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Surgical Treatment of Lumbar Disk Disorders

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THE BENEFIT OF SURGICAL TREATMENT FOR SOME DIS-
eases affecting the lumbar spine is not controver-
sial in many clinical circumstances, such as major
trauma with gross instability, unstable spondylolis-
thesis, persistent or complicated spinal infections, and some
spinal tumors with progressive neurologic loss. More com-
monly a patient may contemplate surgical treatment for com-
plications of common degenerative conditions affecting the
lumbar disk. In general, 2 clinical syndromes are associ-
ated with these degenerative conditions, and the clinical
course and efficacy of interventions for each is very differ-
ent. The first is primary back pain with little or no compo-
nent of radicular symptoms due to nerve root irritation. The
second is primary radicular pain, which usually has some
component of back pain.

Surgical treatment for primary back pain associated with
disk changes ("discogenic pain") is the more controversial
and less successful.^{1,2} When examination of the lumbar spine
reveals only common degenerative changes, the relation-
ship of these findings to a patient's back pain is unclear. Disk
degeneration, annular fissures, small protrusions, and facet ar-
thritis are commonly found in individuals with little or no
back pain.³⁻⁶ Furthermore, many studies have shown that se-
rious disability in this group is associated with abnormal psy-
chological profiles, multiple chronic pain processes, and com-
pensation issues.^{7,8} Conversely, longitudinal studies have found
that the severity of chronic pain illness in this group appears
to correlate much less well with presence or extent of degen-
erative findings than with these psychosocial or generalized
neurophysiological comorbid conditions.^{4,5} Not surpris-
ingly, the surgical treatment of this poorly defined disco-
genic pain illness has been somewhat disappointing.^{1,9} Ran-
domized trials of lumbar fusion compared with various
nonsurgical strategies have shown neither consistently good
outcomes with surgery nor clear benefit over nonsurgical treat-

ments.¹⁰⁻¹² In the randomized controlled trial (RCT) with the
best surgical results, the improvement in pain intensity score
was only 2 points (on a 10-point scale), and the disability im-
provement by Oswestry Disability Index was only 10 to 12
points (on a 100-point scale).¹¹ Furthermore, clinical out-
comes appear to steadily deteriorate after 6 months. In a large
population-based study, approximately 18% of patients who
had spinal fusion for degenerative conditions experienced pro-
cedure-related complications; 20% of these patients went on
to reoperation over the next 5 years.¹³

In contrast, for primary lumbar radicular pain syndromes
or sciatica, the common clinical perception has been that sur-
gical treatment is more effective and more reasonably consid-
ered. In working-age persons, by far the most common cause
of sciatica has been lumbar disk herniation.¹⁴ In most instances,
imaging studies show clear pathologic disk herniation and root
compression. The question of misdiagnosis, a serious issue in
primary back pain syndromes in which imaging and provoca-
tive tests have poor validity, is much less of a problem in the
presence of sciatic tension signs, neurologic symptoms, and
concordant imaging studies. Fortunately, sciatica is usually a
short-lived condition, and many of those affected experience
only minor impairment and often do not seek medical atten-
tion. However, in some persons the radicular pain associated
with disk herniation can be severe, intolerable, and, when per-
sisting, gravely debilitating. How to treat patients seeking care
for this problem is controversial.

In a landmark 1983 RCT, Weber¹⁵ showed that, among pa-
tients with more or less tolerable sciatica and without serious
motor weakness, a laminectomy and disk removal appeared
to be more effective than nonoperative care over at least the
first year. Both groups had a somewhat slow convalescence.
However, the comparatively large surgical exposure and op-
erative morbidity that were characteristic of spinal surgery 30
years ago seem excessive when compared with those of to-
day's surgical interventions, which are characterized by small

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incisions, minimal blood loss, and early hospital discharge. In most cases, a simple laminotomy and discectomy can be performed in about 1 hour on an outpatient basis, with negligible anesthetic risk. In fact, more recent data¹⁶ show the postoperative convalescence after a modern uncomplicated limited discectomy may be only a few weeks compared with a few months in the study by Weber. In contrast to spinal fusion surgery for discogenic pain, observational studies of modern laminotomy and limited discectomy for disk herniation have frequently shown rapid pain relief and functional improvement in 70% or more of patients.^{16,17}

Similarly, the relatively passive approach with expectant care used in the study by Weber¹⁵ may seem overly cautious today. Modern aggressive rehabilitative techniques also may be more effective, with observational studies showing frequent and relatively full recovery over 4 to 6 months despite severe sciatica.¹⁸ Comparing modern techniques, a recent but relatively small (N=56) RCT that included patients with between 6 and 12 weeks of sciatica and disk herniation but only moderate sciatica severity (mean Oswestry Disability Index, 39), more rapid improvement in leg pain and disability occurred during the first 6 to 12 weeks in the surgery group, with these effects diminishing over time.¹⁹ Similarly, in an RCT involving 169 patients, Butterman¹⁷ reported better short-term (up to 6 months after surgery) outcomes with surgical treatment of disk herniation compared with epidural steroid injection. In these RCTs, the differences in outcomes between the surgical and nonsurgical groups becomes much smaller and is possibly negligible with 2 or more years of follow-up.^{15,17,19}

In this issue of *JAMA*, the results of 2 studies^{20,21} from the Spine Patient Outcomes Research Trial (SPORT) on lumbar disk surgery for persistent radicular pain are reported. These include a multicenter RCT of surgical vs nonoperative care (n=501)¹⁸ and a companion observational cohort of patients who declined randomization and selected either surgery or continued nonoperative care (n=743).¹⁹ These 2 studies represent a colossal research effort and provide a fascinating snapshot of both modern patient preferences and clinical outcomes for this common clinical problem.

