



■ EDITORIAL

No need to add fusion to lumbar decompression for stenosis

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Degenerative lumbar spinal stenosis is caused by narrowing of the central bony canal, lateral recesses, or intervertebral foramina due to facet joint arthritis, buckling of the ligamentum flavum, and bulging of the annulus fibrosus. It can cause compression of the spinal nerve roots, and is therefore commonly associated with leg pain, usually in a claudicant pattern, and back pain which can be disabling. The prevalence is reported to be 11% in adults in the USA, increasing with age.¹ Advances in imaging, together with the ageing of the population and the wish of patients to maintain their mobility as they age, have resulted in lumbar stenosis being the most common indication for spinal surgery in patients aged > 65 years.^{2,3}

Surgery, which is indicated in patients with persistent symptoms and failed conservative management, involves decompression of the cauda equina and individual nerve roots. This may be undertaken as decompression alone or decompression with spinal fusion, which can be un-instrumented or instrumented. The latter two are significantly more costly options than the first, and are associated with more complications and adjacent level disease.⁴⁻⁶ There has been a considerable increase in the rate of instrumented fusions in patients with stenosis in the last few decades, despite the lack of high-level evidence of the benefits, which suggests that the procedures represent “low-value care”, and, as such, there is a widespread lack of support for their use in routine clinical practice.^{7,8} In the USA, the greatest increase in the rates of spinal surgery has been in patients aged > 65 years, those with lumbar stenosis with an increase of > 50% between 2004 and 2015, and those with degenerative spondylolisthesis with an increase of 30% between 2004 and 2015.⁹

There is much controversy regarding whether decompression with fusion gives better outcomes compared with decompression alone. Many spinal surgeons presume that decompression alone could lead to iatrogenic spinal instability at the decompressed level, particularly when stenosis is associated with degenerative spondylolisthesis or scoliosis. This instability may hypothetically lead to recurrent leg and back pain, a reduced functional outcome, and an increase in the rate of revision surgery.^{6,10} In order to prevent further

instability, many surgeons around the world perform an additional instrumented fusion to stabilize the adjacent vertebrae. However, the benefits of this additional surgery remain very controversial. Improved outcomes need to be weighed against the risk of complications related to the fusion, such as increased operating time, blood loss, length of stay in hospital, costs, and adjacent level disease.¹⁰⁻¹³

Adjacent level disease is a frequent sequela of spinal fusion, which may occur due to altered biomechanics of the motion segment adjacent to the level(s) which has (have) been fused,¹⁴ and includes progressive disc degeneration, new or worsening stenosis, spondylolisthesis, or scoliosis with nerve root compression.

This issue of *The Bone & Joint Journal* contains a report of the results of a randomized controlled trial comparing the MRI appearances two years after decompression alone compared with decompression and fusion, for lumbar spinal stenosis, by Karlsson et al¹⁵ from the Swedish Spinal Stenosis Study (SSSS).⁶ Adult patients aged between 50 and 80 years with lumbar stenosis with or without degenerative spondylolisthesis were included. Randomization led to 222 patients being assigned to undergo decompression alone or decompression with fusion, in accordance with the previously published SSSS, which had aimed to compare the clinical outcomes of these two surgical approaches. The techniques of lumbar fusion were instrumented posterolateral or posterior interbody, and posterolateral uninstrumented fusion.

The primary outcome measure was new stenosis on MRI at two years postoperatively, defined as a cross-sectional area of ≤ 75 mm² of the dural sac at the operated level (restenosis) and/or at the level above (proximal adjacent level stenosis). Secondary outcomes were the morphology of the dural sac, disc degeneration at the proximal adjacent level, and the grade of vertebral slip from conventional lateral radiographs. All clinical and radiological results were available for 176 patients (79.3%).

The authors found that new stenosis at the operated and/or the adjacent level was more common after decompression with fusion than after decompression alone. Interestingly, proximal adjacent level stenosis was more common

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after decompression and fusion (44%) than after decompression alone (17%), even in patients with stenosis and degenerative spondylolisthesis. They also found that the vertebral slip increased by 1.1 mm after decompression alone, regardless of the presence of preoperative spondylolisthesis, without increasing leg pain.

When considering international trends with the increasingly widespread use of fusion, the results of this study clearly contribute to the emerging literature, suggesting that adding fusion to decompression has no place in the treatment of lumbar stenosis, with or without stable degenerative spondylolisthesis.^{16–18} Indeed, based on the findings in this study, fusion can lead to worse outcomes, resulting from new stenoses. This is in stark contrast to a commonly held view in the spinal surgical world that adding fusion in these patients will prevent further slip in those with stenosis and stable spondylolisthesis.⁷ There is little evidence to support this view, and a review by Kepler et al⁷ showed that decisions about whether fusion was added to a decompression were influenced more by perceptions of the rates of fusion, the importance of sagittal balance, and reimbursement issues than the evidence base. That evidence clearly now favours not using fusion in these patients. Given that new stenosis can be caused rather than prevented by subjecting patients to spinal fusion, avoiding fusion will be of particular benefit to symptomatic elderly patients who may be less able to tolerate it.

There are, however, important limitations in the study by Karlsson et al¹⁵ that should be taken into account when interpreting the findings. Although the clinical outcomes were reported earlier by the authors of the SSSS,⁶ this further study did not correlate the clinical outcomes at long-term follow-up including lower back pain and neurogenic claudication with the imaging findings. Many patients with lumbar stenosis can be asymptomatic and the radiological findings may not be related to poor clinical outcomes. It would be of interest to investigate whether patients with new stenosis following the initial surgery have worse clinical outcomes. Another limitation of the study by Karlsson et al¹⁵ is that the T2 sequence of the MRI may have hampered the accuracy of the assessment. Titanium screws can lead to significant artefacts in spinal imaging, overemphasizing stenosis and therefore reducing the cross-sectional area of the dural sac, leading to the false positive reporting of new stenosis. A further limitation is the lack of detail about the presence of developmental stenosis that could be implicated in symptomatic adjacent level deterioration, which has been shown to be a risk factor for worse disability and poorer quality of life in a previous report.¹⁹ Finally, the authors showed some fine examples of images, but does this represent usual care?

The findings of this landmark study by Karlsson et al,¹⁵ in conjunction with the increasingly large body of evidence, have important consequences in the clinical practice of spinal surgeons. It has been suggested in various guidelines that the addition of lumbar fusion to decompression improves clinical outcomes.^{20,21} However, these guidelines have not been updated to include results from recent well-evidenced controlled trials on this subject.

Most patients with lumbar spinal stenosis and stable degenerative spondylolisthesis who might have previously been

considered suitable candidates for decompression and fusion may, on the evidence now available, be treated with decompression alone. There is no longer a role for an expensive complication-generating associated procedure.

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