiographic signs of lumbar spinal instability following lumbar microdiscectomy. Kotilainen¹⁶ performed a follow-up examination 5 years later in 39 of the patients in whom clinical and radiographic instability after primary disc excision developed. He concluded that patients who experience instability after lumbar discectomy did not do well, with only 38% of these patients able to work. The author hypothesized that if lumbar instability could be identified preoperatively, or if the surgeon could identify patients at risk for the postoperative instability, these patients might be better treated with fusion at the time of discectomy. In a series of 520 patients with herniations treated by discectomy alone during an 18-year period, Cauchoux, et al.,² observed only 31 patients (5.9%) in whom signs or symptoms of mechanical lumbar instability subsequently developed and who required fusion. Although the follow-up duration of their cohort was unclear, these authors concluded that lumbar instability following discectomy was rare and thus did not warrant routine fusion at the time of the primary operation. Padua and colleagues²¹ studied 150 patients who underwent primary lumbar discectomy. Ten to 15 years following surgery, patients were examined clinically and radiographically (flexion-extension lateral lumbar x-ray films). Thirty patients displayed radiographic signs of instability, yet only nine patients were believed to be symptomatic. These series provide Class III medical evidence indicating that postoperative spinal instability may occur after lumbar discectomy and that the occurrence of instability is associated with a greater likelihood of a poor outcome. The incidence of symptomatic lumbar spinal instability is relatively low.

A second rationale for adjunctive fusion is in the treatment of patients with lumbar disc herniation suffering radiculopathy and significant axial back pain or patients who performs heavy, manual labor. Advocates of spinal arthrodesis in these circumstances point out that even though there is no evidence of "true" segmental lumbar instability, there is often significant lumbar pain or "fatigue." This may prevent the full return to manual labor in