The SPORT investigation included patients with definitive symptoms, signs, and imaging of disk herniation and sciatica. Patients had experienced at least 6 weeks of radicular pain at the time of enrollment. It is noteworthy, however, that about 20% to 25% of the enrolled patients had a current sciatica episode of more than 6 months. In addition, patients reported a wide range of pain and disability at baseline. In SPORT, surgical candidates were offered enrollment in either the randomized trial or the concurrent observational cohort. Those entering the RCT seem to have been truly ambivalent about what care they preferred. Even in the group randomized to surgery, only 50% had proceeded to surgery 3 months later. Examining which patients elected surgery in either study shows an interesting pattern: these patients were younger, had lower income and

educational levels, reported more severe perceived disability and pain, and felt their situation was deteriorating.

The surgery appears to have been well monitored and relatively benign. Less than 5% of the surgery group had any complication, and most adverse events appear to have been minor. Reoperation not associated with another disk herniation was also infrequent (<5%). In the RCT, an intent-to-treat analysis at follow-up revealed only small differences in outcomes at 1 and 2 years. But in a study in which only half of those in the surgery group underwent the procedure 3 months after entry, these findings are difficult to evaluate. Nonetheless, it is clear that both surgical and nonoperative treatment were associated with clinically significant improvements over time and that differences between treatments, as has been shown in previous work, decreased with time.

Several other studies have shown an earlier comparative benefit with surgical treatment,^{17,19,22} and this effect also is evident in the SPORT study. The group electing surgery in the observational cohort had an improvement on the Oswestry Disability Index of nearly 40 points (on this scale, the minimal clinically important difference is 10-15 points²³), from severe disability to nearly normal by 6 weeks after surgery. This degree of improvement is as substantial as that reported for any musculoskeletal intervention. After 1 and 2 years, there were no significant differences in outcome between groups in the RCT, whereas in the observational cohort there were both clinically important and statistically significant differences in self-reported outcome for patients having surgery.

Regardless of the intervention received, most patients seemed satisfied with their care and, given the high crossover rate, most received the intervention they preferred. Previous work has shown that the nature of the disk herniation can predict outcome and response to treatment.¹⁶ Similarly, compensation issues and psychological profiles also influence outcomes and clinical course.²⁴ But patient preference and necessity may be even more potent guides to clinical care. In that patients' subjective symptoms improved after both surgical and nonoperative interventions, the results of the SPORT trial appear to support the decision-making of many of the study participants. However, it is unclear whether similar improvements would be found if patients had been restricted to their assigned treatment groups. If the main benefit from surgery is that patients perceive a more rapid resolution of disabling pain, the question for patients may be how badly they feel and how urgently they wish to achieve relief in the next 2 to 4 months.

Consequently, whether to choose a surgical approach to sciatica due to disk herniation depends strongly on the individual patient's situation beyond the commonly considered medical and surgical comorbid conditions. For example, for a self-employed carpenter with little cash reserves, for a mother with toddlers and no local resources for help, or for a salesperson working on commission, the apparently slower recovery without surgery (as demonstrated in the SPORT clinical trial and observational cohort) may represent a hardship be-

yond physical pain. While curtailing activity can lessen sciatica if the patient can afford to do so, these individuals may be unable to meet important daily necessities over an extended illness; they may lose their ability to care for family, to earn a living, or to keep a competitive job. The long-term resolution of radicular pain in 1 year's time will be little comfort if socioeconomic losses have seriously disrupted the patient's family, depleted lifelong savings, or led to losing a job. In these circumstances, the surgical option may be very attractive despite the expense of surgery, the documented small risks of complications, or the potential for reoperation. The data from the SPORT study emphasize the reasonable expectations of surgical outcome for disk herniation and sciatica, how accurate the selection of patients can be with modern imaging, and how the fear of a failed back surgery (a very real possibility following fusion for discogenic pain [50%-60%]⁹⁻¹²) is quite uncommon even in a large multicenter study.

On the other hand, many patients in the SPORT study clearly improved without surgical intervention. These findings suggest that in most cases there is no clear reason to advocate strongly for surgery apart from patient preference. For the patient with emotional, family, and economic resources to handle mild or moderate sciatica, surgery may have little to offer. In fact, this was the profile of many patients who opted against surgery in the SPORT trial: older participants with higher income and higher education but with milder pain and disability. Furthermore, the SPORT data clearly show that the risk of serious problems (neurologic deterioration, cauda equina syndrome, or progression of spinal instability) when receiving nonoperative care is extremely small. The fear of many patients and surgeons that not removing a large disk herniation will likely have catastrophic neurologic consequences is simply not borne out. Thus, these data help both clinicians and patients make better informed decisions based each patient's needs and expectations.

Several important questions remain. The cost-effectiveness of surgery for lumbar disk herniation must be established. A Swedish case-control study suggested favorable cost-utility, but these results need corroboration.²⁵ The effect of early surgical decompression in the face of severe paresis is poorly understood. In the SPORT study, motor loss was infrequent and no surgery was performed soon after herniation. Common clinical practice is to consider decompression when paresis is functionally disabling, but few data support this approach. Similarly, cauda equina syndrome due to disk herniation causing loss of bowel and bladder function is uncommon and usually is treated surgically, even though strong evidence regarding efficacy or timing is lacking. Technical advances allow less extensive procedures to decompress the nerve roots, and whether these approaches will lead to better outcomes or increase complications is unclear. Similarly, pharmacologic treatment aimed at local inflammatory processes is being investigated. For now, however, the SPORT clinical trial and observational cohort have provided important and timely in-

formation regarding the relative advantages of current practice alternatives for patients with radicular pain due to lumbar disk herniation.

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