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The Role of Fusion for Recurrent Disk Herniations

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For patients with symptomatic recurrent disk herniations that have failed nonoperative treatment, surgical treatment can be considered. Although simple repeat diskectomy can be an effective treatment for first time recurrences, many surgeons would consider the addition of fusion, particularly for second or third recurrences. With a lack of high-level evidence, decision making concerning when and how to fuse for a recurrent lumbar disk herniation remains largely surgeon-dependent because a variety of options are available. Although there are limited data, both posterolateral and interbody fusion can be effective. Future study is needed to better define the indications and ideal method of fusion for recurrent disk herniations.
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Lumbar diskectomy for disk herniations is one of the most common spinal surgeries performed in the United States, with approximately 300,000 procedures performed annually.[1,2] Recently published trials have provided high-level evidence confirming good short-term and long-term outcomes after primary diskectomy.[3,4] With current surgical techniques, however, patients have a continued risk for recurrent herniation, one of the more common causes of recurrent radiculopathy, which has a reported incidence ranging from 3%-18%.[5-12] Although definitions vary, recurrent herniation is most appropriately defined as a herniated disk at the same level on the same side as the index procedure after a period of symptomatic improvement.[11]

The initial treatment of a recurrent herniated disk should follow a similar protocol as for the primary event. For patients with symptomatic recurrent disk herniations that have failed nonoperative treatment, surgical treatment can be considered. Although simple repeat diskectomy can be an effective treatment for first time recurrences, many surgeons would consider the addition of fusion, particularly for second or third recurrences. With a glaring lack of high-quality data, decision making about when and how to fuse for a recurrent lumbar disk herniation remains largely surgeon-dependent, with a variety of options available.

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Who Is at Risk for a Recurrent Disk Herniation?

Various risk factors for recurrent herniation have been identified, some of which might be controllable at the time of index surgery.

Patient Factors

Carragee et al[5] prospectively examined a group of 187 patients who underwent simple diskectomy. They found that herniations associated with a small annular defect (ie, less than 6 mm) had a 1% recurrent herniation rate compared with those with a large defect (ie, 6 mm or greater), which had 27% recurrent herniation rate and ultimately a 21% reoperation rate.

Suk et al[10] retrospectively reviewed 28 patients with recurrent disk herniations and found young age, male gender, smoking, and traumatic events to be significant risk factors. Similar factors were noted by Cinotti et al,[13] who prospectively reviewed 26 patients requiring reoperation and also noted that men with marked disk degeneration were at particularly high risk.

Surgical Factors

There are 2 broad categories of surgical technique for lumbar diskectomy. Limited diskectomy, sometimes referred to as a sequestrectomy or fragmentectomy, involves removal of only the herniated portions of the disk. Radical diskectomy, sometimes referred to as disk curettage or subtotal diskectomy, involves aggressive removal of most of the nucleus pulposus in addition to the herniated fragment. Carragee et al[14] found

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that patients who underwent a subtotal (radical) diskectomy had a 9% recurrent herniation rate compared with 18% with limited diskectomy. In a randomized study of 84 patients, Barth et al[15] found the recurrent herniation rate to be 12.5% with radical diskectomy versus 10% with limited diskectomy. A recent systematic review concluded that a limited diskectomy might be associated with less risk for long-term low back pain but an increased risk for recurrent herniation than radical diskectomy.[16]

Evaluation, Work-up, and Nonoperative Treatment

In evaluating a patient with recurrent radiculopathy after a diskectomy, the first step is to identify the causative pathology. This is initially through a detailed history and physical examination, followed by appropriate imaging. Plain radiographs, including flexion-extension views, are useful to rule out segmental instability of deformity. Ultimately, a magnetic resonance imaging (MRI) scan is obtained to better characterize the presence of a recurrent disk herniation.

A recurrent disk is often difficult to distinguish from epidural or perineural scarring. Abundant scar formation can appear as a fragment of disk. To help make this distinction, a gadolinium-enhanced MRI scan can be obtained.[17,18] Gadolinium will enhance scar because it is a vascular tissue, whereas disk material will not enhance. This step is important because many studies have inferior outcomes after revision surgery for symptoms attributed to epidural scarring or fibrosis compared with an identifiable cause of nerve compression such as a recurrent herniation.[19-22] If an MRI scan cannot be obtained, a computed tomography (CT) myelogram is an acceptable alternative.

Once a recurrent disk herniation has been confirmed, the treatment algorithm is similar to that of a primary event. A 3-month trial of nonoperative management might include physical therapy, oral anti-inflammatory medications, spinal injections, and sparing use of narcotics. Unfortunately, outcomes of nonoperative treatment for recurrent herniations have not been well-reported, and at the time of this writing there were no randomized controlled trials comparing operative with nonoperative treatment. Some limited data are available, however. Of 17 patients with a recurrent disk herniation, Ambrossi et al[23] reported that 6 (35%) had successful resolution of symptoms with nonoperative care, whereas 11 (65%) ultimately underwent surgery. Naylor[24] reported that nonsurgical treatment was successful in only 8% of patients with a recurrent disk herniation. Regardless of the poor understanding of nonoperative treatment (and perhaps the poor outcomes), a trial of nonoperative treatment should be attempted before making a decision about surgery.

Surgical Treatment Options

Surgical treatment for recurrent disk herniations can be broadly categorized as revision diskectomy alone or revision diskectomy and fusion. Regardless of approach, revision surgery is more complicated than an index procedure. Local anatomy is often distorted, particularly facet joint that can become hypertrophied. Laminotomy borders are often imbedded within scar, making their delineation more difficult and time-consuming. Adhesions between the dural sac and the surrounding bone and soft tissue make mobilization challenging and are associated with a higher risk of dural tear. Dura and nerve roots. Finally, differentiating herniated disk and annulus from epidural scar requires a higher degree of experience and skill than with primary diskectomies.

Revision Diskectomy

Although early reports documented inferior outcomes with revision diskectomy,[25-32] more investigations, which controlled for confounding factors such as foraminal stenosis and adjacent level herniations, showed that results are more comparable to those for index surgery.[10,20,33-37] In a prospective study with at least 2-year follow-up, Cinotti et al[34] found no significant difference in clinical outcomes between patients undergoing revision or primary diskectomies. Despite finding longer operative times, Suk et al[10] similarly found comparable clinical improvement between revision and primary diskectomy patients. In matched cohort study, Papadopoulos et al[38] retrospectively found that clinical results, which were measured by a validated instrument (Musculoskeletal Outcomes Data Evaluation and Management System or MODEMS), in 27 patients who underwent revision diskectomy were not statistically different from those for 30 patients undergoing primary diskectomy. Considering these data, patients can be advised that revision diskectomy has a reasonably high chance of improving radiculopathy, comparable to an index operation.

When Is Fusion Indicated?

The indications for fusion in conjunction with revision diskectomy have not been well-established. There is a paucity of evidence regarding the outcomes of fusion for recurrent disk herniations. Furthermore, there are no direct comparisons of revision diskectomy with and without fusion for this diagnosis, making the decision for fusion highly surgeon-dependent.

Despite a lack of peer-reviewed data, fusion would be indicated in the presence of radiographically detectable instability. This can include static spondylolisthesis on a lateral radiograph or dynamic instability on flexion-extension radiographs. There are no clear-cut criteria to define dynamic instability in the presence of a recurrent disk herniation. However, even minor amounts of translational change between the vertebrae during flexion and extension can suggest physiological instability, particularly in the presence of nerve root compression from a disk herniation. In this situation, fusion of the involved levels should be considered.

There are mechanical factors that should also be considered. With revision diskectomy, additional portions of the facet joint are usually removed to allow safe identification and mobilization of the nerve root and dural sac. If a large